Established In 1998
CHRISTIAN COLLEGE OF ENGINEERING & TECHNOLOGY
Managed By St. Thomas Mission, Bhilai
Approved by AICTE and Affiliated to CSVTU, Bhilai
If You Aim High, We Provide The Means

QLM 1.1.1

The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment

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Criterion 1

Curricular Planning and Implementation QlM 1.1.1

Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (CG)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination of P1 Group
B Tech (First Semester - Common to all Branches of Engineering) 2019-20

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination Theory/Lab			Total Marks	Credit
				L	T	P	ESE	CT	TA		
1.	Basic Sciences	Physics-I	A000111(015)	3	1	-	100	20	30	150	4
2.	Basic Sciences	Mathematics-I*	A000112(014)	3	1	-	100	20	30	150	4
3.	Electrical Engineering	Basic Electrical and Electronics Engg.	A000113(024)	2	1	-	100	20	30	150	3
4.	Mechanical Engineering	Engineering Graphics and Design	A000114(037)	1	0	-	100	20	30	150	1
5.	Computer Science	Fundamentals of Computer	A000115(022)	2	0	-	100	20	30	150	2
6.	Basic Sciences	Physics (Lab)	A000121(015)	-	-	2	40	-	20	60	1
7.	Electrical Engineering	Basic Electrical and Electronics Engg. (Lab)	A000122(024)	-	-	2	40	-	20	60	1
8.	Computer Science	Fundamentals of Computer (Lab)	A000123(022)	-	-	2	40	-	20	60	1
9.	Mechanical Engineering	Engineering Graphics and Design (Lab)	A000124(037)	-	-	4	40	-	20	60	2
10.	Humanities	Value Education	A000105(046)	-	-	-	-	-	10	10	-
			Total Marks	**11**	**3**	**10**	**660**	**100**	**240**	**1000**	**19**

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note :

(a) The teaching in the 1st and 2nd Semester will be divided in two groups consisting of various branches as shown below :

P1-GROUP : Electronics & Telecommunication, Mechanical, Civil, Mining, Applied Electronics & Instrumentation, Metallurgy, Mechatronics, Automobile, Production Engineering, Fashion and Apparel Engineering

Q1-GROUP : Computer Science, Information Technology, Electronics & Instrumentation, Electrical, Chemical, Electrical & Electronics, Plastic Engineering, Agriculture Engineering, Biotechnology

(b) *Mathematics-I will be taught to both the groups in the first semester.

(c) Value Education will be conducted by the relevant discipline/humanities as decided by the Principal.

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Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (CG)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination of Q1 Group
B Tech (Second Semester - Common to all Branches of Engineering) 2019-20

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
							Theory/Lab				
				L	T	P	ESE	CT	TA		
1.	Basic Sciences	Chemistry-I	A000211(011)	3	1	-	100	20	30	150	4
2.	Basic Sciences	Mathematics-II**	A000212(014)	3	1	-	100	20	30	150	4
3.	Computer Science	Programming for Problem Solving	A000213(022)	3	-	-	100	20	30	150	3
4.	Humanities	English	A000214(046)	2	-	-	100	20	30	150	2
5.	Civil Engineering	Basic Civil Engineering and Mechanics	A000215(020)	3	-	-	100	20	30	150	3
6.	Basic Sciences	Chemistry (Lab)	A000221(011)	-	-	2	40	-	20	60	1
7.	Computer Science	Programming for Problem Solving (Lab)	A000222(022)	-	-	4	40	-	20	60	2
8.	Civil Engineering	Basic Civil Engg. & Mechanics (Lab)	A000223(020)	-	-	2	40	-	20	60	1
9.	Mechanical Engineering	Workshop Practice/ Manufacturing Process (Lab)	A000224(037)	-	1	4	40	-	20	60	3
10.	Humanities	Language (Lab)	A000225(046)	-	-	2	-	-	10	10	1
			Total Marks	14	3	14	660	100	240	1000	24

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note :

(a) The teaching in the 1st and 2nd Semester will be divided in two groups consisting of various branches as shown below :

P1-GROUP : Electronics & Telecommunication, Mechanical, Civil, Mining, Applied Electronics & Instrumentation, Metallurgy, Mechatronics, Automobile, Production Engineering, Fashion and Apparel Engineering

Q1-GROUP : Computer Science, Information Technology, Electronics & Instrumentation, Electrical, Chemical, Electrical & Electronics, Plastic Engineering, Agriculture Engineering, Biotechnology

(b) **Mathematics-II will be taught to both the groups in the second semester.

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Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (CG)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination of P1 Group
B Tech (First Semester - Common to all Branches of Engineering) 2019-20

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
							Theory/ Lab				
				L	T	P	ESE	CT	TA		
1.	Basic Sciences	Physics-I	A000111(015)	3	1	-	100	20	30	150	4
2.	Basic Sciences	Mathematics-I*	A000112(014)	3	1	-	100	20	30	150	4
3.	Electrical Engineering	Basic Electrical and Electronics Engg.	A000113(024)	2	1	-	100	20	30	150	3
4.	Mechanical Engineering	Engineering Graphics and Design	A000114(037)	1	0	-	100	20	30	150	1
5.	Computer Science	Fundamentals of Computer	A000115(022)	2	0	-	100	20	30	150	2
6.	Basic Sciences	Physics (Lab)	A000121(015)	-	-	2	40	-	20	60	1
7.	Electrical Engineering	Basic Electrical and Electronics Engg. (Lab)	A000122(024)	-	-	2	40	-	20	60	1
8.	Computer Science	Fundamentals of Computer (Lab)	A000123(022)	-	-	2	40	-	20	60	1
9.	Mechanical Engineering	Engineering Graphics and Design (Lab)	A000124(037)	-	-	4	40	-	20	60	2
10.	Humanities	Value Education	A000105(046)	-	-	-	-	-	10	10	-
			Total Marks	**11**	**3**	**10**	**660**	**100**	**240**	**1000**	**19**

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note :

(a) The teaching in the 1st and 2nd Semester will be divided in two groups consisting of various branches as shown below :

P1-GROUP : Electronics & Telecommunication, Mechanical, Civil, Mining, Applied Electronics & Instrumentation, Metallurgy, Mechatronics, Automobile, Production Engineering, Fashion and Apparel Engineering

Q1-GROUP : Computer Science, Information Technology, Electronics & Instrumentation, Electrical, Chemical, Electrical & Electronics, Plastic Engineering, Agriculture Engineering, Biotechnology

(b) * Mathematics-I will be taught to both the groups in the first semester.

(c) Value Education will be conducted by the relevant discipline/ humanities as decided by the Principal.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech - I[st]
Subject: Physics-I
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000111(015)
L:3 T:1 P:0 **Credits: 4**

Course Objective:
Basic concepts of Mechanics, Optics and its applications, Electromagnetism, Quantum & Semiconductor Physics.

Note:
5 Units / Semester - Total 50 hrs. (L + T)
Branch wise:

- Civil/Metallurgy/Mining - Units 1/2/3/8/10
- Mechanical/Mechatronics/Production/Automobile - Units 1/4/5/6/10
- Electrical/Electrical & Electronics/Chemical - Units 1/3/7/8/9
- Computer Science/IT/Electronics/EI/AEI/Biotech - Units 1/7/8/9/10

Unit-1: Physical Quantities, Motion in Two or Three dimensions **(10hrs.)**

Standards and Units, Unit consistency and conversions, Uncertainty and Significant figures, Estimates and orders of magnitude, Position and velocity vectors, The Acceleration vector, Projectile motion, Motion in a circle, Relative velocity, Free body diagrams, Conservative and Non-conservative Forces; Central forces, Noninertial frames of reference.

Unit-2: Mechanics of Solids **(10hrs.)**

Angular velocity and acceleration, Rotation with constant angular acceleration, Relating linear and angular kinematics, Energy in rotational motion, Parallel axis theorem, Moment of Inertia calculations, Conditions for equilibrium, Bending Stress, Shear stress, Concept of strain energy, Elastic Module, Concepts of elasticity and plasticity.

Unit-3: Wave Optics **(10hrs.)**

Superposition of waves and interference of light by wave front splitting and amplitude splitting, Fresnel bi-prism; wedge shaped film, Newton's rings, Farunhofer diffraction from a single slit, The Rayleigh criterion for limit of resolution and its application to vision, Diffraction gratings and their resolving power.

Unit-4: Electrostatics in vacuum and dielectric medium **(10hrs.)**

Calculation of electric field and electrostatic potential for a charge distribution,Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential,Laws of electrostatics, Polarisation, Permeability and dielectric constant, Polar and non-polar dielectrics, Solving simple electrostatics problem in presence of dielectrics like Point charge at the centre of a dielectric sphere.

Unit-5: Magneto static in a linear magnetic medium **(10hrs.)**

Bio-Savart law, Divergence and curl of static magnetic field,vector potential and calculating it for a given magnetic field using Stokes' theorem, Magnetisation, Solving for magnetic field due to simple magnets like a bar magnet, Permeability and Susceptibility, Classification of magnetic materials, Ferromagnetism, Paramagnetic and diamagnetic materials, Magnetic domains and hysteresis.

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Unit-6: Faraday's law and Electromagnetic waves (10hrs.)

Faraday's law of electromagnetic induction, Continuity equation for current densities, displace current and magnetic field arising from time dependent electric field, Maxwell's equation in vacuum, Energy in an electromagnetic field, Flow of energy and Pointing vector, Plane electromagnetic waves in vacuum, Their transverse nature and polarization, Relation between electric and magnetic fields of an electromagnetic wave.

Unit-7: Introduction to Quantum Mechanics (10hrs.)

Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, Expectation values (only basic), Free-particle wave function and wave-packets, Uncertainty principle, Solution of stationary-state Schrodinger equation for one dimensional problem like particle in a box.

Unit -8: Solid electronic materials (10hrs.)

Electron in periodic potential, Kronig-Penny model (only basic to introduce origin of band gap), E-k diagram, Electron conduction, Conductivity, Drift velocity, Energy bands in solids, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Occupation probability, Fermi level, Effective mass, Density of states and energy band diagrams.

Unit -9: Semiconductors (10hrs.)

Intrinsic and extrinsic semiconductors, Electron and hole concentration, Concept of Fermi Level, Dependence of Fermi level on carrier-concentration and temperature, Doping, impurity states, n and p type semiconductors, Carrier generation and recombination, Law of mass action, Charge neutrality condition ,Carrier transport: diffusion and drift, p-n junction, Depletion region and potential barrier, Energy band structure of PN junction in forward and reverse biasing ,Metal semiconductor junction (Ohmic and Schottky).

Unit-10: Lasers & Fibre Optics (10hrs.)

Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion in optical resonator, different types of lasers: gas lasers (He-Ne,), solid-state lasers (ruby, Neodymium), semiconductor laser, Properties of laser beams.

Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Numerical aperture and various fibre parameters, Losses associated with optical fibres, Step and graded index fibres, Application of optical fibres.

Course Outcomes:

Students will be familiar with:

- Mechanics of solids, Wave optics & its engineering applications.
- Some of the basic laws related to electromagnetic.
- Introduced to the principle of Semiconductor physics.
- Simple quantum mechanics calculations.

Text Books:

1. Introduction to Mechanics-Mahendra K. Verma,Universities Press, Hyderabad
2. David Griffiths, Introduction to Electrodynamics, Addison-Wesley Professional
3. H. J. Pain, The Physics of Oscillations and Waves, Wiley
4. J. Singh, Semiconductor Optoelectronics: Physics and Technology McGraw-Hill Inc
5. Quantum Mechanics, Ajay Ghatak S. Lokanathan, Trinity
6. Engineering Physics by Gaur & Gupta,DhanpatRai Publications

Reference Books:

1. Engineering Physics by PG Kshirsagar& M N Avadhanulu, S. Chand Publications
2. Modern Physics for Engineers, S.P. Taneja, R. Chand
3. Engineering Physics, Malik and Singh, Tata McGraw Hill
4. Sears and Zemansky's University Physics, Volume-1 Mechanics, Pearson
5. Mechanics, Mathur, S.Chand Publishing
6. Electromagnetic Theory, Prabir K. Basu&HrishikeshDhasmana, AneBooks
7. David Griffiths, Quantum Mechanics, Pearson Education
8. Quantum Mechanics: A Text Book for undergraduates, Mahesh C Jain, TMH
9. A. Ghatak , Optics, McGraw Hill Education
10. O. Svelto, Principles of Lasers, Springer Science & Business Media
11. The Physics of waves and Oscillations, N.K. Bajaj, TMH
12. H. C. Verma, Concepts of Physics Vol – 1&2, Bharti Bhawan Publication
13. Halliday and Resnick, Physics.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech - I[st]
Subject: Mathematics - I
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000112(014)
L: 3 T: 1 P: 0 Credits: 4

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

UNIT I: Calculus **(8 hours)**
Evaluation of definite and improper integrals, reduction formulae, Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II : Calculus **(8 hours)**
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT III : Sequences and series: **(8 hours)**
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV : Multivariable Calculus (Differentiation) **(8 hours)**
Limit, continuity and partial derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence directional derivatives.

UNIT V : Matrices **(8 hours)**
Rank of a matrix by elementary transformation, normal form of a matrix, System of linear equations; Symmetric, skewsymmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem and Orthogonal transformation.

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Text/Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra,Affiliated East–West press, Reprint 2005.

Course Outcomes:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
- The essential tools of matrices and linear algebra including linear transformations, eigen values, diagonalization and orthogonalization.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: B.Tech - Ist **Branch: Common to All Branches**
Subject: Basic Electrical and Electronics Engineering **Course Code: A000113(024)**
Total Marks in End Semester Exam: 100 **L: 2 T:1 P:0** Credits: 3
Minimum number of class tests to be conducted: 02

Course Objective:

- Understand the basic concepts of DC and AC circuits.
- Analyse the series, parallel and series, parallel ac circuits.
- Acquire knowledge about working principle, construction and losses of a transformer.
- Understand the working, characteristics and applications of diodes.
- Understand the construction, working, characteristics and applications of a transistor.

Unit – I: D.C. Networks:
Introduction, Ohm's law, Kirchhoff's laws, Mesh and Nodal analysis, Superposition theorem, (only independent sources). Definitions of MMF, Magnetic field strength, Reluctance, Leakage flux and fringing, Core losses, Comparison of the Electric and Magnetic Circuits, Problems on Series Magnetic Circuits.

Unit – II: A.C. Circuits:
Production of AC voltage, Basic Definitions of root mean square and average values, form factor and peak factor, the j operator and Phasor Algebra, Analysis of ac series and Parallel Circuits, Series- Parallel Circuits.

Unit – III: Single phase Transformers:
Introduction, Principles of operation, Constructional details, Ideal Transformer and Practical Transformer, EMF equation, Rating, Phasor diagram at no load, Losses in Transformers.

Unit-IV: Diode:
Brief Review of Semiconductors, N-Type & P-Type Semiconductors, Formation of Depletion Layer in a PN Junction, Forward & Reverse Biased, V-I Characteristic, Diode Current Equation,Diode Applications.LED, Advantages & applications of LEDs., Seven-segment Displays,

Unit-V: Transistor:
BJT Construction, Junction Biasing of BJT, Operation of NPN & PNP BJT, Input and Output Characteristics of Transistor in CE configuration; Transistor as an Amplifier& as a Switch. Advantages of ICs & Scale of Integration.

Course Outcomes:

- Apply the knowledge of basic laws to electric and magnetic circuits.
- Distinguish between various types of representation of ac quantities.
- Draw the phasor diagrams of an ideal and a practical transformer at no load.
- Analyse and design basic circuits which include diode, LED and seven segment display.
- Analyse and design circuits consisting of transistors.

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Text Books:

1. Fundamentals of Electrical Engineering & Electronics, B.L. Theraja,S. Chand Publication.
2. Principles of Electronics by V. K. Mehta, 3rd Edition, S. Chand and Co.Ltd.**(Unit-IV & V)**
3. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI.

Reference Books:

1. Fitzrald and Higgonbothom, "Basic Electrical Engineering", Fifth Edition, McGraw Hill.
2. V.N. Mittal and Arvind Mittal, "Basic Electrical Engineering", Second Edition, Tata McGraw Hill.
3. Electrical and Electronic Technology By Hughes 10th Edition , Pearson Education.
4. A textbook of Electronic Circuits. By R. S. Sedha, S. Chand Publication.
5. H. Cotton, "Advance Electrical Technology," ISSAC Pitman, London.
6. Parker Smith S. (Ed. Parker Smith N.N.), "Problems in Electrical Engineering", Tenth edition, Asia publication.
7. Del Torro, Vincent "Electrical Engineering Fundamentals", Second Edition Prentice Hall of India Pvt. Ltd.
8. Basic Electrical & Electronics Engineering 1stEdition by **D. P. Kothari** and **I. J. Nagrath,**
9. Electronics Devices and Circuits by Jacob Millman and Christos C. Halkias, 3rd Edition Mc. Grah Hill Pub.

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Semester: B.Tech - I[st]
Subject: Engineering Graphics and Design
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted: 02

Branch: Common to All Branches
Course Code: A000114(037)
L: 1 T: 0 P: 0 Credits: 1

Course Objective:

1. To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises of geometrical solids.
2. Understanding of technical drawings
3. Learn basic CAD software skills.
4. Learn basic engineering drawing formats.
5. Make basic engineering drawings using graphics software.
6. Develop the graphical skills for communication of concepts, ideas and design of engineering

Unit I: Introduction to Engineering Drawing
Principles of Engineering drawing and their significance, Lines, Lettering, Dimensioning, Scales,

Unit II: Projection
Principles of projection, Method of projection, First and third angle projections, Orthographic projections, Isometric projection.

Unit III: Basic concept of drafting software
Introduction to CAD software, merits and demerits of CAD, Application of CAD, GUI, limits and units, Basic co-ordinate system, setting of status bar option-snap, grid, O-snap, Dynamic input, ortho, polar, and etc. concept of block, viewports and layer.

Unit IV: Drafting using CAD software
Drawing Tools: Circle, Arcs, Rectangle, Polygon, Ellipse, Spline, Poly-Line, and Multi-Line. Editing Tools: Trim, Move, Copy, Rotate. Geometry Modifying Tools: Fillet, Chamfer, Scale, Stretch. Copying Tools: Array, Mirror, and Offset. Dimensioning and Annotations.

Unit V: 3-D modeling using CAD software
Types of three dimensional model, basic primitives' tools: extrude, revolve, sweep, loft, wedge. Solid editing Tools: shell, round, taper faces, copy faces, chamfer edges, modifying tools: 3D-move, 3D- copy, rotate, scale, align. Copying tools: array and its type,

Text Books:

1. Bhatt, N.D., "Elementary Engineering Drawing", Charotar Book Stall, Anand
2. George Omura, " Mastering AutoCAD" B.P.B. Publication, New Delhi

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Reference Books:

1. Engineering Graphics – Laxminarayanan & V. and Vaish Wanar, R.S. Jain Brothers, New Delhi
2. Engineering Graphics – Chandra, AM & Chandra Satish 1998.
3. Engineering Graphics – K.L. Narayan and P. Kannaih, Tata McGraw Hill
4. AutoCAD: A problem solving approach- Tickoo, S. Delmar Cengage Learning 2015.
5. Mastering AutoCAD and AutoCAD LT-George Omura, Brian C. Benton, Wiley publisher, 2018.

Course Outcomes:
After learning the course the students should be able to

- To know and understand the conventions and the method of engineering drawing.
- To improve their visualization skills through interpretation of Orthographic, Isometric views of objects so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings.
- To create 2-D Computer geometry and it's dimensioning.
- To create 3-D Computer geometry and able to visualize it for presentation graphics.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech - I[st]
Subject: Fundamentals of Computer
Total Marks in End Semester Exam: 100
Minimum number of Class tests: 02

Branch: Common to All Branches
Course Code: A000115(022)
L: 2 T: 0 P: 0 Credits: 2

Course Objective:

1. To learn the Computer Fundamental concepts
2. To aware students about Software and Hardware
3. To make them to use basic components of MS Office
4. To give the foundations for different Applications

Unit I: Fundamentals of Computers

Generations of computer, block diagram of a computer, computer hardware and software components: Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Memory Hierarchy: Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks vs optical disks (CD, CD-RW and DVD Memory), data – numeric data, alpha numeric data, concept of data and information: storage, seeking, processing and transmission.

Unit II: Hardware and Software

Computer Peripherals: Cables, Buses, Device drivers, installation of devices: keyboard, mouse, scanner, printer, web-camera, speakers and many more; plug-and-play devices; expansion slots……..System software, Program Language Translators, application software, Programming Language Paradigms: Imperative, Object-Oriented and Logic languages, Basics of Popular Operating Systems (Windows and Linux); The User Interface, Using Mouse and Organizing Desktop components, Running an Application, File, Folders and Directory management features, Using Help; Creating Short cuts, Configuring Operating System: Windows and Ubuntu, BIOS, System Utilities and Antivirus software.

Unit III: Basic Computer Literacy

Word Processing Basics (MS Word / LibreOffice Writer): Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document; Using Spread Sheets (MS Excel / LibreOffice Calc) Basic operations of Spreadsheets; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet; Basics of presentation software (MS PowerPoint / LibreOffice Impress) Preparation and Presentation of Slides; Slide Show; How to make an effective presentation: Working with Presentation Tools (Create, Edit, Move, Delete, Resize, Format text object), Working with Graphics tools (Creating Tables, Organization Charts, Hyperlinks), Saving, editing and closing presentation; Taking printouts of presentation / handouts.

Unit IV: Computers and Communication

WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Networking Devices, Topologies, Cables and connectors, Connecting to internet; ISP; Basics of internet connectivity related troubleshooting, Web Browsing software, Search Engines; URL; Domain Names; IP

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Addressing, Wi-Fi and Bluetooth technology overview, Internet and Intranet: architecture, various file formats, Applications of INTERNET: Electronic mailing systems (Google Mail features): Creating and Managing mailing accounts, folders, Document collaboration, Instant Messaging, Netiquettes; Skype calling and Messenger services;functioning and features of smart gadgets: Smart phones, 4K smart television gadgets, kindle, gaming-gadgets, fitness gadgets and alike.

Unit V: Application Domains

Impact of computers in society: Computer applications in office automation, book publishing, data analysis, accounting, investment, inventory control, graphics and multimedia, air and railway ticket reservation sites, robotics, cyber security, Audio andVideo-conferencing, social networking, surveillance, Case Studies: Computer Literacy for banking, KYC, Insurance and financial transactions, operating mobile banking, Nine Pillars of Mission Digital India (DI-Initiatives) and their scheme highlights.

Text Books:

1. Computer Basics by IGNOU.
2. Suresh K Basendrea: Computers Today
3. Pradeep K. Sinha, Priti Sinha, "Computer Fundamentals". BPB Publications.
4. Rajaraman, V., "Fundamental of Computers". Prentice Hall India, New Delhi
5. Sanders Donald H Computers Today

Course Outcomes:

The student will learn

- To familiar with Computer Fundamental
- To know about MS Office.
- To use different text, spreadsheet and presentation skill.
- To apply different applications.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech - I[st] **Branch: Common to all branches**
Subject: Physics (Lab) **Course Code: A000121(015)**
Total Marks in End Semester Exam: 40 **L: 0 T: 0 P: 2 Credits: 1**

Course Objective:
Physics lab provides students the first-hand experience of verifying various theoretical concepts learnt in theory courses.

Total 36 labs. Hrs. About 10 – 12 experiments to illustrate the concepts learnt in Physics (Hrs. 3/ week).
Suitable number of experiments from the following categories:

- Mechanics
- Optics and its applications
- Electromagnetic
- Semiconductor Physics
- Laser & Optical fiber

Text book:

1. A textbook of Engineering Physics Practical 2[nd] edition, University Science Press

Laboratory Objective:
Students should be able to
- State various laws which they have studied through experiments.
- Describe principles of LASER & Optical fibre.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: B.Tech - Ist **Branch: Common to All Branches**
Subject: Basic Electrical and Electronics Engineering (Lab) **Code: A000122(024)**
Total Marks in End Semester Exam: 40 **L: 0 T: 0 P: 2** **Credits: 1**

Lab Objective:

- Verify the basic laws and theorems of DC circuits.
- Analysis the RLC series, parallel and series, parallel ac circuits.
- Understand the construction and perform ratio test on a single phase transformer.
- To plot and find out the characteristics of a diode in forward and reverse bias.
- Top plot and find out the input and output characteristics of a transistor

List of Experiments (To perform minimum 10 experiments):

1. To verify Superposition theorem.
2. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.
3. To determine V– I characteristics of Incandescent lamp.
4. To study B-H curve.
5. To measure current, power, voltage and power factor of series RLC circuit.
6. To measure current, power, voltage of parallel RLC circuit.
7. To measure current, power, voltage of series parallel RLC circuit.
8. To measure R and L of choke coil.
9. To study construction of a single phase transformer.
10. To perform ratio test and polarity test of a single phase transformer.
11. To calculate efficiency of a single phase transformer by direct loading.
12. To verify Thevenin's theorem and Norton's theorem.
13. To study construction of Single Phase A.C. machines.
14. To study construction of Three Phases Induction motors.
15. To study charging and discharging of a capacitor.
16. To study types of meters in the lab.
17. To study construction of D.C. machine.
18. To plot V-I characteristics of PN Junction Diode.
19. To plot V-I characteristics of Light Emitting Diode.
20. To plot Static Characteristics of Transistor in CE configuration
21. To study the operation of transistor as a switch.
22. To study the operation of transistor as an amplifier.

Lab Outcomes:
Students will be able to

- Relate the Basic laws and theorems with the practical applications.
- Apply the knowledge in their daily life with electrical circuits.
- Visualize the magnetic and electric circuits in a transformer.
- Analyze diode circuits and to design and implement diode applications.
- Analysis and design circuits using bipolar transistors.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech - I[st] **Branch: Common to All Branches**
Subject: Fundamental of Computer (Lab) **Course Code: A000123(022)**
Total Marks in End Semester Exam: 40 **L: 0 T: 0 P: 2 Credits: 1**

The laboratory should be preceded or followed by a Practical Lecture to explain the approach or algorithm to be implemented for the problem given. Open Source software can be used.

Practical Lecture (L T P) – 0 0 1	Lab. Work (L T P) – 0 0 3
Practical Lecture 1:Introduction and working of Hardware Components	**Lab1**: Identifying the computer hardware like input output devices, CPU, mother board, Buses etc.
Practical Lecture 2: Introduction and working of Software.	**Lab 2**: Making Algorithm, DFD, ER diagram. Working of software's like system, Utility, Application software.
Practical Lecture 3: Introduction and working of Operating System	**Lab 3**: Basic operations of Operating System: creating file, Directory, Removing file, directory, date time setting, renaming etc. use internal and external connabds.
Practical Lecture 4: Introduction and working of MS Office	**Lab 4**: use the basic features of MS Office
Practical Lecture 5: Introduction of MS Word	**Lab5: Create** the document with all alignment. Use the different properties of MS Word
Practical Lecture 6: Introduction of MS Excel	**Lab 6**: Make the use of Spreadsheet for data representations, Calculation and graphical presentations. Use properties of Excel
Practical Lecture 7: Introduction of Power presentation	Lab 7: MS-PowerPoint Make the presentation with Multimedia features. Use the animation tools
Practical Lecture 8 &9: Introduction of computer communication	**Lab 8 and 9**: *Computer communication related practical* 1. Connect the Internet; open any website of your choice and save the WebPages. 2. Search any topic related to your syllabi using any search engine and download the relevant material. 3. Send any greeting card to your friend. 4. Create your E-Mail ID on any free E-Mail Server. 5. Login through your E-Mail ID and do the following: a. Read your mail b. Compose a new Mail c. Send the Mail to one person d. Send the same Mail to various persons e. Forward the Mail f. Delete the Mail

	g. Send file as attachment 6. Surf Internet using Google to find information about your state 7. Surf Internet using Google to find Tourism information about your state 8. Surf Internet using Yahoo to find Hotels around your state 9. Surf Internet using Google to find information about educational institutes for teaching M.S in comp science in India Surf Internet using Google to find information about Indian Compare the cost, overheads and
Practical Lecture 10: installing Computer System	**Lab 10:** Installing the working computer system
Practical Lecture 11: Different ICT use of Government Schemes	**Lab 11: Filling online AAADHAR, Voter id, PAN etc form**
Practical Lecture 12: Applications of Computer in Digital India	**Lab 12**: online filling of different digital India applications

Laboratory Outcomes:

- To give idea about fundamentals of Computer
- To make familiar with MS Office
- To be able to write, document, present their work when developing project
- To be able to better foundations in Computer Field.
- To be able to know online applications of Digital India.

Text & Reference books:

1. Pradeep K. Sinha, Priti Sinha, "Computer Fundamentals". BPB Publications.
2. Rajaraman, V., "Fundamental of Computers". Prentice Hall India, New Delhi
3. Suresh K Basendrea: Computers Today
4. Sanders Donald H Computers Today

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: B.Tech - I^st^ **Branch: Common to All Branches**
Subject: Engineering Graphics and Design (Lab) **Course Code: A000124(037)**
Total Marks in End Semester Exam: 40 **L: 0 T: 0 P: 4** **Credits: 2**

List of Practical:

1. Study of any drafting software- GUI, limits and units, drawing tools, editing tools, annotations, etc.
2. Study of co-ordinates systems- Cartesian and polar (absolute and relative system of measurement) and Practice drawing by using following tools: Grid, snap, O-snap, Lines, Erase, Zoom.
3. Study and create drawing by using Drawing tools: Circle, arcs, rectangle, polygon, ellipse, Editing tools: trim, move, copy, rotate and practice of drawing using these commands.
4. Study and create drawing by using Geometry modifying tools: fillet, chamfer, scale, stretch
5. Study and create drawing by using copying tools like array, mirror, block and offset.
6. Study and detailing of drawing by using dimensioning and annotations tools.
7. Study and create drawing with different types of line by using Layer command
8. Create geometry by modify it by using Scales- plane and diagonal scale and create conics sections- ellipse, parabola, hyperbola, rectangular hyperbola, involutes.
9. Draw regular solids: Cube, Prism, Pyramid, Cylinder, Cones
10. Draw sectional views of solids- Cube, Prism, Pyramid, Cylinder, Cones.

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Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (CG)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination of Q1 Group
B Tech (Second Semester - Common to all Branches of Engineering) 2019-20

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination Theory/ Lab			Total Marks	Credit
				L	T	P	ESE	CT	TA		
1.	Basic Sciences	Chemistry-I	A000211(011)	3	1	-	100	20	30	150	4
2.	Basic Sciences	Mathematics-II**	A000212(014)	3	1	-	100	20	30	150	4
3.	Computer Science	Programming for Problem Solving	A000213(022)	3	-	-	100	20	30	150	3
4.	Humanities	English	A000214(046)	2	-	-	100	20	30	150	2
5.	Civil Engineering	Basic Civil Engineering and Mechanics	A000215(020)	3	-	-	100	20	30	150	3
6.	Basic Sciences	Chemistry (Lab)	A000221(011)	-	-	2	40	-	20	60	1
7.	Computer Science	Programming for Problem Solving (Lab)	A000222(022)	-	-	4	40	-	20	60	2
8.	Civil Engineering	Basic Civil Engg. & Mechanics (Lab)	A000223(020)	-	-	2	40	-	20	60	1
9.	Mechanical Engineering	Workshop Practice/ Manufacturing Process (Lab)	A000224(037)	-	1	4	40	-	20	60	3
10.	Humanities	Language (Lab)	A000225(046)	-	-	2	-	-	10	10	1
			Total Marks	14	3	14	660	100	240	1000	24

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note :

(a) The teaching in the 1st and 2nd Semester will be divided in two groups consisting of various branches as shown below :

P1-GROUP : Electronics & Telecommunication, Mechanical, Civil, Mining, Applied Electronics & Instrumentation, Metallurgy, Mechatronics, Automobile, Production Engineering, Fashion and Apparel Engineering

Q1-GROUP : Computer Science, Information Technology, Electronics & Instrumentation, Electrical, Chemical, Electrical & Electronics, Plastic Engineering, Agriculture Engineering, Biotechnology

(b) ** Mathematics-II will be taught to both the groups in the second semester.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Chemistry-I
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000211(011)
L: 3 T: 1 P: 0 Credits: 4

Unit I – V is common for all braches except Chemical Engineering

Unit VI – X are specific to Chemical Engineering

Unit – I

Atomic & molecular structure **10 hours**

Molecular orbital Theory: Equations for atomic and molecular orbitals (LCAO), Energy level diagram of homo(H_2,N_2,O_2,Li_2 F_2) & hetero molecules (CO,NO, HF), Concept of bond order. Pi-molecular orbitals of butadiene, benzene and aromaticity.

Crystal Field Theory: Splitting of d-orbital of octahedral and tetrahedral complexes, Energy level diagram of transition metal ion & magnetic property, numerical based on Crystal field stabilization energy.

Unit – II

Spectroscopic techniques and applications **10 hours**

Principle of spectroscopy. Electromagnetic radiation, Spectrophotometer (line diagram)
Electronic Spectroscopy (Ultraviolet–visible spectroscopy): Theory, Types of electronic transition, Chromophore, auxochromes , Electronic excitation in conjugated dienes , Absorption Laws, applications on quantitative analysis , Simple numerical based on absorption laws and uses or application of Electronic Spectroscopy
Vibrational spectroscopy (Infrared spectroscopy): Molecular vibration, Selection rule, functional group region, fingerprint region and uses or application of Vibrational spectroscopy.
Nuclear magnetic resonance spectroscopy: Introduction, number of signal, chemical shift, Spin-spin coupling and uses or application of Nuclear magnetic resonance spectroscopy.

Unit – III **8 hours**

Use of free energy in Chemical Equilibria

Thermodynamic Functions: Energy, Entropy, Free energy, Cell potential & related numericals, Estimations of entropy and free energies, Nernst Equation & its application to voltaic cell, Relation of free energy with EMF.
Corrosion: Electrochemical theory of corrosion, galvanic series, Galvanic corrosion, Differential aeration corrosion, Pitting, and Water line corrosion, Caustic embrittlement, factors affecting corrosion , Cathodic Protection.

Unit –IV

Periodic properties **8 hours**

Periodic table, atomic and ionic radii, ionisation energies, electron affinity, electronegativity.
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms. Polarizability, Oxidation states, coordination numbers and geometries, Hard, soft acids and bases (Classification, Pearsons HSAB principle, its applications & limitations) Molecular Geometry (Valence shell electron pair repulsion theory to NH_3, H_3O+, SF_4, ClF_3, ICl_2 and H_2O), Numerical based on effective nuclear charge.

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Unit -V **8 hours**

Organic reactions and synthesis of drug molecule

Introduction to reactions involving substitution (free radical-Chlorination of molecule, Gomberg reaction, Wurtz reaction, Electrophilic, Nucliophilic-SN^1 SN^2), Addition (Electrophilic–Morkownihoff rule,Nuclophilic)Elimination (α elimination , β elimination , unimolecular E_1, biomolecular E_2), oxidation (Baeyer villiger oxidation), reduction (Clemmensen reduction, Wolff-Kishner reduction) cyclization (Bergman Cyclization) and ring openings and rearrangement reaction (Beckamann, Reimer-Tiemann reaction, Canannizaro, crossed cannizzaro reaction)

Synthesis of a commonly used drug molecule: General guidelines of drug making, synthesis of Aspirin, Ibuprofen, Paracetamol.

Unit -VI

Introduction to quantum theory **8 hours**

Schrodinger equation & its importance, Applications to hydrogen atom, Wave mechanical model for many electron atoms-radial distribution curves.

Unit -VII **10 hours**

Chemical bonding in molecules:

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit -VIII **8 hours**

Stereochemistry:

Introduction to Stereochemistry: Representations of 3 dimensional structures, Chirality, Optical activity. Isomerism- structural isomerism, stereoisomers, enantiomers, diastereomers, Configurations (D, L &R, S), Geometrical isomerism (cis and trans & E and Z). Racemic modification & their resolution, Isomerism in transitional metal compounds.

Conformational analysis: Conformations of cyclic (cyclohexane) and acyclic compounds (ethane & butane).

Unit -IX

Reactivity of organic molecules: **8 hours**

Organic acids and bases: factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. thermodynamic control of reactions.

Unit -X **10 hours**

Strategies for synthesis of organic compounds:

Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents.

Course Outcomes:

The concepts developed in this course will aid in the quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbital's and intermolecular forces.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Rationalise periodic properties such as ionisation potential, electro negativity, Oxidation states.
- List major to significant chemical reactions that are used in the synthesis of molecules.
- Use the knowledge of quantum theory in various chemical systems.
- Appreciate aliphatic chemistry and stereochemistry
- Write simple mechanisms

Text Books:

1. A.TextBookofEngg.Chemistry,ShashiChawala,DhanpatRai&Co.(P)Ltd.
2. EngineeringChemistrybyP.C.Jain(Dhanpat RaiPublishingCompany.
3. Engineering Chemistry,Concept in engineering Chemistry by Satyaprakash and Manisha Agrawal by Khanna Publication.

Books for Chemical Engineering:

1. Advanced InorganicChemistry Vol 1 & II by Gurdeep Raj,Goel Publishing House.
2. OrganicReactionandTheirMechanism P.S.Kalsi ,NewAgeInternational Publishers.

Reference Books:

1. University chemistry, by B. H. Mahan
2. Chemistry: PrinciplesandApplications,by M.J.SienkoandA. Plane
3. Fundamentalsof Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe,Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. OrganicChemistry: StructureandFunctionbyK.P.C. VolhardtandN.E. Schore, 5th Edition
7. EssentialsofPhysicalChemistry,Bahi& Tuli,S.Chand Publishing
8. Introductionto Nanoscience by S. M. Lindsay

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd | **Branch: Common to all Branches**
Subject: Mathematics - II | Course Code: A000212(014)
Total Marks in End Semester Exam: 100 | **L: 3 T: 1 P: 0 Credits 4**
Minimum number of Class Tests: 02

Course Objective:
The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

UNIT I
Multivariable Calculus (Integration) **(8 hours)**
Double and triple integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian),

Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes (without proof) & its applications.

UNIT II
First order ordinary differential equations **(8 hours)**
Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT III
Ordinary differential equations of higher orders **(8 hours)**
Higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation.
Power series solutions; Legendre polynomials and their properties, Bessel functions of the first kind and their properties.

UNIT IV
Complex Variable – Differentiation **(8 hours)**
Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

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UNIT V

Complex Variable – Integration (8 hours)

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series. Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems,9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice HallIndia, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Programming for Problem Solving
Total Marks in End Semester Exam: 100
Minimum number of Class tests: 02

Branch: Common to all Branches
Course Code: A000213(022)
L: 3 T: 0 P: 0 Credits: 3

Course Objectives:

- To learn the Computer Fundamental concepts
- To aware students about Problem Solving approach
- To make them to use basic components of Programming

Unit I: Introduction (4 lectures)

Introduction to Programming, Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart, Pseudo code and Source code with examples.

Unit II: Programming Concepts (9 lectures)

Variables, data types, memory locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence, Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Unit III: Arrays (9 lectures)

Introduction to Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

Unit IV: Function (9 lectures)

Definition, prototyping, built in libraries, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion: Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit V: Structure (9 lectures)

Defining structures and Array of Structures, Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), bit-fields.
File handling: concept of a file, text files and binary files, Formatted I/O, file I/O operations, example programs

Course Outcomes:

The student will learn-

- To formulate simple algorithms for arithmetic and logical problems.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

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Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: English
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000214(046)
L:2 T:0 P:0 Credits: 2

UNIT – I
Vocabulary Building

1.1 Root words from foreign languages and their use in English
1.2 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.3 Synonyms, antonyms, Homonyms and Homophones.
1.4 One Word Substitution
1.5 Basics of Phonetics: Definitions, Phonetic Symbols, Transcription of one and two syllable words
1.6 Communication: Definition, Cycle, Elements, 7Cs & Barriers

UNIT – II
Basic Writing Skills

2.1 Types of Sentences and Tenses, Voices and narration
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Techniques for writing precisely

UNIT – III
Identifying Common Errors in Writing

3.1 Parts of speech, Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés
3.8 Errors in Spelling/ Misspelled words

UNIT – IV
Writing Practices

4.1 Comprehension
4.2 Précis Writing
4.3 Essay Writing
4.4 Business Letters & Job Application
4.5 Formal Reports: Components & Characteristics
4.6 Writing e-mails

UNIT – V
Listening

5.1 Listening: Definition, purposes, types, and strategies to improve listening.
5.2 Characteristics of effective listening.
5.3 Barriers to Listening and measures to overcome barriers
5.4 Note making: types and conversion of notes into texts.

UNIT – VI

Oral Communication (This unit involves interactive practice sessions in Language Lab)

6.1 Listening Comprehension
6.2 Pronunciation, Intonation, Stress and Rhythm
6.3 Common Everyday Situations: Conversations and Dialogues
6.4 Communication at Workplace
6.5 Interviews
6.6 Formal Presentations

Course Outcomes:
The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Suggested Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
7. English and Communication Skills for Students of Science and Engineering. S.P. Dhanavel. Orient Blackswan Ltd.2009.
8. Scientific English: A Guide for Scientists and Other Professionals. R A Day. Universities Press. 2000.
9. Word Power Made Easy. Norman Lewis. W R Goyal Publishers and Distributors. Publishers. 2009
10. Textbook of English Phonetics for Indian Students. T Balasubramaniam. Macmillan Publishers.2012
11. Technical Communication: Principles and Practice. Meenakshi Raman and Sangeeta Sharma. Oxford University Press. 2015.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Basic Civil Engineering & Mechanics
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000215(020)
L: 3 T: 0 P: 0 Credits: 3

Course Objectives:

- To introduce about the properties of common building materials to the students.
- To introduce the basic concepts of concrete and foundation to the students.
- To introduce the basic concepts of surveying & levelling to the students.
- To introduce the basic concepts of general system of forces to the students.
- To introduce the simple methods of analyzing truss to the students.

UNIT - I
Building Material
Qualities of good brick, Water absorption and Compressive Strength test for bricks. Types of Cement, Ingredients of Portland cement and their functions, Fineness, Setting Times and Compressive Strength of Cement, Functions of Sand in mortar, Mortar Mix proportions for various uses.

UNIT – II
Building Construction
Ingredients of Cement Concrete, Grades of Concrete, proportions for Nominal mix concrete, Workability & Compressive Strength of Concrete, Curing of Concrete.
Necessity of foundations, Definitions of Safe bearing capacity, Ultimate bearing capacity and factor of safety, Difference between Load Bearing & Framed Construction.

UNIT - III
Surveying & Levelling
Principles of Surveying, Technical terms, Calculation of reduced level by Height of instrument and Rise & Fall method, Simple problems in levelling.

UNIT – IV
General System of Forces
Equations of equilibrium for a system of concurrent forces in a plane.Constraint, Action and Reaction.Types of support and support reactions. Free Body Diagram – Body subjected to two forces & Body subjected to three forces. Moment of a force. Theorem of Varignon, Equations of Equilibrium.

UNIT –V
Analysis of Plane Trusses
Engineering Structures, Rigid or perfect Truss, Determination of Axial forces in the members of truss, Method of Joints, Method of Sections.

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Course Outcomes:

After completing the course students should be able to

- Identify the properties of common building materials.
- Understand basic concepts of concrete and foundation.
- Understand the basic concepts of Surveying & levelling.
- Understand the basic concepts of general system of forces.
- Analyze truss by simple methods.

Text books:

1. Comprehensive Basic Civil Engineering B.C. Punmia
2. Building construction by Ahuja and Birdi
3. Engineering Mechanics by A. K. Tayal

Reference books:

1. Basic Civil Engineering by Ramamurutham
2. Engineering Mechanics by R. K. Bansal

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Chemistry-I (Lab)
Total Marks in End Semester Exam: 40

Branch: Common to all Branches
Course Code: A000221(011)
L: 0 T: 0 P: 2 Credits: 1

List of Experiments:

Choice of 8 – 10 experiments from the following:

1. Determination of surface tension and viscosity.
2. Thin layer chromatography.
3. Ion exchange column for removal of hardness of water.
4. Determination of chloride content of water.
5. Colligative properties using freezing point depression.
6. Determination of the rate constant of a reaction.
7. Determination of cell constant and conductance of solutions.
8. Potentiometry - determination of redox potentials and emfs.
9. Synthesis of a polymer/drug/ organic compounds.
10. Saponification/acid value of oil.
11. Chemical analysis of salt / organic compounds.
12. Lattice structures and packing of spheres.
13. Models of potential energy surfaces.
14. Chemical oscillations- Iodine clock reaction.
15. Determination of the partition coefficient of a substance between two immiscible liquids.
16. Adsorption of acetic acid by charcoal.
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the Ph of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .
18. Spectrophotometric determination.

Course Outcomes:
The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

Text Books:

1. Laboratory Manual Engg. Chemistry, Anupama Rajput, Dhanpat Rai & Co. (P) Ltd.
2. Laboratory Manual on Engg. Chemistry, S. K. Bhasin& Sudha Rani, Dhanpat Rai & Co. (P) Ltd.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd **Branch: Common to all Branches**
Subject: Programming for Problem Solving (Lab) **Course Code: A000222(022)**
Total Marks in End Semester Exam: 40 **L: 0 T: 0 P: 4 Credits: 2**

The laboratory should be preceded or followed by a Practical Lecture to explain the approach or algorithm to be implemented for the problem given.

Practical Lecture (L T P) – 0 0 1	Lab. work (L T P) – 0 0 3
Practical Lecture 1: Problem solving using computers	**Lab1**: Familiarization with programming environment
Practical Lecture 2: Variable types and type conversions	**Lab 2**: Simple computational problems using arithmetic expressions
Practical Lecture 3: Branching and logical expressions	**Lab 3**: Problems involving if-then-else structures:
Practical Lecture 4: Loops, while and for loops	**Lab 4**: Iterative problems e.g., sum of series
Practical Lecture 5: 1D Arrays: searching, sorting	**Lab 5**: 1D Array manipulation
Practical Lecture 6: 2D arrays and Strings	**Lab 6**: Matrix problems, String operation
Practical Lecture 7: Functions, call by value	**Lab 7**: Simple functions
Practical Lecture 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):	**Lab 8 & 9**: Programming for solving Numerical methods problems
Practical Lecture 10: Recursion, structure of recursive calls	**Lab 10**: Recursive functions
Practical Lecture 11: Pointers, structures and dynamic memory allocation	**Lab 11**: Pointers and structures
Practical Lecture 12: File handling	**Lab 12**: File operations

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program• To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them
- through a program
- To be able to declare pointers of different types and use them in defining self referential structures.
- To be able to create, read and write to and from simple text files.

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.

Reference Books :

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Basic Civil Engineering & Mechanics (Lab)
Total Marks in End Semester Exam: 40

Branch: Common to all Branches
Course Code: A000223(020)
L: 0 T: 0 P: 2 Credits: 1

List of Experiments:

1. Water Absorption test on bricks.
2. Compressive strength test on bricks.
3. Fineness of cement by sieve analysis.
4. Initial setting time of cement.
5. Compressive Strength test of Cement.
6. Sieve analysis and F.M. of fine aggregate.
7. Sieve analysis and F.M. of coarse aggregate.
8. Compressive strength test of Concrete.
9. Difference in level between two given stations by Height of Instrument method.
10. Difference in level between two given stations by Rise & Fall method.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: B.Tech – 2nd
Branch: Common to all Branches
Subject: Workshop Practice/Manufacturing Process (Lab)
Course Code: A000224(037)
Total Marks in End Semester Exam: 40
L:0 T:1 P:4 Credits: 3

Course Objective:
The course is designed to meet the following objectives.
- Acquire skills in engineering practice.
- To identify tools, work materials and measuring instruments for different trades.

Unit I:
Forging: Introduction to manufacturing process, and its classification, use of various forging tools, forging operations, forging defects.
Suggested Jobs: Forging of chisel, forging of screw driver.

Unit II:
Carpentry: Different types of wood, carpentry tools, different joints, polishing, wood working Lathe.
Suggested Jobs: Making of name plate, stools and a small job on wood working lathe.

Unit III:
Fitting Shop: Introduction to bench working. Work holding devices, measuring instruments, fitting tools and their specification, types of joints fitting operations.
Suggested Jobs : Preparation of job by use of filling, sawing, chipping, drilling and tapping operations.

Unit IV: Moulding: Pattern materials, allowances, moulding terminology.
Suggested Jobs : Prepare moulds of patterns, casting small household objects like paper-weight etc.

Unit V: Welding: Study and use of gas, Arc, soldering, brazing methods. Safety precaution.
Suggested Jobs : Preparing Lap and Butt joints by gas and arc welding method.

Unit VI: Metal Cutting: Common machining operations, different machine tools, cutting tools materials, different type of Lathes, Lathe operations, shaper and its specification. Quick return mechanism of shaper.
Suggested Jobs : Making small shaft, cutting screw thread on Lathe.

Course Outcomes:-
Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Text Books:
1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.
3. B.S. Raghuvanshi, Workshop Technology, Vol I&II, Dhanpat Rai & Sons.

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Reference Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
2. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
3. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
4. M.L.Begeman and B.H.Amstead, Manufacturing Process, Wiley
5. W.A.J.Chapman and E. Arnold, Workshop Technology, Vol I, II, & III, CRC Press, Prentice Hall
6. V. Narula, Workshop Technology, S.K. Kataria and sons.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology Branch:All Branches
Semester: III
Subject: Mathematics – III
Code: B000311(014)
Total Theory Periods: 03
Total Tutorial Periods: 01
Class Tests: Two (Minimum)
Assignments: Two (Minimum)
ESE Duration: Three Hours
Maximum Marks: 100
Minimum Marks: 35

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

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Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Principles of Programming Languages**	Course Code: **B022313(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Program Design: Introduction- fundamental design concepts - Modules and modularization criteria – Design notation: Procedure template, Pseudo code - Structured flow chart decision. Tables - Design techniques: Stepwise refinement, Levels of abstraction, Top down- Test Plans-Design guidelines.

UNIT-II Programming language processors: Characteristics of programming languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues, Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding times, storage management comparisons.

UNIT- III Functional & Logic programming languages: Introduction, comparison and applications of functional and logic programming languages; fundamentals of LISP (Objects, Control constructs, List processing) & PROLOG (Syntax, Lists, Operators and arithmetic, Control constructs).

UNIT-IV Object-Oriented Programming Concepts-I: Introduction to Basic Object-Oriented Concepts: (Object, Class, Encapsulation, Abstraction, Data Hiding, Inheritance, Polymorphism, Message Passing), Basic structure of a C++ program, C++ Compiler, C++ Classes, Methods, Objects, Nested Class, Const, Static members, this pointer, Comparison between Pointer and Reference Variables, Comparison between New and Delete Operators.

UNIT-V Object-Oriented Programming Concepts-II: Constructor, Destructor, Function and Operator Overloading, Friend functions and Friend classes, Inheritance, Abstract classes, Polymorphism, Virtual Function and Classes, Dynamic Binding, Exception Handling and Templates.

Text Books:

1. "Software Engineering Concepts" by Richard Fairley, Tata McGraw Hill,
2. "Programming Languages, Design and implementation" by Terrance W. Pratt, and Marvin V. Zelkowitz, Prentice-Hall of India, Fourth edition, 2002.
3. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill

Reference Books:

1. "Programming Languages – Concepts and Constructs" by Ravi Sethi, Addison-Wesley, 2nd Ed. 1996.
2. "Programming Languages: Principles and Paradigms" by Allen B. Tucker, Robert Noonan, TMH, 2006.

Course Outcomes [After undergoing the course, students will be able to:]

1. Obtain broad understanding of the role of computer science, fundamental software design concepts and notations.
2. Get an overview of various programming language paradigms, processors & software simulation types.
3. Understand key concepts in the implementation of common features of programming languages.
4. Acquire knowledge of basic concepts about object-oriented programming languages.
5. Program in object-oriented programming language paradigm using various computational methods.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Data Structures & Algorithms**	Course Code: **B022312(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Row Major & Column Major Order Representation of Arrays, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT-II Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT- III Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST Trees, Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees.

UNIT-IV Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

UNIT-V Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Tree (BST) Sort; Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees, Hashing: Hash Function, Collision Resolution Strategies, Storage Management: Garbage Collection and Compaction.

Text books:

1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C/C++" , PHI
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

References books:

1. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
3. G A V Pai, "Data Structures and Algorithms", TMH

Course Outcomes [After undergoing the course, students will be able to:]

1. Have a comprehensive knowledge of the data structures and algorithms on which file structures and data bases are based.
2. Understand the importance of data and be able to identify the data requirements for an application.
3. Have in depth understanding and practical experience of algorithmic design and implementation.
4. Have practical experience of developing applications that utilize databases.
5. Understand the issues involved in algorithm complexity and performance.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Digital Electronics**	Course Code: B022314(022)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Digital Fundamentals: Weighted & Non-weighted codes, Sequential codes, self-complementing codes, Cyclic codes, 8-4-2-1 BCD code, Excess-3 code, Gray code: Binary to Gray and Gray to binary code conversion, Error detecting code, Error correcting code, 7-bit Hamming code, ASCII code, Binary Arithmetic, Boolean Algebra, Minimization of Switching Function , Demorgan's Theorem, Karnaugh's Map Method, Quine-McCluskey's Method (Tabular Method). Basic and Universal logic Gates, Realization of switching functions using gates.

UNIT-II Digital Logic Families and Memory: Transistor Inverter: Basic Concepts of RTL and DTL; TTL: Open collector gates, TTL subfamilies, IIL, ECL; MOS Logic: CMOS Logic, Dynamic MOS Logic, Interfacing: TTL to ECL, ECL to TTL, TTL to CMOS, CMOS to TTL, and Comparison among various logic families. Memories: ROM and RAM, PLA, PAL and FPGA;

UNIT- III Combinational Circuits: Adder & Subtractor: Half adder, Full adder, Half-subtractor, Full-subtractor, Parallel Binary adder, Look Ahead carry adder, Serial adder, BCD adder. Code converter, Parity bit generator/Checker, Comparator. Decoder: 3-line to 8-line decoder, 8-4-2-1 BCD to Decimal decoder, BCD to Seven segment decoder. Encoder: Octal to binary and Decimal to BCD encoder. Multiplexer: 2-input multiplexer, 4-input multiplexer. De- multiplexer: 1-line to 4-line, study of Multiplexer as Universal Logic Function Generator.

UNIT-IV Sequential Circuits: Flip-Flops: SR, JK, T, D, Master/Slave JK FF and their conversion, Excitation Tables. Introduction to registers (SISO, SIPO, PIPO, PISO) and Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT-V Machines and Application: Finite State Machine, Meelay Machine, Moore Machine, **Introduction to VHDL:** Behavioral – data flow and algorithmic and structural description, lexical elements, data objects types, attributes, operators; VHDL coding examples.

Text Books:

1. R. P. Jain: "Modern Digital electronics", TMH.
2. B. Somanathan Nair, "Digital Electronics & Logic Design", Prentice-Hall of India.
3. Pedroni V.A., "Digital Circuit Design with VHDL", Prentice Hall, India 2nd Edition.

Reference Books:

1. R J Tocci, "Digital System principles and Applications"
2. "Digital Electronics " by A.K.Maini, Wiley India.
3. M.M. Mano: "Digital logic and computer design", PHI.
4. Floyd: "Digital fundamentals", UBS.

Course Outcomes [After undergoing the course, students will be able to:]

1. Apply digital coding concepts to simplify circuit design.

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2. Analyze the operations of various logic families and different semiconductor memories.
3. Design and implement various combinational circuits
4. Outline the concepts of latch circuits, flip flops and counters.
5. Design and develop basic digital systems using VHDL.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Operating System**	Course Code: B022315(022)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction: Operation System objectives and functions, The Evolution of operating Systems, Batch Systems, interactive systems, time sharing and real time systems, Protection. Operating System Structure, System Components, operating system service, System structure. Distributed Computing.

UNIT-II Concurrent Processes: Process concept: Introduction, Definitions, Process States, Process State Transitions, The process Control Block, Operations on Processes, Suspend and Resume, Interrupt Processing. Mutual Exclusion, the Producer / Consumer problem, the critical section problem, Semaphores, Classical problems in concurrency, inter process communication. CPU scheduling: concepts, performance criteria, and scheduling Algorithms. Algorithm evaluation, Multiprocessor scheduling.

UNIT- III Dead Locks: System model, Deadlock characterization. Prevention, Avoidance and Detection, Recovery from deadlock, combined approach.

UNIT-IV Memory Management: Base machine, Resident Monitor, multiprogramming with fixed partition, Multiprogramming with variable partitions, Paging, Segmentation, paged - segmentation, virtual Memory concepts, Demand paging, performance, Page Replacement algorithms, Allocation of frames, Thrashing, cache memory organization.

UNIT-V I/O Management & Disk Scheduling: I/O system Interrupts Direct Memory Access, I/O Buffering, File system: File Concepts – File organization and Access mechanism, File Directories, File sharing, Implementation issues. Disk Scheduling algorithms. Case Study on LINUX: Kernel and Buffer Cache Architecture, concept of inode file & directory structure, Basic system calls (Open, Read, Write, namei, File and Record Close, File Creation, Creation of Special Files, Change Directory and Change Root, Change Owner and Change Mode

Text Books:

1. Operating system concepts Galvin by Silberschatz, John Wiley & Sons
2. Operating System Design & Implementation by Tanenbaum, A.S., PHI.
3. The Design of Unix Operating System, Maurice J. Bach, Pearson Education.

Reference Books :

1. Modern Operating System: Andrew S. Tanenbaum, PEARSON EDUCATION INTERNATIONAL
2. Operating System concepts by Silberscatz A and Peterson, J.L, PE- LPE.
3. Operating systems: Internals & Design Principles, William Stallings, PHI.

Course Outcomes [After undergoing the course, students will be able to:]

1. Identify the role of operating system in making computers execute data-processing jobs.
2. Realize managing computer's resource complexity during concurrent process execution through OS layers.
3. Analyse the reasons of resource bottlenecks-concurrency, deadlock and various synchronization mechanisms available.
4. Understand the functioning of operating system components in Memory Management techniques, Virtual Memory Management.
5. Understand disk organization, file system structure, Secondary Storage Management functions of OS.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Data Structures (Laboratory)**	Course Code: **B022321(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (At least 10 experiments are to be performed by each student)

1. Write a program to perform following operations in one dimensional array, Insertion, Deletion and Searching (Linear & Binary).
2. Write a program to implement stack and perform push and pop operations.
3. Write a program to convert infix to postfix expressions using stack.
4. Write a program to perform following operations on a linear queue - addition, deletion, traversing.
5. Write a program to perform following operations on a circular queue - addition, deletion, traversing. 6. Write a program to perform following operations on a double ended queue - addition, deletion, traversing.
6. Write a program to perform following operations on a single link list-creation, insertion, deletion.
7. Write a program to perform following operations on a double link list – creation, insertion, deletion. 9. Write a program to implement polynomial in link list and perform. a) Polynomial arithmetic b) Evaluation of polynomial
8. Write a program to implement a linked stack and linked queue.
9. Write programs to perform Insertion, selection and bubble sort.
10. Write a program to perform quick sort.
11. Write a program to perform merge sort.
12. Write a program to perform heap sort.
13. Write a program to create a Binary search tree and perform –insertion, deletion & traversal.
14. Write a program to traversal of graph (Breadth-first Search, Depth-first Search methods)

Remarks: The students are free to choose any programming platform from (C++ / JAVA / PYTHON) to perform the above-mentioned set of laboratory experiments.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Understand the importance of abstract data types, structure types and their usability in different applications through different programming platforms.
2. Implement various data structure operations (traversal, accession, insertion, deletion & updation) on stacks, linked lists, queues, trees & graphs.
3. Design and analyse the time and space efficiency of implemented data structures
4. Identity the selection of appropriate data structure for given problem situations.
5. Implement various kinds of searching and sorting techniques.

Recommended Books:

1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C/C++", PHI
2. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
3. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Digital Electronics Laboratory**	Course Code: **B022322(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (At least 10 experiments are to be performed by each student)

1. To study the characteristics and operations of TTL Inverters, OR, AND, NOR and NAND gate using ICs.
2. To study NAND and NOR gates as a universal logic.
3. To study and prove Demorgan's Theorem .
4. To design Half and Full adder circuits using logic gates.
5. To design Half and full subtractor circuits using logic gates.
6. To study the binary parallel adder.
7. To design 4 bit magnitude comparator circuits.
8. To study the 7 segment decoder .
9. To design 4:16 decoder using two 3:8 decoder and four 2:4 decoder
10. To design 16: 1 Multiplexer using 4:1 Multiplexer.
11. To study various types of flip flops using logic gates and ICs.
12. To design Mode-N and divide by K counter.
13. To construct a 4 bit binary to gray converter and vice versa using IC 7486 .
14. To study Up-Down counter.
15. To study programmable shift registers.

Experiments using VHDL (At least 4 Experiments are to be performed by each student)

1. Design AND,OR,XOR gates.
2. Design Half Adder (Data Flow Style)
3. Design Half Adder (Behavioural Style)
4. Design Half Adder (Structural style Direct entity instantiation)
5. Design Half Adder (Structural style indirect entity instantiation(Component))
6. Design Half Adder (Mixed Style)
7. Design 4 bit comparator Using std_logic_vector inputs.
8. Design 4:1 Multiplexer using Boolean expression
9. Design the 7 segment decoder .
10. Design 3:8 decoder

Laboratory Equipment / Machine Requirements: Logic gate trainer, Digital ICs Trainer, Various ICs 7400,7402,7404,7408,7432,7486,74138,74151,74155 etc, Xilinx ISE WebPACK

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Acknowledge about the fundamentals of digital circuit Design.
2. Understand the concepts of logic families.
3. Take interest to design and develop ICs in VLSI industries.
4. Understand the operations of latch circuits, flip flops, counters & semiconductor memories.
5. Understand and design combinational circuits.

Recommended Books:

1. M.M. Mano : "Digital Logic and Computer Design";
2. Kenneth L. SHORT "VHDL FOR ENGINEERS", Pearson Education.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Operating Systems (UNIX) Laboratory**	Course Code: B022323(022)
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (At least 10 experiments are to be performed by each student)

1. Practice session: Study the features of Linux environment, basic Linux commands (echo, who, date, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, find, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, comm, cmp, diff, tr); also document the syntax and semantics of those commands.
2. Write a shell script that accepts a name from the user and displays whether it is a file, directory or something else.
3. Write a shell script that creates users; also check if a particular user has logged in or not. If not, continue the loop till he/she logins. Once the required user logins, display a message.
4. Write a shell script that searches for a given string in a text input file.
5. Write a shell script that compiles all C files in your home directory and creates executable files.
6. Write a shell script that given a filename as argument, deletes all even lines in a file & removes duplicate lines from a file.
7. Write a shell script that enhances find command by adding error messages that explain why the command failed.
8. Write a shell script to input marks of five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate percentage and grade according to following logic:
   Percentage >= 90% : Grade A, Percentage >= 80% : Grade B, Percentage >= 70% : Grade C, Percentage >= 60% : Grade D, Percentage >= 40% : Grade E, Percentage < 40% : Grade F.
9. Write a shell script to accept the name, grade, and basic salary from the user. Write the details into a file called employee, separating the fields with a colon (,) continue the process till the user wants.
10. Write an Áwk' script to count the number of lines in a file that do not contain vowels.
11. Write an Áwk' script to find the number of characters, words and lines in a file.
12. Write a C program to simulate following non-preemptive CPU scheduling algorithms: a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority scheduling techniques.
    a. to find average turnaround times and waiting times;
    b. to display / print Gantt Chart (in any convenient format).
13. Implement the Producer – Consumer problem using semaphores (using UNIX system calls).
14. Write a C program to simulate disk-scheduling algorithms: a) FCFS b) SCAN c) C-SCAN techniques.
15. Write a C program to simulate page replacement algorithms: a) FIFO b) LRU c) LFU d) OPT techniques.

Remarks: The laboratory experiments may be performed in with of the LINUX shell environments: BOURNE Shell / KORN Shell / 'Ç' Shell.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Understand the concept of Unix and shell programming.
2. Learn the working of Linux OS Kernel.
3. Analyse the differences between features provided in Windows and Linux operating system.
4. Learn the concept of loops and decision-making statements.
5. Analyse the logic & procedure of problem solving through Scripts.

Recommended Books:

1. Advance UNIX, a Programmer's Guide, S. Prata, BPB Publications, New Delhi.
2. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: **Software Laboratory (SciLAB / MATLAB)**	Course Code: **B022324(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (At least 10 experiments are to be performed by each student)

1. Identification of different matrix types.
2. Properties and Operations of arrays and matrices.
3. Write a program to find probability of tossing a coin and rolling a die through large no. of experimentation.
4. Compute y- coordinates of a STRAIGHT LINE y = mx + c, where slope of line m =0.5 , intercept c= -2 and x-coordinates : x = 0 to 10 for 0.5 increments.
5. Plot y = Sin x where 0 ≤ x≤2.
6. Plot y = e - 0.4 x Sin x where 0 ≤ x≤ 4.
7. Find the solution of linear algebraic equations in 2 variables, 3 variables:
   a. x + 4y = 18; 2x +3y =16
   b. x + 2 y + 3 z = 1; 3x + 3 y + 4 z = 1; 2x + 3 y + 3 z = 2
8. Determination of roots of a given polynomial & quadratic equations.
9. Determination of Eigen Value & Eigen Vectors for matrices.
10. Write a script file to draw a unit circle.
11. Write a function factorial to compute the factorial n! for any integer n.
12. Write a function factorial to compute the factorial n! using RECURSION for any integer n.
13. Write a function to compute the geometric series
    1 + r + r2 + r3 + ...+ rn for given r and n.
14. Write a function file *crossprod* to compute the cross product of two vectors u and v.
15. Design of a toy project as an independent study towards problem-based learning.

Laboratory Equipment: The experiments may be performed in FOSS (Spoken Tutorials SciLAB Project: www.scilab.org, www.scilab.in.

Laboratory Outcomes [After undergoing the course, students will be able to:]
1. Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning.
2. Realize the power of interactive calculation, programming, graphics, animation in SciLAB / MATLAB and complete portability across platforms.
3. Enjoy SciLAB / MATLAB as a scientific computing and visualization tool.
4. Explore Interactive Computation with matrices and arrays of n-dimensions.
5. Interpret and visualize simple mathematical functions and operations there on using plots/display.

Recommended Books:

1. Getting started with MATLAB: A Quick Introduction for Scientists and Engineers by Rudra Pratap, IIS Banaglore.
2. Scilab Manual for Probability Theory and Statistics Lab by Prof S N Chandra Shekhar; https://scilab.in/lab_migration_run/82
3. Scilab Manual for Numerical techniques lab by Prof Kanika Gupta; https://scilab.in/lab_migration_run/82
4. Scilab Manual for Probability Theory and Random Processes by Prof Shital Thakkar; https://scilab.in/lab_migration_run/82.
5. Scilab Manual for Numerical Techniques by Dr Javed Dhillon; https://scilab.in/lab_migration_run/82

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (III)**	Branch: **Computer Science &Engineering**
Subject: Soft Skills & Personality Development	Course Code: B000306(046)
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Listening: What to listen for and why, When to speak and how, Starting and sustaining a conversation, Presentation and Interaction, Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to say NO

UNIT-5 Inner Development: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger, Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Canfield, Jack.The Success Principles (TM) — 10th Anniversary Edition: How to get from Where You Are to Where You want to Be. New York Times. 2009.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes [After undergoing the course, students will be able to:]

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety profiling tool.
3. Master three "As" of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mindset and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Discrete Mathematics**	Course Code: B022411(014)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives:

1. To introduce a number of discrete mathematical structures found to be serving as tools in the development of theoretical computer science.
2. Course focuses on how discrete structures actually helped computer engineers to solve problems occurred in the development of programming languages.
3. Course highlights the importance of discrete structures towards simulation of a problem in computer science engineering.

UNIT-I **MATHEMATICAL LOGIC & BOOLEAN ALGEBRA:** Basic concept of mathematical logic, Statements, Connectives, Conditional and biconditional statements, Logical equivalence, Logical implication & quantifiers, Basic concept of Boolean Algebra, Properties of Boolean Algebra, Boolean functions, Disjunctive & conjunctive normal forms of Boolean functions, Applications of Boolean Algebra in switching circuits & logic circuits.

UNIT-II **SET THEORY, RELATIONS, FUNCTIONS:** Basic concept of set theory, Relations, Properties of relation in a set, Equivalence relation, Composition of relations, Partial order & total order relations, Lattices &Hasse diagram, Introduction to function, Inverse, Identity, Injective, Surjective & Bijective functions, Composition of functions and some special functions.

UNIT-III **ALGEBRAIC STRUCTURES:** Groups, Subgroups, Cosets, Lagrange's theorem, Isomorphism, Automorphism, Homomorphism, Codes & group codes, Rings, Integral domains and Fields.

UNIT-IV **GRAPH THEORY:** Introduction to graph theory, Walks, Paths & Circuits, Types of graphs, Shortest path problems, Eulerian and Hamiltonian graphs, Basic concept of tree: spanning tree, minimum spanning tree, search tree, rooted binary tree, Cut sets, Network flow, Matrix representation of graphs.

UNIT-V **COMBINATORICS:** Permutation and combination, Pigeon-hole principle, Mathematical induction, Principle of Inclusion and Exclusion, Generating function, Recurrence relation.

Text Books:

1. Elements of discrete mathematics by C.L. Liu, Tata McGraw-Hill, publications.
2. Discrete Mathematical structures, by Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, Pearson Education.

Reference Books:

1. A Text Book of Discrete Mathematics, Swapan Kumar Sarkar, S. Chand &Compeny Ltd.
2. Graph theory with applications to engineering and computer science, by NarsinghDeo, Prentice Hall of India.
3. Discrete mathematics for computer scientists and mathematicians, by J.L. Mott, A. Kandel and T.P. Baker, Prentice Hall of India.
4. Discrete Mathematical Structures with applications to computer science, by J.P. Tremblay and R. Manohar, Tata McGraw-Hill.

Course Outcomes:

After completion of this course students will be –

1. Able to apply mathematical logic and Boolean algebra in switching circuits & logic circuits.
2. Familiar with set theory, relation and functions.
3. Familiar with algebraic structures, graph theory and combinatorics.
4. Able to solve problems in various fields in computer science, specially networking

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Computer System Architecture**	Course Code: B022412(022)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Basic Structure Of Computers: Functional units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, BASIC PROCESSING UNIT: bus architecture, Instruction Cycle, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format.

UNIT-II Arithmetic: Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth's Algorithm, bit-pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

UNIT- III The Memory System: Various technologies used in memory design, Memory Hierarchy: Main Memory, Auxiliary Memory, Associative Memory, Cache memory, Virtual Memory. Memory Management Hardware, Multi-module memories and Interleaving,

UNIT-IV Input/ Output Organization: Peripheral Devices, I/O interfaces I/O-mapped I/O and memory-mapped I/O, interrupts and interrupt handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access

UNIT-V Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

Text Books:
1. Computer Organization, V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, McGraw Hill,5th Edition,2002.
2. Structured Computer Organization, A.S.Tanenbaum, 4th Edition, Pearson Education India
3. Computer System Architecture, M. Marris Mano,PHI

Reference Books:
1. Computer System Architecture &Organisation, Dr. Usha, Wiley India
2. Computer Architecture & Organization, 3rdEdition, J.P. Hayes, McGraw-Hill.
3. Computer Organization & Architecture, W. Stallings, Pearson Education India

Course Outcomes [The students should be able to]:
1. Identify the basic hardware components of a computer system.
2. Familiarize themselves with binary and hexadecimal number systems including computer arithmetic.
3. Familiarize themselves with functional units of the processor such as the register file and arithmetic logical unit.
4. Understand basics functionality of systems: parallel, pipelined, superscalar and RISC/CISC architectures.
5. Represent system design in appropriate formats; addressing modes, an instruction sets as per the system configuration requirements.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Database Management System**	Course Code: B022413(022)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.

UNIT II Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

UNIT III Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms. **Storage strategies**: Indices, B-trees, hashing,

UNIT IV Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database Recovery.

UNIT V Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. **Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Text books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3. "Introduction to Database Systems", 8th Edition by C J Date, Addison Wesley, 2003.

Suggested reference books

1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
2. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Course Outcomes [The students should be able to]:

1. Be familiar with basic concepts of RDBMS, Relational data model & be able to write relational algebra expressions for queries;
2. Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree and hashing;
3. Understand DML, DDL and will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications;
4. Utilize a database modelling technique for a single entity class, a one-to-one (1:1) relationship between entity classes, a one-to-many (1:M) relationship between entity classes, a many-to-many (M:M) relationship between entity classes, and recursive relationships;
5. Be familiar with the basic issues of transaction, its processing and concurrency control.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Object Oriented Programming (with JAVA)**	Course Code: B022414(022)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction & Fundamentals of JAVA, Background of JAVA, About Java Technology, Java's architecture, Reading console inputs, Arrays, Constructors, Finalize method, final, this method and reference, static members.

UNIT-II Concrete class, Abstract class, Interface, Inner classes. Aggregation, Composition and Inheritance, super method and reference. Method overloading and overriding. Singleton classes. Package concepts. Exception Handling: Inbuilt, User defined, Checked and Unchecked.

UNIT- III String class. Wrapper classes (Integer, Boolean, Character, etc.). Multi-threading: Thread concept, Thread class, Runnable interface, Creating cutomized threads, Thread synchronization, Thread class methods. Java I/O: Use of InputStream, OutputStream, Reader and Writer classes for reading from and writing data into disk files.

UNIT-IV AWT & SWING: Frame, Panel, Dialog, CheckBox, Choice, List, JComboBox, JFrame, JPanel, JRadioButton, JScrollPane, JTabbedPane, Using Listeners: ActionListener, ContainerListener, FocusListener, ItemListener, KeyListener, MouseListener, TextListener, WindowListener. Applets. JDBC: Type1 to Type4 drivers. Java Networking: ServerSocket, Socket, RMI.

UNIT-V Collections Frameworks: HashSet, TreeSet, ArrayList, LinkedList, Vector, HashMap, TreeMap, Hashtable classes. Generics in Java: Creating instances of generic classes, generic types, Declaring (and invoking) methods that take generic types. Creating and running executable JAR (Java ARchives).

Text Books:
1. Herbert Schildt: "Java A Beginner's Guide, 7th edition",Oracle Press.
2. Maurice Naftalin, Philip Wadler, "Javas Generics and Collections", O'Reilly Media, Inc.
3. Benjamin J Evans, David Flanagan., "Java in a Nutshell", O'Reilly Media, Inc.

Reference Books:
1. Kathy Sierra, Bert Bates, "Head First Java", O'Reilly Media, Inc.
2. Kathy Sierra, Bert Bates, "OCA Java SE 8 Programmer I Exam Guide", McGraw Hill Professional.
3. Kathy Sierra, Bert Bates, "OCA Java SE 8 Programmer II Exam Guide", McGraw Hill Professional.
4. Kathy Sierra, Bert Bates, "OCA/OCP Java SE 8 Programmer Certification Bundle", McGraw Hill Professional.

Course Outcomes [The students should be able to]:
1. Apply Java in developing Object Oriented code.
2. Apply the knowledge of Multi-threading and Streams in developing Java applications.
3. Design and implement applications using GUI and Networking in Java.
4. Apply the knowledge of Collections and Generics for building Java applications.
5. Design and develop Java based applications for solutions to real world problems.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Design & Analysis of Algorithms**	Course Code: B022415(022)
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I Algorithms: Definitions and Application of notations, Asymptotic notations: big oh, small oh, omega and theta notations, worst case, best case and average case analysis. solving recurrence equations: General recurrence equation, Master Method, Recursive Tree Method, substitution method, analysing control structures. Analysis of Sorting and Searching: Heap, insertion, selection and bubble sort; sequential, binary and Fibonacci search.

UNIT II Divide-Conquer & Greedy Paradigm: Introduction to Divide and conquer paradigm, Quick and merge sorting techniques, the basic divide and conquer algorithm for matrix multiplication, Greedy Method: The basic greedy strategy & computing minimum spanning trees, Algorithms of Kruskal and Prims, use of greedy strategy in algorithms for the Knapsack problem and Huffman trees.

UNIT III Dynamic Programming and String-Matching Algorithms: The basic dynamic programming paradigm, Dynamic programming solution to the optimal matrix chain multiplication and the longest common subsequence problems, String matching algorithm: The general string problem as a finite automata, Knuth Morris and Pratt algorithms, Boyer-Moore Algorithm, linear time analysis of KMP algorithm and Boyer-Moore algorithm.

UNIT IV Backtracking: Back tracking and Recursive back tracking, the general method, 8-queens problem, sum of subsets, graph coloring, Hamiltonian cycle, Knapsack problem

UNIT V Branch and Bound & NP Complete Problem: General method, applications: Travelling sales person problem, 0/1 knapsack problem, LC (Least-cost search), FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP – Hard and NP-Complete classes, Cook's theorem.

Text Books:

1. Cormen, Lelserson, Rivert, "Introduction to Algorithms", Second Edition, PHI.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications Pvt. Ltd., 2008

Reference Books:

1. Paneerselvam, "Design and Analysis of Algorithms", Prentice-Hall of India, 2006
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2005.
3. Gilles Brassard and Paul Bratley, "Fundamentals of Algorithms", Prentice-Hall of India, 1997

Course Outcomes: [The students should be able to]:

1. Calculate the Time complexity of Insertion sort, Heap sort, Bubble sort, Linear and Binary search algorithms.
2. Apply the algorithms and design techniques to solve problems related to divide and conquer and Greedy Algorithm
3. Analyse Dynamic programming problems including Matrix chain multiplication, Longest Common subsequence and Knapsack Problem.
4. Understand the implementation of Backtracking and Recursive Backtracking Methods.
5. Understand the basic concepts of NP-Hard, NP-Complete and Branch and Bound methods.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Computer System Architecture (Laboratory)**	Course Code: B022421(022)
Total / Minimum-Pass Marks (End Semester Exam): **40/ 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. Assembling of a Personal Computer:
   a. Identifying parts of mother board, power connections and locating other connectors.
   b. Interconnection of disk drive units, keyboard, mouse and monitor.
2. Hard disk partitioning and OS installation:
   a. Partitioning the hard disk using FDISK/ Partition Magic/ Disk Manager
3. a. Installation of Windows XP/2000/Pro
   b. Installation of Linux kernel (possibly with dual boot option).
4. Circuit Tracing: Using Multimeter and continuity test mode, to trace a given circuit board and draw the schematic.
5. Load testing of SMPS: Testing the given SMPS of a PC using a multimeter.
6. Installation of Software packages in Linux Platform.
7. BIOS setup and Configuration.
8. Hardware Troubleshooting:
9. (Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.)
10. Software Troubleshooting:
11. (Students have to be given a malfunctioning CPU due to System software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.)
12. Basic operation using Command Line Interface in DOS and Linux Terminal.
13. Computer User and Device Management through Windows Control Panel.
14. Design of digital circuits (MUX, DEMUX & ALU) in VHDL using Active VHDL.
15. Write a program to perform signed bit multiplication using Booth's algorithm.
16. Write a program for IEEE-754 floating point representation and perform Addition/Subtraction.

Laboratory Equipments / Machine Requirements: Computer Hardware trainer kits, Old computing system – should be used for training, Prepare museum of antique computer components for display in laboratory, Xilinx ISE WebPACK

Recommended Books:

1. Computer Repair with Diagnostic Flowcharts Third Edition: Troubleshooting PC Hardware Problems from Boot Failure to Poor Performance - Morris Rosenthal
2. A+ Guide to Hardware: Managing, Maintaining, and Troubleshooting: by Jean Andrews
3. Kenneth L. SHORT "VHDL FOR ENGINEERS" Pearson Education

Course Outcomes [The students should be able to]:

1. Assemble the hardware part of the computer system and will be able to partition the memory and format the system.
2. Install different types of OS and BIOS setup and Configuration.
3. Trace the Circuit using Multimeter and perform continuity test mode, able to draw the schematic
4. Design and simulate digital circuit like multiplexer, demultiplexer and ALU in VHDL.
5. Use terminal Windows for Linux (multiuser and a free and open-source) and DOS (Single User) user OS.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Object Oriented Programming (with JAVA) Laboratory**	Course Code: B022422(022)
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments:*(At least Ten experiments are to be performed by each student)*

1. Write a program in Java to read from console employee details of 5 employees with following details: Name of employee, Department, Age, Salary. Print the details of every employee.
2. Write a program to show the use 'this' keyword to call the default and parameterized constructors.
3. Write a program in Java to display the count of number of objects created and finalized. Provide unique IDs to every object while creation and display the same ID during finalization.
4. Create a Shape Interface which has a member method area(). Derive two subclasses Circle and Triangle from it. Using reference of Shape class fill the required members in Circle and Triangle also display the area of Circle and Triangle. Take input from user while filling data members.
5. Write a program to demonstrate the effect of access modifiers (default, protected, public and private) on members with and without inheritance within a package and outside a package.
6. Write a program to show inbuilt and user defined: checked and unchecked exceptions.
7. Write a program to show the use of various member methods of String class.
8. Create two threads T1 and T2. The thread T1 should print numbers from 1 to 10 and thread T2 prints characters from A to J. Ensure that T2 starts first and T1 should only start when T2 finishes. (Note: use join())
9. Demonstrate using a Java program, how DEADLOCK occurs between threads and also give solution program.
10. Write a program to merge the contents of text files T1.txt and T2.txt into T3.txt. The contents of T1.txt should appear first and then T2.txt in the destination file T3.txt.
11. Develop a GUI application that gives text equivalent of any numeric value entered by the user ranging from 0 to 9.
12. Develop a GUI application to implement Date of Birth validator. The DOB should only be in the form "dd/mm/yyyy". Use customized exception handling method as the validator.
13. Develop an Applet to insert username and password into a MySQL (or any) database.
14. Develop an Applet to display all the usernames and passwords present in a MySQL (or any) database.
15. Develop two applications in Java using Sockets to communicate with each other using text messages.
16. Develop two applications in Java using RMI to communicate with each other using text messages.
17. Develop a Java program to demonstrate the use of HashSet, TreeSet, ArrayList, LinkedList classes.
18. Develop a Java program to demonstrate the use of Vector, HashMap, TreeMap, Hashtable classes.
19. Develop a Java program to demonstrate the use of generics.
20. Create and run an executable JAR.

Laboratory Equipments / Machine Requirements: Windows operating system, 4GB RAM, 500GB HDD, JDK8 and Netbeans IDE.

Recommended Books:

1. Maurice Naftalin, Philip Wadler, "Java Generics and Collections", O'Reilly Media, Inc.
2. Benjamin J Evans, David Flanagan., "Java in a Nutshell", O'Reilly Media, Inc.

Course Outcomes [The students should be able to]:

1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
2. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
3. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
4. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
5. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Database Management System Laboratory**	Course Code: B022423(022)
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: *(At least Ten experiments are to be performed by each student)*
Topics to be covered during LAB

1. How to install Oracle/ MySQL/ PostgreSQL in Windows/ Linux platforms. Creating users and database objects, inserting rows in the database tables.
2. Introduction to SQL, DDL, DDL, DCL queries and constraints. Populating and manipulating database tables using DML statements.
3. Selecting data from tables : SELECT statement, where clause, having clause, group by, order by, selecting NULL values, use of IN and DISTINCT keywords.
4. SQL functions : Study the use of SQL string, date, arithmetic and aggregate functions with examples.
5. JOINS : study the use of joining tables using natural, inner, outer joins.
6. Subqueries and set operations : Study the use of nested queries and how to apply them in database.
7. Views : Study the use of inline and external views.
8. Introduction to PL/ SQL : Pl/ SQL block, PL/ SQL statements, if else statements, looping statements.
9. Cursor : Study the use of cursor and exceptions.
10. Functions and procedures : Study the use of functions and procedures in PL/ SQL programs.
11. Trigger : Study the use of triggers to enforce constraints.
12. Forms and Report generation using PL/SQL.

Hardware / Software Requirements:
- At least Dual Core or Core-I3 Pro Computing System, 2GB RAM, 80GB HDD
- All systems are configured in **DUAL BOOT** mode i.e.Students can boot from Windows 7/8 or Linux as per their lab requirement.
- MySQL/ PgSQL /Oracle May be used as Database Management System

Recommended Books:
1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
3. "Introduction to Database Systems", 8th Edition by C J Date, Addison Wesley, 2003.

Course Outcomes [The students should be able to]:
1. Write efficient DB handling codes in DML, DDL and will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications.
2. Write codes using efficient database storage structures and access techniques: file and page organizations, indexing methods including B-tree and hashing, transaction processing and concurrency control.
3. Write programs in PL/SQL using cursor, functions, triggers.
4. Write programs in PL/SQL, to generate the Report.
5. Design the database of any organisation with Front end and Back end with database connectivity.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Virtual Laboratory (PHP / MySQL)**	Course Code: B022424(022)
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments:*(At least Ten experiments are to be performed by each student)*

1. Create a PHP webpage and print "hello world".
2. Write a PHP program to find maximum of three numbers.Write a PHP program Create a switch statement that will output "Hello" if $var is "1", and "welcome" if $var is "2".
3. Write a PHP program to compute factorial of a number using While loop.
4. Write a program to enter numbers till the user wants. At the end it should display the count of positive, negative and zeros entered. (Using do-while loop)
5. Write a program that will accept an array of integers as input, and output an array where for each item in the source array, the new array will perform the following operations:
    a) For even numbers divide by 2
    b) For odd numbers multiply by 3
6. Create an associative array using the countries as keys, the cities as values and display the data as a table.
7. Write a function calculate_Average () which takes four arguments which are marks for four courses in the semester and returns their average.
8. Write a PHP program to compute factorial of a number using recursion.
9. Write a program that displays a different message based on time of day. For-example, page should display "Good Morning" if it is accessed in the morning.
10. Write a program for Student Mark List Processing by executing DDL, DML, DCL commands on MySQL database.
11. Create pages for signup and sign-in process using PHP MySQL database operations.
12. Create pages for profile updation and deletion of an employee using PHP MySQL.
13. Write a php program to demonstrate Login Panel by session creation, checking and deletion.
14. Create the pages for Petrol and diesel with their rates, quantity, write the program to calculate the total, display the selected item and total in separate page using cookies.

Remarks: Design of a toy project as an independent study towards problem-based learning to be submitted at the end of semester for evaluation.

Laboratory Equipment / Machine Requirements:
Dual Core or Core-I3 Pro Computing System (2GB RAM, 80GB HDD): systems configured in DUAL BOOT mode (inter-switching bootable between Windows 7/8 or Linux as per their lab requirements); MySQL to be used as Database Management System -php7.0 as scripting language

Recommended Books:
1. PHP: The Complete Reference by Steven Holzner
2. Head First PHP & MySQL – by Lynn Beighley & Michael Morrison
3. The Joy of PHP Programming: A Beginner's Guide – by Alan Forbes

Course Outcomes [The students should be able to]:
1. Develop dynamic web designing applications and database handling applications using php;
2. Design and develop dynamic web page components, interfaces & portals – (Project-based Learning technique).

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (IV)**	Branch: **Computer Science &Engineering**
Subject: **Constitution of India**	Course Code: B000406(046)
Total Marks (Internal Assessment): 10	L: 0 T: 0 P: 2 Credits: 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

Unit 1: The Constituent Assembly & The Constitution Of India: Historical Context of Constituent Assembly, Compositions & Functions, Critical Evaluation, Features of Indian Constitution, Preamble to the Constitution of India, Introduction to Fundamental Rights, Right to Equality, Right to Freedom, Constitutional Position of Some Democratic Rights, Right Against Exploitation, Right to Freedom of Religion, Right To Constitutional Remedies, Directive Principles

Unit 2: Organs Of The Government: The President of India, Powers and Functions of President, Emergency Powers and the Position of the President, Union Council of Ministers, Prime Minister, The Rajya Sabha, The Lok Sabha& Lok Sabha Speaker, Relation between Lok Sabha & Rajya Sabha

Unit 3: Indian Judiciary: The Structure and Organization of the Judiciary & the High Court, The Supreme Court, Role of The Supreme Court, Judicial Activism in India, Basic Structure Doctrine & PIL

Unit 4: Federalism & Decentralization: Legislative Procedures of the Parliament, Parliamentary Committees, Centre-State Legislative Relations, Centre-State Administrative Relations, Centre-State Financial Relations, The 5th & 6th Schedules

Unit 5: Indian Municipality and Gram Panchayats: Municipality-1 (History of Indian Municipality), Municipality-2 (Organization & Functions), Panchayat---1 (Idea of Panchayat), Organization and Powers of Panchayats in India

Text Books:
1. Durga Das Basu --- Introduction to the Constitution of India, 23rd Edition (Gurgaon; LexisNexis, 2018).
2. J.C.Johari -- The Constitution of India: A Politico-Legal Study (Greater Noida: Sterling Publishers Pvt. Ltd. 2013).
3. Himangshu Roy and M.P.Singh – Indian Political System, 4th Edition (Bengalaru; Pearson Education, 2018)
4. Vidya Bhushan &VishnooBhagwan--- Indian Administration (S. Chand, 2011)

Reference Books:
1. S.R.Maheswari --- Indian Administration (Orient Blackswan, 2001)
2. Dr. A.Avasthi& A.P. Avasthi --- Indian Administration (L.N. Agarwal Educational Publishing, 2017).
3. B. L. Fadia --- Indian Government and Politics (Sahitya a. Bhawan, 13th Revised Edition, 2017).
4. P.M.Bakshi – The Constitution of India (Prayagraj, UP; a. Universal Law Publishing, January, 2018)

Course Outcomes [The students should be able to]:
1. The citizens of India learn to abide by the laws of Indian Parliament and the judiciary.
2. Indians become aware of their fundamental rights and duties from the Constitution of India.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Microprocessors & Interfaces**	Course Code: **C022511(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I: Introduction to Basic Microprocessors: Historical Background, the Harvard and Princeton architecture, The Microprocessor-Based Personal Computer Systems. The Microprocessor 8085, 8088 basics and comparison (Block & Pin diagram only).

UNIT II: Microprocessor Architecture 8086: 8086 basic block diagram, Internal Microprocessor Architecture, Real Mode Memory Addressing, Registers, pin configuration, segmentation. Data Movement Instructions: MOV, PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Segment Override Prefix, Assembler Details. Arithmetic and Logic Instructions: Addition, Subtraction and Comparison, Multiplication and Division, BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. Program Control Instructions: The Jump Group, Controlling the Flow of the Program, Procedures, and Introduction to Interrupts, Machine Control and Miscellaneous Instructions. Assembler directives, assembler instructions, Assembly Language Programming.

UNIT III: Assembly Language programming : Assembly Language programming with C/C++, Interrupt and Timing diagrams: Using Assembly Language with C/C++ for linking C/C++ into assembly language, Basic Programs – Use of BIOS and DOS Interrupts in assembly & C/C++, Interrupts of 8086 microprocessors, Timing diagram of 8086 microprocessor.

UNIT IV: Memory and I/O Interfacing: Minimum and Maximum mode configuration of 8086, Memory Interface with 8086 microprocessor, Address Decoding. Basic I/O Interface: Introduction to I/O Interface, I/O Port Address Decoding. I/O Interface using peripheral devices: The Programmable Peripheral Interface 8255, Programmable Interval Timer 8254. Direct Memory Access: Basic DMA Operation and Definition.

UNIT V: Advanced Microprocessors: 80386- Features, block diagram, data types, supported registers, memory system, real mode and protected mode operation, descriptors, cache register, control register, paging mechanism, virtual mode, and protection mechanism for operating system. Comparative Study of Modern Microprocessor (Web based Reference for study): Pentium Pro (Pentium II, Pentium III, Pentium IV), Core i3,i5,i7 and Atom processors.

Text Books:

1. Barry B Brey: The Intel Microprocessors, 8th Edition, Pearson Education, 2009. (Listed topics only from the Chapters 1 to 13)
2. Ramesh S. Gaonkar : Microprocessor Architecture, programming and Application with 8085, 4th Edition, Wiley,2012

Reference Books:

1. Douglas V. Hall: Microprocessors and Interfacing, Revised 2nd Edition, TMH, 2006.
2. James L. Antonakos: The Intel Microprocessor Family: Hardware and Software Principles and Applications, Cengage Learning, 2007.
3. Nilesh B. Bahadure: Microprocessors: The 8086/8088, 80186/80286, 80386/80486 and the Pentium family, 2nd edition (2014), Prentice Hall of India (PHI).
4. K. Udaya Kumar & B.S. Uma Shankar: Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
5. Microprocessor: Theory and Applications- Intel and Motorolla, Rafiquuzzaman, PHI.

Course Outcomes [After undergoing the course, students will be able to:]

1. Apply basic concepts of digital fundamentals to Microprocessor based personal computer system.
2. Identify a detailed software& hardware structure of the Microprocessors.
3. Design, write and test assembly language programs of moderate complexity.
4. Illustrate how the different peripherals are interfaced with Microprocessor
5. Apply concepts of microprocessor for developing system to solve real world problems.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Computer Networks**	Course Code: **C022512(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction: OSI, TCP/IP and other networks models, Network Topologies WAN, LAN, MAN. Transmission media copper, twisted pair wireless, switching and Multiplexing and De-multiplexing, Networking Devices.

UNIT-II Data link layer: Framing, Error detection and correction, Flow Control. Multiple Access Protocols – Data Link Layer Addressing, ARP, RARP, DHCP, Ethernet standards. Media Access Control Protocols. MAC addresses. Wireless LANS. High Level Data Link Control, Asynchronous Transfer Mode.

UNIT- III Network Layer: Internet Protocol (IP), IPv4 and IPv6, Sub-netting and Super-netting, ICMP, Unicast Routing Protocols: Link State Routing, Distance Vector Routing, Hierarchical Routing, RIP, OSPF, BGP Multicast Routing, Multicast Routing Protocols: DVMRP, MOSPF, CBT, PIM, MBONE, Mobile IP, IPsec.

UNIT-IV Transport Layer: Transport Layer Services Connectionless Protocols: UDP, UDP segment, Reliable Data Transfer. Connection-Oriented Protocols: TCP Segment Structure, RTT estimation, Flow Control, Connection Management, Congestion Control, Integrated and Differentiated Services: Intserv – Diffserv.

UNIT-V Application Layer: Principles of Network Applications, The Web and HTTP, FTP, Electronic Mail, SMTP, Mail Message Formats and MIME, DNS, Socket Programming with TCP and UDP. Multimedia Networking: Internet Telephony, RTP, RTCP, RTSP. Network Security: Principles of Cryptography, Firewalls, Attacks and Countermeasures.

Text Books:

1. Data Communications and Networking – Behrouz A. Forouzan.Third Edition TMH.
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, Third edition, 2006

Reference Books:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
3. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

Course Outcomes[After undergoing the course, students will be able to:]

1. On completion of this unit the student should be able to:
2. Understand the basic structure of an abstract layered Network protocol model for any Networking environment
3. Identify and apply basic theorems and formulae for the information-theoretic basis of communication and the performance of TCP/IP network protocols.
4. Acquire reflective practice necessary to support a career in Computer Networking at advanced professional level.
5. Understand different protocols, software, and network architectures, their topologies, protocols in any networking application domains.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Formal Languages and Automata Theory**	Course Code: **C022513(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I The Theory Of Automata: Introduction to automata theory, Examples of automata machine, Finite automata as a language acceptor and translator, Deterministic finite automata. Non-deterministic finite automata, finite automata with output (Mealy Machine. Moore machine), Finite automata with ε moves, Minimizing number of states of a DFA, My hill Nerode theorem, Properties and limitation of FSM, Application of finite automata.

UNIT-II Regular Expressions: Alphabet, String and Languages, Regular expression, Properties of Regular Expression, Finite automata and Regular expressions, Arden's Theorem, Regular Expression to DFA conversion & vice versa. Pumping lemma for regular sets, Application of pumping lemma, Regular sets and Regular grammar, Closure properties of regular sets. Decision algorithm for regular sets and regular grammar.

UNIT- III Grammars: Definition and types of grammar, Chomsky hierarchy of grammar, Relation between types of grammars, Context free grammar, Left most & right most derivation trees, Ambiguity in grammar, Simplification of context free grammar, Chomsky Normal From, Greibach Normal From, properties of context free language, Pumping lemma for context free language, Decision algorithm for context tree language.

UNIT-IV Push Down Automata And Turing Machine: Basic definitions, Deterministic push down automata and non-deterministic push down automata, Acceptance of push down automata, Push down automata and context free language, Turing machine model, Representation of Turing Machine, Construction of Turing Machine for simple problem's, Universal Turing machine and other modifications .Church's Hypothesis, , Halting problem of Turing Machine.

UNIT-V Computability: Introduction and Basic concepts, Recursive function, Partial recursive function, Initial functions, Composition of functions, Ackerman's function, Recursively Enumerable and Recursive languages, Decidable and undecidable problem, Post correspondence problem, Space and time complexity.

Text books:

1. Theory of Computer Science (Automata Language & Computation), K.L.P. Mishra and N. Chandrasekran, PHI.
2. Introduction to Automata theory. Language and Computation, John E. Hopcropt & Jeffery D. Ullman, Narosa, Publishing House.

References books:

1. John Martin, "Introduction to Languages and the Theory of Computation", Tata McGraw Hill.
2. Kamala Krithivasan, Rama R., "Introduction to Formal Languages Automata Theory and Computation", 2nd Edition, Pearson Education.

Course Outcomes [After undergoing the course, students will be able to:]

1. Design finite automata to accept a set of strings of a language.
2. Determine whether the given language is regular or not.
3. Design context free grammars to generate strings of context free language.
4. Design push down automata and the equivalent context free grammars and Design Turing machine.
5. Distinguish between computability and non-computability, Decidability and un-decidability.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Data Analytics with PYTHON**	Course Code: **C022514(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction: Key Concepts: Python Identifiers, Keywords, Indentations, Comments in Python, Operators, Membership operator, String, Tuple, List, Set, Dictionary, File input/output.

UNIT-II An Introduction to Data Analysis: Knowledge Domains of the Data Analyst, Understanding the Nature of the Data, The Data Analysis Process, Quantitative and Qualitative Data Analysis

UNIT- III The NumPy Library: Ndarray, Basic Operations, Indexing, Slicing, and Iterating, Conditions and Boolean Arrays, Shape Manipulation, Array Manipulation, Vectorization, Broadcasting, Structured Arrays, Reading and Writing Array Data on Files.

UNIT-IV The pandas Library: The Series, The DataFrame, The Index Objects, Reindexing, Dropping, Arithmetic and Data Alignment, Operations between DataFrame and Series, Functions by Element, Functions by Row or Column, Statistics Functions, Sorting and Ranking, Correlation and Covariance, "Not a Number" Data. Reading and Writing Data: CSV and Textual Files, HTML Files, XML, Microsoft Excel Files.

UNIT-V Data Visualization with matplotlib: A Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy, Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts. Line Chart, Histogram, Bar Chart, Pie Charts.

Text Books:

1. Python Data Analytics– Fabio Nelli, APress.
2. Python for Data Analysis, Wes McKinney, O'Reilly.

Reference Books:

1. Mastering Machine Learning with Python in Six Steps, Manohar Swamynathan, APress
2. Data Structures and Algorithms Using Python, Rance D. Necaise, WILEY

Course Outcomes [After undergoing the course, students will be able to:]

1. Use various data structures available in Python.
2. Apply the concepts of Data Analysis.
3. Apply the use of Numpy Library for performing various data processing activities.
4. Apply the use of Pandas library for data handling activities.
5. Apply the use of Matplotlib for data visualization activities.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Computer Graphics (Professional Elective – I)**	Course Code: **C022531(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 0 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction to computer graphics & graphics systems
Overview of computer graphics, storage tube graphics display, Raster scan display. Points & lines, Line drawing algorithms, DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Ellipse generating algorithm, scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

UNIT-II Two-Dimensional and Three-dimensional Transformations: Transformations and Matrices, Transformation Conventions, 2D & 3D Transformations, Homogeneous Coordinates and Matrix Representation of 2D & 3D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, 3DShearing, Combined 2D & 3D Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point / Plane, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, Window-to-Viewport Transformations.

UNIT- III Clipping: Types and Algorithms, Cohen-Sutherland, Cyrus-beck line clipping, Sutherland-Hodgeman polygon clipping algorithm;
Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.

UNIT-IV Plane Curves and Surfaces: Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, Representation of Space Curves, Cubic Splines, Bezier Curves, Bspline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.

UNIT-V Animations & Realism 10 Animation Graphics: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening, Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.

Text Books:
1. Computer Graphics – Principles and Practice by J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes 2nd edition, Pearson
2. Fundamentals of Computer Graphics by S. Marschner, P. Shirley, 4th Edition, CRC Press.

Reference Books :
1. Computer Graphics: H. Baker, 2nd Edition, Pearson.
2. Principles of Interactive Computer Graphicsby W.M. Newman & R. F. Sproull, Peterson, 2nd Edition, TMH.

Course Outcomes [After undergoing the course, students will be able to:]
1. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
2. Use of geometric transformations on graphics objects and their application in composite form.
3. Extract scene with different clipping and transformation methods; also exploring projections and visible surface detection techniques for display of 3D scene on 2D screen.
4. Render projected objects to naturalize the scene in 2D view and use of illumination models for this.
5. Design simple applications using principles of virtual reality.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Object Oriented Analysis & Design (Professional Elective – I)**	Course Code: **C022532(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 0 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction:Modelling Concepts and Class Modelling: What is Object 8 Hours orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models; Advanced Class Modelling, Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages.

UNIT-II UseCase Modelling and Detailed Requirements: Overview; Detailed object- 8 Hours oriented Requirements definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour-The state chart Diagram; Integrated Object-oriented Models.

UNIT- III Process Overview: System Conception and Domain Analysis: Process Overview: 8 Hours Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis.

UNIT-IV System design and Class Design: System design: Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identifying Concurrency, Allocating Subsystems, Management of Data Storage, Handling Global Resources, Choosing Software Control Implementation, Handling Boundary Conditions, Setting Trade-off Priorities, Common Architectural Styles, Architecture of the ATM System. Class design: Overview of Object Design, Bridging the gap, Realizing Use Cases, Designing Algorithms, Recursing Downward, Refactoring, Design Optimization, Reification of Behavior, Adjustment of Inheritance, Organizing a Class Design, ATM Example.

UNIT-V Design Patterns: Introduction; what is a design pattern?, Describing design patterns, the catalogue of design patterns, Organizing the catalogue, How design patterns solve design problems, how to select a design patterns, how to use a design pattern; Creational patterns.

Text Books:
1. Object – Oriented Modeling and Design with UML, Michael R Blaha and James R Rumbaugh, 2nd Edition, Pearson Education, India.
2. Object oriented systems development, Ali Bahrami, McGraw-Hill Higher Education, 1999.

Reference Books:
1. Object Oriented Analysis & Design, Atul Kahate, Tata McGraw-Hill Education
2. Object-Oriented Analysis and Design with Applications, Third Edition, Grady Booch, Robert A. Maksimchuk Michael W. Engle, Bobbi J., Young, Ph.D., Jim Conallen, Kelli A. Houston.

Course Outcomes [After undergoing the course, students will be able to:]
1. Describe the concepts involved in Object-Oriented modelling and their benefits
2. Demonstrate concept of use-case model, sequence model and state chart model for a given problem.
3. Explain the facets of the unified process approach to design and build a Software system.
4. Translate the requirements into implementation for Object Oriented design.
5. Choose an appropriate design pattern to facilitate development procedure.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Digital Image Processing (Professional Elective – I)**	Course Code: **C022533(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 0 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I: Introduction: Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image formation model, Image Acquisition , Image Sampling and Quantization , Spatial & Gray level resolution, Basic Relationships Between Pixels.

UNIT II: Image Enhancement & Restoration: Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters smoothing and sharpening, Image Restoration and Reconstruction

UNIT III: Morphological Image Processing & Image segmentation: Logic operations involving binary image, Dialation & Erosion, Opening & Closing, Applications to Boundary extraction, region filling, connected component extraction. Line detection, Edge detection, Edge linking & boundary detection, Thresholding, Region based segmentation.

UNIT IV: : Image Descriptor & Classification: Image Descriptors, Boundary descriptors, Shape numbers, Texture, Feature Extraction, Image Pattern Classification, Neural Networks and Deep Learning

UNIT V Image compression: Coding redundancy- Huffman coding, LZW coding, run length coding, Lossy compression- DCT, JPEG, MPEG, video compression.

Text Books:
1. Ganzalez and Woods, Digital Image Processing, Pearson education.
2. Sonka and Brooks, Image Processing, TSP ltd,

Reference Books :
1. Jain and Rangachar, Machine Vision, MGH.
2. Schalkoff, Digital Image Processing, John Wiley and sons.

Course Outcomes [After undergoing the course, students will be able to:]
1. Describe, analyze and reason as to how digital images are represented, manipulated and get encoded.
2. Understand the processing of images with emphasis on algorithm design, implementation and performance evaluation.
3. Apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.
4. Analyze and implement image-processing algorithms.
5. Extract features for image description and apply neural network and deep learning forclassification.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Multimedia & Virtual Reality (Professional Elective – I)**	Course Code: **C022534(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 0 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Theory of Internet:-Introduction, Evolution of Internet, Internet applications, Internet Protocol: TCP/IP, Protocol, Versions, Class full addressing, IP data gram, ICMP &IGMP. Functions of ARP and RARP ,User Data gram Protocol(UDP),Transmission Control Protocol(TCP):Flow-Control, Error-Control. Internet Security& Firewalls.

UNIT-II Bounded Media for Internet: Cable media,Telephone network, ISDN: Overview, Interfaces& Functions, Physical Layer, Data Link Layer, Network Layer Services ,Signaling System Number7.ATM& B-ISDN: Introduction Services& Applications, Principles& building blocks of B-ISDN, DIAS network.

UNIT- III Un-Bounded Media for Internet: Wireless media: Components and working of Wireless network, IEEE 802.11standardsandWLANtypes, Ad-hoc networks, MACAW Protocol. Features and Goals of Bluetooth, Bluetooth products and security, TCP OverWireless&Ipv6:Mobile IP ,support of Mobility on the Internet, Mobile TCP, Traffic Routing in Wireless Networks, Circuit switched DataServices,Packet switched Dataservices. WLL Architecture, WLL Technologiesand frequency spectrum, Local Multipoint Distribution Service(LMDS), Ultra Wideband Technology.

UNIT-IV Introduction to Multimedia:-Concept of Non-Temporal and Temporal Media. Hypertex tand Hypermedia.Presentations:Synchronization,Events, Scriptsand Interactivity,CompressionTechniques: Basic conceptsof Compression. StillImageCompression:JPEG Compression., FeaturesofJPEG2000.Video Compression:MPEG-1&2 CompressionSchemes,MPEG-4 NaturalVideoCompression.Audio Compression: IntroductiontospeechandAudio Compression,MP3Compression Scheme. Compression ofsynthetic graphical objects.

UNIT-V MultimediaSystemsTechnology: ArchitectureforMultimediaSupport:MultimediaPC/Workstation Architecture,CharacteristicsofMMXinstructionset, I/Osystems:IEEE 1394 interface,OperatingSystemSupport forMultimediaData: ResourceSchedulingwith realtimeconsiderations,FileSystem,I/O DeviceManagement. MultimediaInformationManagement:MultimediaDatabaseDesign, Content Based InformationRetrieval:Image Retrieval, VideoRetrieval, OverviewofMPEG-7,Design ofVideo-on-demand systems.

Text Books:

1. Multimedia System Design, Andleigh and Thakarar , PHI, 2003.
2. Multimedia Technology & Application, David Hillman, Galgotia Publications.

Reference Books :

1. Multimedia Computing Communication and Application, Steinmetz, Pearson Edn.
2. Virtual Reality Systems, John Vince, Pearson Education.
3. Fundamentals of Computer Graphics and Multimedia, D.P. Mukherjee, PHI

Course Outcomes [After undergoing the course, students will be able to:]

1. Know the fundamental video, audio, image, text processing techniques
2. Acquire the basic skill of designing video compression, audio compression, image compression, text compression.
3. Know the basic techniques in designing video transmission systems: error control and rate control.
4. Know the technologies related to virtual reality and application of virtual reality system.
5. Get familiar with VRML programming.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Microprocessors & Interfaces (Laboratory)**	Course Code: **C022521(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. To perform addition & subtraction of two 8 – bit hexadecimal numbers.
2. To perform addition & subtraction 16 – bit hexadecimal numbers.
3. To perform addition & subtraction 32 – bit hexadecimal numbers.
4. To perform addition & subtraction of two 8 – bit decimal numbers and store the result in DX register.
5. To perform addition & subtraction of two decimal digits 9 and 7 using ASCII code store the result in ASCII format.
6. To perform addition & subtraction of two decimal digits 97 and 25 using ASCII code store the result in ASCII format in CX-BX register.
7. To perform multiplication of 4 and 5 .
8. To perform division of 16 – bit number with 8-bit number.
9. To perform multiplication of two 8-bit numbers using ASCII code store the result in ASCII form in DX register.
10. To perform division of two 8-bit numbers using ASCII code store the result in ASCII form in DX register.
11. To solve Arithmetic equation 3AX+5DX+BP and store the result in CX register.
12. To solve Arithmetic equation (P*Q)+(R*S).
13. To add only positive number from 100 data bytes.
14. To write a program to add series of 20 bytes.
15. To find positive & negative byte from 100 data bytes.
16. To find largest & smallest byte from block of data.

Laboratory Equipment / Machine Requirements: 8086 based microprocessor kit, MASM assembler, 8086 simulator, PCs.

The students are free to choose any programming platform from (C++ / JAVA / PYTHON) to perform the above-mentioned set of laboratory experiments.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
2. Identify a detailed s/w & h/w structure of the Microprocessor
3. Design, write and test assembly language programs of moderate complexity.
4. Illustrate how the different peripherals are interfaced with Microprocessor
5. Apply concepts of microprocessor for developing system to solve real world problems.

Recommended Books:

1. IBM PC Assembly Language and Programming, P. Abel, 5th Edition, PHI/Pearson Education.
2. Introduction To Assembly Language Programming, SivaramaP.Dandamudi, Springer Int. Edition,2003.
3. The 8088 and 8086 Microprocessors: Programming , Interfacing,Software,Hardware and Application,4th edition, W.A. Triebel, A.Singh,N.K.Srinath,Pearson Education

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Computer Networks Laboratory**	Course Code: **C022522(022)**
Total / Minimum-Pass Marks(End Semester Exam):**40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Introduction to Local Area Network with its cables, connectors and topologies.
2. Installation of UTP, Co-axial cable, Cross cable, parallel cable NIC and LAN card.
3. To connect two Personal Computer with UTP cable.
4. Installation of Switch. their cascading and network mapping.
5. Case Study of Ethernet (10 base 5,10 base 2,10 base T)
6. Installation and working with Telnet (Terminal Network).
7. Installation and working with FTP (File Transfer Protocol).
8. Installation and basic operation of a packet sniffer wireshark.
9. Installation of Modem and Proxy Server.
10. Simulation of LAN protocol using NETSIM/Packet Tracer/Lan Trainer Kit.
11. Introduction to Server administration.
12. Installation of Windows 2003 server/ Windows 2000 server.
13. Configuration of DHCP.
14. Configuring Switch/Router.
15. Installation and working of Net meeting and Remote Desktop.

List of Equipment / Machine Required:
Windows 2003 server/Windows 2000 server. . NETSIM, WIRESHARK, cisco packet tracer, LAN Trainer Kit LAN Card Cable, WIRE CUTTER , Connectors, Switch, Crimping Tools.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Design LAN
2. Configure Windows 2003 /2000/DHCP, Proxy Server.
3. Configure L2/L3 Switches.
4. Install netsim and simulate various LAN Protocols.
5. Install wireshark and Analyze network data using it.

Recommended Books.

1. Computer Network and internet by Dougles E. Comer (Pearson Education)
2. List of Software required :-
3. Windows 2003 server/Windows 2000 server.
4. List of Hardware required :-
5. LAN Trainer Kit LAN Card Cable, Connectors, HUB, Switch, Crimping Tools.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Data Analytics with PYTHON Laboratory**	Course Code: **C022523(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Write programs to understand the use of Python Identifiers, Keywords, Indentations, Comments in Python, Operators, Membership operator.
2. Write programs to understand the use of Python String, Tuple, List, Set, Dictionary, File input/output.
3. Write programs to understand the use of Numpy's Ndarray, Basic Operations, Indexing, Slicing, and Iterating, Conditions and Boolean Arrays.
4. Write programs to understand the use of Numpy's Shape Manipulation, Array Manipulation, Vectorization.
5. Write programs to understand the use of Numpy's Structured Arrays, Reading and Writing Array Data on Files.
6. Write programs to understand the use of Pandas Series, DataFrame, Index Objects, Reindexing, Dropping, Arithmetic and Data Alignment.
7. Write programs to understand the use of Pandas Functions by Element, Functions by Row or Column, Statistics Functions, Sorting and Ranking, Correlation and Covariance, "Not a Number" Data.
8. Write programs to understand the use of Pandas for Reading and Writing Data using CSV and Textual Files, HTML Files, XML, Microsoft Excel Files.
9. Write programs to understand the use of Matplotlib for Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy.
10. Write programs to understand the use of Matplotlib for Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts.
11. Write programs to understand the use of Matplotlib for Working with Line Chart, Histogram, Bar Chart, Pie Charts.

Recommended Books:

1. Python Data Analytics– Fabio Nelli, APress.
2. Python for Data Analysis, Wes McKinney, O'Reilly.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Use various data structures available in Python.
2. Apply the concepts of Data Analysis.
3. Apply the use of Numpy Library for performing various data processing activities.
4. Apply the use of Pandas library for data handling activities.
5. Apply the use of Matplotlib for data visualization activities.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **PROJECT-I Laboratory**	Course Code: **C022524(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

Each student has to undergo Project I using any language platform based on Summer Internship and / or Industrial Training)

Guidelines for Pursual / Assessment of Project I Laboratory:

1. Students are encouraged to pursue live / research based / survey based / case study based projects under this Laboratory post summer internship or Industrial Training period;
2. Students are encouraged to make teams of maximum FOUR to work under a single project title;
3. Students are initially advised to get approval of their project titles and mentorship consent under any faculty from own discipline and training supervisor in the prescribed format provided;
4. Student groups can be of inter-disciplinary nature;
5. Students are required to submit weekly progress report with due approval signature(s) of their project mentors till the completion of that project;
6. At the end, the students must submit the project reports with due signature(s) of project mentor (in-house Teaching Faculty from relevant discipline) and training supervisor (representing the organization of training) in the following format.

Vocational / Industrial Training Report Format

Cover Page (1 page)
Inner Pages (3 pages)
Certificate by Company/Industry/Institute
Declaration by student

About Company/Industry/Institute (1 page)
Table of Contents (1 page)
List of Tables (1 page)
List of Figures(1 page)
Abbreviations and Nomenclature (If any)
Chapters (1-2 page each)
Introduction to Project
Tools & Technology Used
Snapshots
Task Deliverables / Project Outcome
Conclusions and Future Scope
Bibliography / Webliography / References (1page)
Weekly Progress Sheets (4 pages)
Feedback Report by Company/Industry/Institute (1 page)

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V)**	Branch: **Computer Science &Engineering**
Subject: **Environmental Studies**	Course Code: **C000506(020)**
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:

1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

UNIT I: Introduction to environmental studies, ecology and ecosystems (06 hours)
Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II: Biodiversity and conservation (06 hours)
Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III: Natural resources and environment (08 hours)
Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV: Human communities, social issues and environment (08 hours)
Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V: Environmental pollution, policies, legislations, assessment and practices (12 hours)
Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

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On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO) [On completion of the course, students will able to:]

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.
7.

TEXT BOOKS:

1. De, A.K., (2006).*Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006).*Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971).*Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005).*Ecology and Environment*. Rastogi Publications.

OPEN SOURCE LEARNING: http://nptel.ac.in/

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Compiler Design**	Course Code: **C022611(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I: Introduction : Introduction to Compiler, single and multi-pass compilers, Translators, Phases of Compilers, Compiler writing tools, Finite Automata and Lexical Analyzer: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata, from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer with LEX.

UNIT II: Syntax Analysis and Parsing Techniques : Context free grammars, Bottom-up parsing and top down parsing, Top down Parsing : elimination of left recursion, recursive descent parsing, Predicative Parsing, Bottom Up Parsing : Operator precedence parsing, LR parsers, Construction of SLR, Canonical LR and LALR parsing tables, Construction of SLR parse tables for Ambiguous grammar, parser generator- YACC, error recovery in top down and bottom up parsing.

UNIT III: Syntax Directed Translation & Intermediate Code Generation : Synthesized and inherited attributes, Construction of syntax trees, bottom up and top down evaluation of attributes, S- attributed and L-attributed definitions ,Postfix notation; Three address codes, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expression and Procedure Calls.

UNIT IV: Run-time Environment : Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation.

UNIT V: Code Optimization and Code Generation : Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations. Issue in the design of Code generator, register allocation, the target machine, and simple Code generator.

Text Books:

1. Compilers Principles, Techniques and Tools, Alfred V. Aho, Ravi Sethi and Ullman J.D., 2nd edition , Addison Wesley.
2. Principle of Compiler Design, Alfred V. Aho and J.D. Ullman, Narosa Publication
3. Introduction to Compiler Techniques, J.P. Bennet, 2nd edition, Tata McGraw-Hill

Reference Books:

1. Compiler Design in C, A.C. Holub, PHI.
2. Compiler construction (Theory and Practice), A. Barret William and R.M., Bates, Galgotia Publication.
3. Compiler Design, O.G. Kakde, 4th edition, Laxmi Publication.

Course Outcomes [After undergoing the course, students will be able to:]

1. Explain the concepts of Compilers and roles of the lexical analyzer.
2. Apply the concepts of different Parsing techniques and implement the knowledge to Yacc tool.
3. Develop syntax directed translation schemes.
4. Implement the principles of scoping, parameter passing and runtime memory management.
5. Use the new code optimization techniques to improve the performance of a program in terms of speed & space and develop algorithms to generate code for a target machine.

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Software Engineering & Project Management**	Course Code: **C022612(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I: Introduction to software engineering and project management -Introduction to Software Engineering: Software, Evolving role of software, Three "R"-Reuse, Reengineering and Retooling, An Overview of IT Project Management: Define project, project management framework, The role of project Manager, Systems View of Project Management, Stakeholder management, Project phases and the project life cycle. Software Process Models-Waterfall Model, Evolutionary Process Model: Prototype and Spiral Model, Incremental Process model: Iterative approach, RAD, JAD model, Concurrent Development Model, Agile Development: Extreme programming, Scrum.

UNIT II : Software Requirement Analysis and Specification : Types of Requirement, Feasibility Study, Requirement Analysis and Design: DFD, Data Dictionary, HIPO Chart, Warnier Orr Diagram, Requirement Elicitation: Interviews, Questionnaire, Brainstorming, Facilitated Application Specification Technique (FAST), Use Case Approach. SRS Case study, Software Estimation: Size Estimation: Function Point (Numericals). Cost Estimation: COCOMO (Numericals), COCOMO-II (Numericals). Earned Value Management

UNIT III: Software Project Planning : Business Case, Project selection and Approval, Project charter, Project Scope management: Scope definition and Project Scope management, Creating the Work Breakdown Structures, Scope Verification, Scope Control, Project Scheduling and Procurement management- Relationship between people and Effort: Staffing Level Estimation, Effect of schedule Change on Cost, Degree of Rigor & Task set selector, Project Schedule, Schedule Control, CPM (Numericals), Basic Planning Purchases and Acquisitions, Planning Contracting, Requesting Seller Responses, Selecting Sellers, Out Sourcing: The Beginning of the outsourcing phenomenon, Types of outsourcing relationship, The realities of outsourcing, Managing the outsourcing relationship.

UNIT IV :Software Quality : Software and System Quality Management: Overview of ISO 9001, SEI Capability Maturity Model, McCalls Quality Model, Six Sigma, Formal Technical Reviews, Tools and Techniques for Quality Control, Pareto Analysis, Statistical Sampling, Quality Control Charts and the seven Run Rule. Modern Quality Management, Juran and the importance of Top management, Commitment to Quality, Crosby and Striving for Zero defects, Ishikawa and the Fishbone Diagram.

UNIT V : Human Resource Management: Human Resource Planning, Acquiring the Project Team: Resource Assignment, Loading, Leveling, Developing the Project Team: Team Structures, Managing the Project Team, Change management: Dealing with Conflict & Resistance Leadership & Ethics. Software Risk Management and Reliability issues- Risk Management: Identify IT Project Risk, Risk Analysis and Assessment, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation. Software Reliability: Reliability Metrics, Reliability Growth Modelling

Text Books:

1. Software Engineering, 5th and 7th edititon, by Roger S Pressman, McGraw Hill publication.
2. Managing Information Technology Project, 6edition, by Kathy Schwalbe, Cengage Learning publication.
3. Information Technology Project Management by Jack T Marchewka Wiley India publication.

Reference Books:

1. Software Engineering 3rd edition by KK Agrawal, Yogesh Singh, New Age International publication.
2. Software Engineering Project Management by Richard H. Thayer Wiley India Publication
3. Software Engineering for students: A Programming Approach by Douglas Bell, Pearson publication.

Course Outcomes [After undergoing the course, students will be able to:]

1. To understand and conceptualize the process of Software Development Life Cycle (SDLC) models.
2. Apply use of knowledge of Software Life Cycle to implement the projects successfully in the corporate world.

3. Identify the Inputs, Tools and techniques to get the required Project deliverables and Product deliverables using 10 Knowledge areas of Project Management.
4. To familiarize with Project Management framework and To
5. Implement Project Management Processes to successfully complete project in IT industry.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Artificial Intelligence & Expert Systems**	Course Code: **C022613(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT I: Introduction: Overview of AI problems, examples of successful recent AI applications. The Turing test, Rational versus non-rational reasoning. Search Strategies: Problem spaces (states, goals and operators), problem solving by search. Uninformed search (breadth-first, depth-first, depth-first with iterative deepening). Heuristics and informed search (hill-climbing, generic best-first, A*). Minimax Search, Alpha-beta pruning. Space and time efficiency of search. Two-player games (introduction to minimax search). Constraint satisfaction (backtracking and local search methods).

UNIT II: Knowledge representation and reasoning: Review of propositional and predicate logic, First order logic, Resolution and theorem proving, Forward chaining, Backward chaining,Temporal and spatial reasoning. Review of probabilistic reasoning, Bayes theorem. Totally-ordered and partially-ordered Planning

UNIY III: Planning : The blocks world, Components of Planning Systems, Goal stack planning, Non-linear planning, Hierarchical planning. Learning-Learning from example, Learning by advice, Explanation based learning, Learning in problem solving, Definition and examples of broad variety of machine learning tasks, Classification, Inductive learning, Simple statistical-based learning such as Naive Bayesian Classifier, decision trees.

UNIT IV: Natural Language Processing: Language models, n-grams, Vector space models, Bag of words, Text classification, Information retrieval, Page rank, Information extraction, Question-answering

UNIT V: Agents: Definition of agents, Agent architectures (e.g., reactive, layered, cognitive), Multi-agent systems- Collaborating agents, Competitive agents, Swarm systems and biologically inspired models. Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Text Books:

1. Title Artificial Intelligence Author Elaine Rich, Kevin Knight and Shivashankar B Nair Publisher Tata McGraw Hill Edition 3rd Edition 2009

Reference Book:

1 Title Introduction to Artificial Intelligence and Expert Systems Author Dan W. Patterson Publisher Pearson Education Edition 1st Edition, 2015

2. Title Artificial Intelligence: A Modern Approach Author S. Russell and P. Norvig. Publisher Prentice Hall Edition 3rd Edition 2009

Course Outcomes [After undergoing the course, students will be able to:]

1. Understand the basic principles of AI towards problem solving and perception.
2. Understand the basic principles of Knowledge representation and inference.
3. Acquire basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
4. Experiment with a machine-learning model for simulation of intelligent systems in NLP systems and Planning Problems.
5. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural Networks and other machine learning models.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Web Technologies (Professional Elective-II)**	Course Code: **C022631(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I

Introduction to WWW: Protocols and programs, Internet Protocol -TCP/IP, UDP, HTTP, Secure Http(http), secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Domain Name Server and IP Addresses, dynamic IP

Web Design: Web site design principles, planning the site and navigation

UNIT-II

HTML: Planning for designing Web pages, Model and structure for a Website, Developing Websites, Basic HTML using images links, Lists, Tables and Forms, Frames for designing a good interactive website

CSS: Introduction Cascading Style Sheets: Syntax, Class Selector, Id Selector, External Style Sheets, Internal Style Sheets, Inline Style, the class selector, div & span tag, introduction to AJAX, ajax based web application

UNIT- III

JAVA SCRIPT: Programming Fundamentals, Statements, Expressions, Operators, Popup Boxes, Control Statements, Try…. Catch Statement, Throw Statement, and Objects of JavaScript: Date object, array object, Boolean object, math object

Advance Script:HTML DOM, inner HTML, Dynamic HTML (DHTML), DHTML form, forms and validations

UNIT-IV

XML & JSON: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to JSON, JSON syntax, Datatypes, objects and JSON parse

Ajax: Introduction, AJAX request, AJAX Response, AJAX XML File

UNIT-V

PHP: Starting to script on server side, Arrays, function and forms, advance PHP

Databases: Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

Text Books:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education
2. Web Warrior Guide to Web Design Technologies, Don Gosselin, Joel Sklar& others, Cengage Learning
3. Web Technologies, Black Book, DreamTech Press

Reference Books:

1. Web Technology and Design by Xavier, C, New Age International
2. HTML, DHTML, Java Script, Perl & CGI by Ivan Bayross, BPB Publication.
3. Internet and Web Design by Ramesh Bangia, New Age International
4. Web Technology: A developer perspective, Gopalan&Akilandeswari, PHI

Course Outcomes [After undergoing the course, students will be able to:

1. To design web sites utilizing multiple tools and techniques
2. To demonstrate the ability to create dynamic pages that are easy to navigate and easy to update
3. To utilize entry - level system analysis and design principles to solve business problems.
4. To demonstrate the ability to apply testing, debugging, and troubleshooting skills.

To exhibit the ability to design and implement an internet database.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Internet Of Things (Professional Elective – II)**	Course Code: **C022632(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 01 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

- To understand Concepts, design and characteristics of IoT.
- To understand Architecture of IoT.
- To understand basic protocols of IoTs.
- To understand challenges and applications of IoTs.
- To develop IoT applications using Tools.

Course Outcomes

- Students will familiar with the concepts of Internet of Things.
- Students will familiar with IoT Architecture
- Students will ready to Analyze basic protocols in wireless sensor network
- Students will be capable to design IoT applications in different domain and be able to analyze their performance
- Capable to implement basic IoT applications on embedded platform

Unit-I	**Introduction to Internet of Things:** Origin of Terminology IoT, Applications, Characteristics, Components of IoT, Associated technologies with IoT (M2M, Big Data, Cloud, Smart Grid, IoV, CPS, SDN, 3G/4G/5G), Challenges in IoT.
Unit-II	**Connectivity:** IoT Network Configurations, Gateway Prefix Allotment, IPv4, IPv6, IPv4 versus IPv6, RPL **Data Protocol:** MQTT, CoAP, AMQP, **Communication Protocols:** IEEE 802.15.4, ZWave, Bluetooth, ZigBee, 6LowPAN, HART and Wireless HART, NFC, RFID.
Unit-III	**Actuation:** Actuator, Actuator Types: Hydraulic Pneumatic, Electrical, Thermal/ Magnetic Mechanical, Soft Actuators, Shape memory polymer (SMP) **Types of Motor Actuators**: Servo motor, Stepper motor, Hydraulic motor, Solenoid Relay, AC motor **Sensing:** Definition, Types of sensors, Transducers, Sensors Classes
Unit-IV	**Introduction to Arduino Programming:** Operators in Arduino, Control Statement, Loops, Integration of Sensors and Actuators with Arduino. **Implementation of IoT**: Interoperability in IoT, Introduction to NodeMCU (ESP8266), Connectivity of Sensors and Actuators with NodeMCU, Introduction to Python programming, Introduction to Raspberry PI.
Unit-V	**Cloud Computing Fundamentals:** Recent Trends in Computing, Evolution of Cloud Computing, Evolution of Cloud Computing, Business Advantages, Components **Service Models:** Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) Infrastructure-as-a-Service (IaaS), Multi-cloud, Inter-cloud, Cloud Computing Service Management and Security, **Case studies:** Amazon Elastic Compute Cloud (EC2), Microsoft Azure.

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Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

Reference Book:

1. Internet of Things with Arduino Cookbook by Macro Schwart Published by Packt Publishing Ltd.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Soft Computing (Professional Elective – II)**	Course Code: **C022633(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 01 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

UNIT- I Introduction: Concept of computing systems. "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques.

UNIT-II Fuzzy logic : Introduction to Fuzzy logic. Fuzzy sets and membership functions. Operations on Fuzzy sets. Fuzzy relations, rules, propositions, implications and inferences. Defuzzification techniques. Fuzzy logic controller design. Some applications of Fuzzy logic.

Fuzzy rule base system : Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

UNIT- III Artificial Neural Networks: Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network. Perceptron: Perceptron training algorithm, Linear separability Introduction of MLP, different activation functions, Error back propagation algorithm, Applications of ANNs to solve some real life problems.

UNIT-IV Genetic Algorithms: Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator ,Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V Multi-objective Optimization Problem Solving: Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA). Non-Pareto approaches to solve MOOPs,Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

Text Books:
1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications,S.Rajasekaran, G. A. Vijayalakshami, PHI.
2. Neural Networks and Learning Machines, (3rd Edn.), Simon Haykin, PHI Learning, 2011.
3. Soft Computing, D. K. Pratihar, Narosa, 2008.

Reference Books :
1. Fuzzy Logic: A Pratical approach, F. Martin, , Mc neill, and Ellen Thro, AP Professional, 2000.
2. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.

Course Outcomes [After undergoing the course, students will be able to:]
1. Fuzzy logic and its applications.
2. Artificial neural networks and its applications.
3. Solving single-objective optimization problems using GAs.
4. Solving multi-objective optimization problems using Evolutionary algorithms (MOEAs).
5. Applications of Soft computing to solve problems in varieties of application domains.

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Network Programming (Professional Elective – II)**	Course Code: **C022634(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 01 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Unit- I Networking & TCP/IP: Communication protocols, Network architecture, UUCP, XNS, IPX/SPX for LANs, TCP & IP headers, IPv4 & v6 address structures, Programming Applications: Time & date routines, Internet protocols: Application layer, Transport layer, Network layer, Datalink layer protocols, Chat, Email, Web server working method & programming.

UNIT-II Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal &*fcntl* functions, socket implementation (client & server programs), UNIX domain protocols.

UNIT- III APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues.

UNIT- IV Web Programming & Security: Distributed System Design concept, RMI, Component technology, CGI programming PHP/PERL, Overview of JavaScript, Firewall & security technique, Cryptography, Digital Signature.

UNIT- V Client Server Programming: Java network programming, packages Client side programming: Creating sockets, implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server.

Text Books:-

1. UNIX Network Programming, Steven.W.R, PHI (VOL I& II)
2. Window Socket Programming by Bobb Quinn and Dave Schutes
3. TCP/IP Protocol Suite by Behrouz A. Forouzan

Reference Books :-

1. Windows Network Programming, Davis.R., Addison Wesley
2. Network Programming With Windows Socket By Baner .P., PH New Jersey.

Course Outcome: After successful completion of the course, students will be

1. Familiar with protocols, network interfaces, and Design/performance issues in local area networks and wide area networks,
2. Familiar with basics of Socket and Socket programming.
3. Familiar with contemporary issues in networking technologies,
4. Familiar with network tools and network programming.
5. Familiar with client server programming.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Software Engineering & Project Management (Laboratory)**	Course Code: **C022621(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

Note: The course pre-requisite for pursuing Software Development and Project Management Laboratory PHP/MySQL; which if not covered beforehand; students should be encouraged to undertake SPOKEN TUTORIAL COURSE on PHP (duration: 4 – 6 Weeks before pursuing this laboratory.

Course Objectives: The goal of this course is to teach and provide experience building software projects in service to real-time end-user beneficiaries. The laboratory is pursued in the following sequence of stages with due coordination with co-projectees in teams (of 3–4 students) and supervision of laboratory instructor upon which the project is graded accordingly:

1. Writing the complete problem statement.
2. Writing the Software Requirement Specification document.
3. Drawing the entity relationship diagram.
4. Drawing the data flow diagrams at level 0 and level 1.
5. Drawing use case diagram.
6. Drawing activity diagram of all use cases.
7. Drawing state chart diagram of all use cases.
8. Drawing sequence diagram of all use cases.
9. Drawing collaboration diagram of all use cases.
10. Assigning objects in sequence diagram to classes and make class diagram.
11. Performing system analysis on any of the selected modules designed above.

Each team can choose any one-project theme (around and similar to below stated List of Sample Project Themes, also not repeating with any other group and are expected to provide the above mentioned project deliverables.)

[Student Result Management System, Library management system, Inventory control system, Accounting system, Fast food billing system, Bank loan system, Blood bank system, Railway reservation system, Automatic teller machine, Video library management system, Hotel management system, Hostel management system, E-ticking, Share online trading, Hostel management system, Resource management system, Court case management system]

Once project deliverable sequence is decided, each team meets with its client to understand the requirements and priorities of the client, which starts the software development process, a process that continues until the end of the semester.

Guidelines for Perusal / Assessment of Software Development and Project Management Laboratory:

1. The students are free to choose any Technology or Tool like (C/C++/VB/Gambas/PhP/Core Java/Servlet/ JSP/ Python and alike) for developing their case study on selected Project Theme.
2. This course is a CI (communications intensive) course. The meetings with end-user client, project supervisor involve extensive communication and involves frequent coordination with team members in order to assign tasks and communicate questions, issues, and completions. Hence, 20% of total grade shall be evaluated on the meeting-conduction patterns by the project team.
3. Also, the project team is expected to submit duly filled and signed (phase-wise) project progress reports by the authorised signatories (as provided in Annexure I) with reference to their progress in ongoing project work till its completion within scheduled semester deadline.

4. The documentation of the project should begin after exhibiting targeted project deliverables only, duly checked by project supervisor.
5. The final documentation should be made with due guidance from project mentor or supervisor and should be submitted (in both soft and hard copy formats).
6. Before the Final Practical examinations, every individual student should submit his own hardcopy of the documentation in a PunchedCardboard File Only, with a CD containing the softcopy of the same.
7. During Final Submissions, every copy of the documentation should be accompanied by a Submission Certificate duly signed by signatory authorities (Project Supervisor &Head of Department)

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Define various software application domains and remember different process model used in software development.
2. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.
3. Convert the requirements model into the design model and demonstrate use of software and user-interface design principles.
4. Justify the role of SDLC in Software Project Development and evaluate importance of Software Engineering in PLC.
5. Generate project schedules, deliverables and construct, design and develop network diagram for different type of projects; also practising the activities of each phase.

Recommended Books:

6. Fundamentals of Software engineering - Rajib Mall.
7. Software design – From programming to architecture - Eric Braude

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Artificial Intelligence & Expert Systems Laboratory**	Course Code: **C022622(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Write a prolog program to find the rules for parent, child, male, female, son, daughter, brother, sister, uncle, aunt, ancestor given the facts about father and wife only.
2. Write a program to find the length of a given list
3. Write a program to find the last element of a given list
4. Write a program to delete the first occurrence and also all occurrences of a particular element in a given list.
5. Write a program to find union and intersection of two given sets represented as lists.
6. Write a program to read a list at a time and write a list at a time using the well defined read & write functions.
7. Write a program given the knowledge base,
   If x is on the top of y, y supports x.
   If x is above y and they are touching each other, x is on top of y.
   A cup is above a book. The cup is touching that book. Convert the following into wff's, clausal form; Is it possible to deduce that 'The book supports the cup'.
8. Write a program given the knowledge base,
   If Town x is connected to Town y by highway z and bikes are allowed on z, you can get to y from x by bike.
   If Town x is connected to y by z then y is also connected to x by z.
   If you can get to town q from p and also to town r from town q, you can get to town r from town p.
   Town A is connected to Town B by Road 1. Town B is connected to Town C by Road 2.
   Town A is connected to Town C by Road 3. Town D is connected to Town E by Road 4.
   Town D is connected to Town B by Road 5. Bikes are allowed on roads 3, 4, 5.
   Bikes are only either allowed on Road 1 or on Road 2 every day. Convert the following into wff's, clausal form
   and deduce that 'One can get to town B from town D'.
9. Solve the classical problems for demonstrating AI search heuristics: (Water Jug problem, Monkey Banana problem, Missionary Cannibals problem, Travelling Salesman Problem and alike).
10. Solve the classical Crypt arithmetic problems in AI: (DONALD + GERALD = ROBERT, CROSS + ROADS = DANGER, SEND + MORE = MONEY and alike).
11. Solve the classical Blocks World Problem demonstrating Planning Problem-solving simulation in AI.
12. Write a program to search any goal given an input graph using AO* algorithm.

List of Equipments/Machine required: PC with Wndows XP Operating System, Visual prolog compiler

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Acquire an overview of logic constructs for performing inferencing techniques. (First Order Predicate Calculus) in toy problems /classical problems using PROLOG / LISP syntax.
2. Gain confidence in drafting production rules (iterative / recursive) for an AI simulating code, given a story domain.
3. Understand, on how to use different data structures (lists, trees, stacks and queues) for solving routing problems and implementing heuristic searches.
4. Gain exposure to deal with situations that crop up syntax / compile-time / run-time errors.
5. Simulate game playing / puzzle problemsusing general solution in PROLOG / LISP syntax.

Recommended Books :

1. Ivan Bratko : Logic & prolog programming.
2. Carl Townsend : Introduction to Turbo Prolog, BPB, Publication.
3. W.F. Clocksin & Mellish : Programming in PRLOG, Narosa Publication House

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Web Technologies Laboratory(Professional Elective –II)**	Course Code: **C022623(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. To Develop and demonstrate a XHTML document that illustrates the use external style sheet, ordered list, table, borders, padding, color, and the tag.
2. To Develop and demonstrate a XHTML file that includes JavaScript script for the following problems: a) Input: A number n obtained using prompt, Output: The first n Fibonacci numbers b) Input: A number n obtained using prompt, Output: A table of numbers from 1 to n and their squares using alert
3. To Develop and demonstrate a XHTML file that includes Javascript script that uses functions for the following problems: a) Parameter: A string, Output: The position in the string of the left-most vowel b) Parameter: A number, Output: The number with its digits in the reverse order
4. To Develop and demonstrate, using Javascript script, a XHTML document that collects the RollNo (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed- e.g. 1AB23CD356, 1GC13CS345) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
5. To Modify the above program to get the current semester also (restricted to be a number from 1 to 8)
6. To Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
7. To Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom
8. To Design an XML document to store information about a student in an engineering college affiliated to CSVTU. The information must include RollNo, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 5 students. Create a CSS style sheet and use it to display the document.
9. To Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.
10. Write an application in php that contains a textbox in which the user has to enter a name and a textarea in which the user has to enter his comments. When the Submit is clicked, the output should display the name entered in the textbox and the user-selection from the listbox. All the above should be displayed with the tracing for the page being enabled
11. Create a simple Web Service that converts the temperature from Fahrenheit to Celsius, and vice versa create a simple Web Service that converts the temperature from Fahrenheit to Celsius, and vice versa. Also write anphp program to consume this web service.
12.
    a) Write a Program in php that has a form taking the user s name as input. Store this name in a permanent cookie & whenever the page is opened again, then value of the name field should be attached with the cookie s content
    b) Write a Program to delete all cookies of your web site that has created on the clients computer
13. (Form Validation)
    a) Write a HTML file to create a simple form with 5 input fieldsviz. Name, Password, Email, Pincode, Phone No. and a Submit button
    b) Write a PHP program to demonstrate required field validations to validate that all input fields are required
    c) Write a PHP program to validate Name, Email and Password
    d) Write a PHP program to display error messages if the above validations do not hold.

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14. (File Handling)
    a) Create a PHP program to demonstrate opening and closing a file
    b) Create a PHP program to demonstrate reading a file
    c) Create a PHP program to demonstrate writing in a file.
15. Create a PHP program to read the following text from a file csvtu.txt "Chhattisgarh Swami Vivekanand Technical University, Bhilai " And write to another file learningphp.txt.

Recommended Books:

1. HTML Complete Reference- Tata McGraw hill 2. HTML and XML: An Introduction NIIT, Prentice-Hall of Indi
2. Head first PHP & My SQL – Lynn Beighley, Michael Morrison
3. PHP Cook Book0 David Sklar, Shroff Publish

Course Outcomes [After undergoing the course, students will be able to:]

1. Build and learn web development technologies.
2. Analyze a web page and identify its elements and attributes.
3. Build career in professional web site designing with good aesthetic sense of designing.
4. Have a Good grounding of back-end scripting.
5. Pursue their research-oriented career in the relevant and allied domains.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Internet of Things Laboratory (Professional Elective –II)**	Course Code: **C022624(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

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List of Experiments: (Each student should perform, at least, 10 experiments.)

Note: Students need to perform at least 10 experiments. Use of sensors and actuators are not restricted as provided. Student may use any other components also.

1. Introduction to various sensors and actuators.
    a) PIR Motion Sensor.
    b) Rain Drop Sensor.
    c) Moisture Sensor.
    d) Temperature Sensor.
    e) Touch Sensor.
    f) Infrared Sensor.
    g) RFID Sensor.
    h) Ultrasonic Sensor.
    i) Bluetooth Module.
    j) Wi-Fi Module.
    k) LED/OLED
    l) Servo Motor.
2. Acquaintance with Arduino /Raspberry Pi/Node MCU and perform essential programming establishment.
3. Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
4. Connect LED/Buzzer with Arduino/Raspberry Pi and compose a program to turn ON LED for 1 sec later at regular intervals.
5. Connect Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and compose a program to turn ON LED when press button is squeezed or sensor activates.
6. Interact with DHT11 sensor with Arduino/Raspberry Pi and compose a program to print temperature and humidity readings on screen.
7. Connect engine utilizing hand-off with Arduino/Raspberry Pi and compose a program to turn ON engine when push button is squeezed.
8. Communicate OLED with Arduino/Raspberry Pi and compose a program to print temperature and moistness readings on it.
9. Communicate Bluetooth with Arduino/Raspberry Pi and compose a program to send sensor information to cell phone utilizing Bluetooth.
10. Connect Bluetooth with Arduino/Raspberry Pi and compose a program to turn LEDON/OFF when '1'/'0' issent from cell phone utilizing Bluetooth.
11. Compose a program on Arduino/Raspberry Pi to transfer temperature and stickiness information to thing speak cloud.
12. Compose a program on Arduino/Raspberry Pi to recover temperature and moistness information from thing speak cloud.
13. Getting Started and working with ESP8266 Wi-Fi to control devices from mobile.
14. Creating a webpage and display the values received from sensors through Arduino.
15. Study of other IoT Boards and components available.(Student Activity).

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Recommended Books:

1. Vijay Madisetti, ArshdeepBahga, Ïnternet of Things, "A Hands on Approach", University Press

2. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs

3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press Laboratory Outcomes

[After undergoing the course, students will be able to:]

1. Describe what IoT is and how it works today
2. Recognize the factors that contributed to the emergence of IoT, Design and program IoT devices
3. Use real IoT protocols for communication, secure the elements of an IoT device
4. Design an IoT device to work with a Cloud Computing infrastructure
5. Transfer IoT data to the cloud and in between cloud providers

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Subject: **Soft Computing Laboratory(Professional Elective –II)**	Course Code: **C022625(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Writing programs using basic scalar Data types and user input output operations.
2. Writing programs creating various vectors and basic operations on vector types.
3. Writing programs creating Matrices and basic operations on matrix types.
4. Plotting 1D AND 2D Data Sets in MATLAB.
5. Plotting and configure various charts/Figures.
6. Problem–Solving using Linear System Equations.
7. Solving Quadratic Equations in MATLAB.
8. Solving Polynomial equations in MATLAB.
9. Working with User Defined Function.
10. Working with Control Structures and Recursion.
11. Design Neural Network Simulation for the following problem solving:
    a. Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.
    b. Create a simple ADALINE network with appropriate no. of input and output nodes.Train it using delta learning rule until no change in weights is required. Output the final weights.
    c. Train the autocorrelator by given patterns: A1=(-1,1,-1,1), A2=(1,1,1,-1), A3=(-1, -1, - 1, 1). Test it using patterns: Ax=(-1,1,-1,1), Ay=(1,1,1,1), Az=(-1,-1,-1,-1).
    d. Train the hetrocorrelator using multiple training encoding strategy for given patterns: A1=(000111001) B1=(010000111), A2=(111001110) B2=(100000001), A3=(110110101) B3(101001010).
12. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform maxmin composition on any two fuzzy relations.
13. Implementing simulations using Fuzzy Tool Box.
14. Implementing simulations using GA Tool Box.
15. Solving Real world Toy Projects in MATLAB.

List of Equipment / Machine Required:MATLAB / SciLAB / OCTAVE

Recommended Books:

1. Python Data Analytics– Fabio Nelli, APress.
2. Python for Data Analysis, Wes McKinney, O'Reilly.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Use various data structures available in Python.
2. Apply the concepts of Data Analysis.
3. Apply the use of Numpy Library for performing various data processing activities.
4. Apply the use of Pandas library for data handling activities.
5. Apply the use of Matplotlib for data visualization activities.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Network Programming Laboratory(Professional Elective –II)**	Course Code: **C022626(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Implementation of Fork and EXEC in Unix environment.
2. Implementation of signal handling in Unix environment.
3. Implementation of pthread in Unix environment
4. Write an echo program with client and iterative server using TCP.
5. Write an echo program with client and concurrent server using TCP.
6. Write an echo program with client and concurrent server using UDP.
7. Write a program to retrieve date and time using TCP.
8. Write a program to retrieve date and time using UDP.
9. Write a client and server routines showing I/O multiplexing.
10. Write an echo client and server program using Unix domain stream socket.
11. Write an echo client and server program using Unix domain Datagram socket.
12. Write a client and server program to implement file transfer.
13. Write a client and server program to implement the remote command execution.
14. Write a client program that gets a number from the user and sends the number to server for conversion into hexadecimal and gets the result from the server.
15. Write a program for extracting information from URL.

List of Equipment / Machine Required:

1. Unix/Ubuntu/Linux
2. JDK

Recommended Books:

1. Steven.W.R: UNIX Network Programming, (Vol. I & II), PHI.
2. Reference Book 2: Java: The Complete Reference by SCHILDT and HERBERT, McGraw Hill.

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Create multiple processes and implement inter-process communication methods in Unix environment.
2. Develop Client Server Based application using TCP/UDP.
3. Implement I/O Multiplexing mechanism to handle multiple i/o operation.
4. Analyze URL Data and Information.
5. Design protocol for data communication

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VI)**	Branch: **Computer Science &Engineering**
Subject: **Android Application Laboratory**	Course Code: **C022611(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credit(s): 1

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Download and setup Android Environment
2. Using the Development environment
    a) Create a new Project using wizard
    b) Add source and resource files.
    c) Import existing projects into workspace
    d) Create testing Emulator
    e) Compile and run the project
    f) Debug the project
    g) Debug on android device.
3. XML Files
    a. AndroidManifest.xml
        i. Edit the manifest and change min sdk and target sdk of application.
        ii. Add main activity entries in manifest.
        iii. Add second activity entries in manifest.
        iv. Add Entries for Service, Broadcast receivers.
        v. Add uses permissions for reading files, internet, camera.
    b. Layouts
        i. Create Linear Layout in xml
        ii. Create Relative Layout in xml
        iii. Create frame layout in xml
        iv. Create a complex mixed layout using all above layouts
    c. Drawables
        i. Create xml drawable for rectangular, oval and other basic shapes
        ii. Create xml drawable with Layer list for complex shapes.
    d. Values
        i. Create strings.xml to store all your application strings.
        ii. Create color.xml to store all your color values
        iii. Create styles.xml to store all your custom themes and style objects
    e. Alternate resources based on qualifiers
        i. Create separate draw tables folders and xml files based on screen density (LDPI, MDPI, HDPI, XHDPI, XXHDPI)
        ii. Create separate styles.xml based on different android versions.
        iii. Create separate layout folders based on device screen sizes and orientations.
4. Creating User Interface
    a. Create application with Basic Views (Textview, Button, ListView)
    b. Create application with different Layouts (Linear, Relative, Frame)
    c. Create application to handle and respond on click using Click Listeners
5. Assets and Images
    a. Create application which will access files from Assets folder (Images, sounds, Custom Fonts)
6. Application Fundamentals
    a. Activities
        i. Create application with one activity and display a layout created in xml.
        ii. Create application which will log all activity lifecycle events using Android log api.
        iii. Create application which should be Saving and restoring app state (eg textview text, checkbox checked state)
    b. Intents
        i. Create application which will start another activity using intent.
        ii. Create an activity which will pass data to second activity using intent.
        iii. Create activity which will start second activity and get response back from second activity.
    c. Services

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7. Content Providers
    a. System provided content providers
        i. Create application which can access/modify Contacts of device.
        ii. Create application which can access & display Images available on device.
        iii. Create application which can access and play Media files (Audio & Video)
    b. Custom Contact providers
        i. Create application which will provide some data to other applications using ContentProvider system.
8. Broadcast Receivers
    a. Create application to Listen to following system events using Receivers
        i. Incoming SMS
        ii. In and outgoing Phone Call
        iii. Low Battery & Storage state changed
    b. Create application which will broadcast Custom event to custom Receivers.
9. Create application which will display following Notifications
    a. Toast notification
    b. Status bar notification
    c. Dialog notification
10. Preference & Data Storage
    a. Create application which will save and read back data using Shared Preference
    b. SQLite database
        i. Create app to create database using Open helper
        ii. Create app to read, write and delete database entries
11. Networking & Web API
    a. HTTP connectivity
        i. Create app to connect and fetch data from a Http server/ website using URLConnection
        ii. Create app to connect and fetch data from a Http server/ website using HTTPClient library
        iii. Create app to connect and post data to Http server/ website using URLConnection
        iv. Create app to connect and post data to Http server/ website using HTTPClient library
    b. TCP Sockets or Sockets
        i. Create a server app using tcp socket, it will send "Welcome" to client when its connected.
        ii. Create a client app using tcp socket, it will send "Hello" to server once connected.
12. Google API
    a. Create application using Maps api, it should display marker on current location of user
    b. Create application which will display ads using Admob api
13. Accessing android hardware
    a. Create Application to take picture and save it to file storage using camera api
    b. Create application to display current direction using sensor api
    c. Create application to show a toast if phone is waved in air.
    d. Create application to show list of paired and nearby bluetooth devices.
14. Facebook SDK
    a. Create application which can share link on facebook using Facebook sdk.
    b. Create application which can share photo on facebook using Facebook sdk.
15. Publish to playstore
    a. Enable Obfuscation for your application using Proguard
    b. Export Signed application package
    c. Prepare Store listing
    d. Upload and publish apk

Recommended Books:

1. Head First Android- By Jonathan Simon

Laboratory Outcomes [After undergoing the course, students will be able to:]

1. Understand basic concepts and technique of developing applications for the Android phone.
2. Able to use the SDK and other development tools.
3. Acquire to know, how to publish Android applications to the Android Market.

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Program / Semester: **B.Tech (VI)**	Branch: **Humanities**
Subject: **Technical Communication & Soft Skills**	Course Code: **C000601(046)**
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication&writing CVs, Cover Letters for correspondence.Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting.On Saying "Please", How to say "NO".

UNIT-5Positive Pschycology: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger**,** Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman& Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three "As" of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Machine Learning**	Course Code: **D022711(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

1. To introduce the basic concepts of Machine Learning.
2. To introduce the concepts of Data Analysis in Machine Learning.
3. To introduce the concepts of Machine Learning algorithms.
4. To introduce the concepts related to Machine Learning model diagnosis and tuning.
5. To introduce the concepts related to Artificial Neural Networks.

UNIT- I Introduction: History and Evolution, Machine Learning Categories: Supervised Learning, Unsupervised Learning, Reinforcement Learning. Knowledge Discovery in Databases, SEMMA (Sample, Explore, Modify, Model, Assess).

UNIT-II Machine Learning Perspective of Data: Scales of Measurement, Dealing with Missing Data, Handling Categorical Data, Normalizing Data, Feature Construction or Generation. Correlation and Causation, Polynomial Regression, Logistic Regression, ROC Curve.

UNIT- III Introduction to Machine Learning Algorithms: Decision Trees, Support Vector Machine, k-Nearest Neighbors, Time-Series Forecasting, Clustering, Principal Component Analysis (PCA).

UNIT-IV Model Diagnosis and Tuning: Bias and Variance, K-Fold Cross Validation, Bagging, RandomForest, Gradient Boosting, Stacking.

UNIT-V Artificial Neural Network (ANN): Perceptron—Single Artificial Neuron, Multilayer Perceptrons (Feedforward Neural Network), Restricted Boltzman Machines (RBMs).

Text Books:

1. Mastering Machine Learning with Python in Six Steps– Manohar Swamynathan, APress.
2. Python Machine Learning for Beginners, M. Usman Malik, AI Publishing.

Reference Books:

1. Introduction to Machine Learning with Python, Daniel Nedal& Peters Morgan, AI Sciences
2. Data Structures and Algorithms Using Python, Rance D. Necaise, WILEY

Course Outcomes [After undergoing the course, students will be able to:]

1. Remember the basic concepts of Machine Learning.
2. Able to perform Data Analysis in Machine Learning.
3. Remember the Machine Learning algorithms.
4. Able to perform Machine Learning model diagnosis and tuning.
5. Apply the concept of Artificial Neural Networks.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Data mining and Warehousing**	Course Code: **D022712(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

1. To understand the overall architecture of a data warehouse.
2. The different data mining models and techniques will be discussed in this course.
3. Evaluate different models used for OLAP and data pre-processing;
4. Design and implement systems for data mining and evaluate the performance of different data mining algorithms;
5. Propose data mining solutions for different applications.
6. Differentiate Online Transaction Processing and Online Analytical processing

UNIT-I Overview and Concepts: Need for data warehousing, basic elements of data warehousing, Trends in data ware housing. Planning and Requirements: Project planning and management, Collecting the requirements. Architecture And Infrastructure: Architectural components, Infrastructure and metadata.

UNIT-II Data Design and Data Representation: Principles of dimensional modelling, Dimensional modelling advanced topics, data extraction, transformation and loading, data quality

UNIT-III Information Access and Delivery: Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web. Implementation And Maintenance: Physical design process, data warehouse deployment, growth and maintenance.

UNIT-IV Data Mining: Introduction: Basics of data mining, related concepts, Data mining techniques Data Mining Algorithms: Classification, Clustering, Association rules. Knowledge Discovery: KDD Process.

UNIT-V Web Mining: Web Content Mining, Web Structure Mining, Web Usage mining. Advanced Topics: Spatial mining, Temporal mining. Visualization : Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining descriptive statistical measures in large databases Data Mining Primitives, Languages, and System Architectures: Data mining Primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems Application and Trends in Data Mining: Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining.

Text Books:

1. Data warehousing- concepts, Techniques, Products and Applications by Prabhu, Prentice hall of India
2. Insight into Data Mining: Theory & Practice by Soman K P, Prentice hall of India.
3. Data Mining Introductory and Advanced Topics by M.H. Dunham, Pearson Education.

Reference Books:

1. Data Warehousing Fundamentals by PaulrajPonniah, John Wiley.
2. Introduction to Data mining with Case Studies by Gupta, PHI.
3. The Data Warehouse Lifecycle toolkit by Ralph Kimball, John Wiley.
4. Introduction to Building the Data warehouse, IBM, PHI.

Course Outcome: After successful completion of this course students will be able to

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1. Design a data warehouse for an organization
2. Develop skills to write queries using DMQL
3. Extract knowledge using data mining techniques
4. Adapt to new data mining tools.
5. Explore recent trends in data mining such as web mining, spatial-temporal mining.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Internet and Web Technology**	Course Code: **D022713(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

1. Describe the important features of the Web and Web browser software
2. Evaluate e-mail software and Web-based e-mail services
3. Use FTP and other services to transfer and store data
4. Demonstrate the use of real-time chat and briefly describe the history of the wireless Internet
5. Create HTML documents and enhance them with browser extensions

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UNIT-I INTRODUCTION TO INTERNET: Introduction, Evolution of Internet, Internet Applications, Internet Protocol -TCP/IP, UDP, HTTP, Secure Http(Shttp) Internet Addressing – Addressing Scheme – Ipv4 & IPv6, Network Byte Order, Domain Name Server and IP Addresses, Mapping . Internet Service Providers, Types Of Connectivity Such As Dial-Up Leaded Vsat Etc. Web Technologies: ThreeTier Web Based Architecture; Jsp, Asp, J2ee, .Net Systems

UNIT-II HTML CSS AND SCRIPTING: HTML - Introduction, Sgml, Dtd(Document Type Definition, Basic Html Elements, Tags and usages, HTML Standards , Issues in HTML Dhtml: Introduction Cascading Style Sheets: Syntax ,Class Selector, Id Selector Dom (Document ObjectModel) &Dso (Data Source Object) Approaches To Dynamic Pages: Cgi, Java Applets, Plug Ins, Active X, Java Script –Java Script Object Model, Variables-Constant – Expressions, Conditions-Relational Operators- Data Types – FlowControl – Functions & Objects-events and event handlers – Data type Conversion & Equality – Accessing HTML form elements

UNIT-III XML: What is XML – Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents &Data ,DefiningAttributes & Entities in the DTD ,Defining Parameter Entities & conditional Sections, Resolving a naming conflict, UsingNamespaces, Designing an XML data structure, Normalizing Data, Normalizing
DTDS

UNIT-IV INTERNET SECURITY & FIREWALLS: Security Threats From Mobile Codes, Types Of Viruses, Client Server Security Threats, Data & Message Security, Various electronic payment systems, Introduction to EDI, Challenges–Response System, Encrypted Documents And Emails,Firewalls: Hardened Firewall Hosts, Ip- Packet Screening, Proxy Application Gateways, Aaa (Authentication, AuthorizationAnd Accounting).

UNIT-V WEBSITE PLANNING & HOSTING: Introduction, Web Page Lay-Outing, Where To Host Site, Maintenance Of Site, Registration Of Site On Search Engines And Indexes, Introduction To File Transfer Protocol, Public Domain Software, Types Of Ftp Servers (Including Anonymous),Ftp Clients Common Command. Telnet Protocol, Server Domain, Telnet Client, Terminal Emulation. Usenet And Internet Relay Chat

Text Books:

1. Internet & Intranet Engineering,- Daniel Minoli, TMH.
2. Alexis Leon and Mathews Leon – Internet for Every One, Tech World.

Reference Books:

1. Eric Ladd, Jim O'Donnel–"Using HTML 4, XML and JAVA"-Prentice Hall of India -1999.
2. "Beginning Java Script "– Paul Wilton – SPD Publications –2001.
3. Frontiers of Electronics of Commerce, Ravi kalakota& Andrew B. Whinston Addison Wesley

Course Outcomes [After undergoing the course, students will be able to:]

1. Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, and web applications
2. Analyze a web page and identify its elements and attributes.
3. Create XML documents and XML Schema

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Parallel and Distributed Algorithms** (Professional Elective III)	Course Code: **D022731(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 1 T: 1 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Parallel Algorithms

Unit-I: Introduction Parallel Programming Models: Shared-memory model (PRAM, MIMD, SIMD), network model (line, ring, mesh, hypercube), performance measurement of parallel algorithms.

Unit-II Algorithm Design Techniques for PRAM Models: Balancing, divide and conquer, parallel prefix computation, pointer jumping, symmetry breaking, pipelining, accelerated cascading. Algorithms for PRAM Models: Parallel Reduction, Prefix Sums, List ranking, sorting and searching, tree algorithms, graph algorithms, string algorithms.

Unit-III Algorithms for Network Models: Matrix algorithms, sorting, graph algorithms, routing, Relationship with PRAM models. Parallel Complexity: Lower bounds for PRAM models, the complexity class NC, P-completeness.

Distributed Algorithms

Unit-IV Basic concepts. Models of computation: shared memory and message passing systems, synchronous and asynchronous systems. Logical time and event ordering. Global state and snapshot algorithms, clock synchronization. Distributed Operating Systems: Mutual exclusion, deadlock detection

Unit-V Classical Algorithms: Leader election, termination detection, distributed graph algorithms. Fault tolerance and recovery: basic concepts, fault models, agreement problems and its applications, commit protocols, voting protocols, check-pointing and recovery, reliable communication. Security and Authentication: basic concepts, Kerberos. Resource sharing and load balancing.

Text Books:

1. Joseph F Jájá, An Introduction to Parallel Algorithms, Addison-Wesley, 1992.
2. Joseph Jaja, An Introduction to Parallel Algorithms, Addison Wesley
3. Mukesh Singhal and Niranjan Shivaratri, Advanced Concepts in Operating Systems, McGraw-Hill.

Reference Books:

1. Michael J Quinn, Parallel Computing: Theory and Practice, second edition, McGraw Hill, 1994/2002.
2. Michael J Quinn, Parallel Programming in C with MPI and OpenMP, first edition, McGraw Hill, 2004/2003.
3. AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, Introduction to Parallel Computing, second edition, Addison-Wesley/Pearson, 1994/2003.
4. Nancy Lynch, Distributed Algorithms, Morgan Kaufmann.
5. Andrew S. Tanenbaum, Distributed Operating Systems, ACM Press.
6. Jie Wu, Distributed Systems, CRC Press.
7. HagitAttiya, Jennifer Welch, Distributed Computing: Fundamentals, Simulations and Advanced Topics, McGraw-Hill.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Cyber Security**	Course Code:
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 1 T: 1 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

1. To Create cyber security awareness and to understand principles of web security
2. To understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
3. To make attentive to students about possible hacking and threats in this communication era.
4. Discuss Issues for creating Security Policy for a Large Organization.

Unit – 1 Cyber Security Fundamentals: Security Concepts: Authentication, Authorization, Non-repudiation, Confidentiality, Integrity, availability. CyberCrimes and Criminals: Definition of cyber-crime, types of cyber-crimes and types of cyber-criminals.

Unit – 2Cyber attacker Techniques and Motivations: Anti-forensics: Use of proxies, use of tunneling techniques. Fraud techniques: Phishing and malicious mobile code, Rogue antivirus, Click fraud. Threat Infrastructure: Botnets, Fast Flux and advanced fast flux.

Unit – 3 Exploitation: Techniques to gain foothold: Shellcode, Buffer overflows, SQL Injection, Race Conditions, DoS Conditions, Brute force and dictionary attacks. Misdirection, Reconnaissance, and DisruptionMethods: Cross-Site Scripting (XSS), Social Engineering, WarXing, DNS Amplification Attacks.

Unit – 4 Information Technology Act 2000: Overview of IT Act 2000, Amendments and Limitations of IT Act, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offenses, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit – 5 Cyber Law and Related Legislation: Patent Law, Trademark Law, Copyright, Software Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code,Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution, Online Dispute Resolution (ODR).

Text Books:

1. Cyber Security Essentials, James Graham et al. CRC Press
2. Cyber Laws: Intellectual property & E Commerce Security, Kumar K. Dominant Publisher

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Reference Books:

1. Cyber Law Text & Cases, Gerald R. Ferrera, Margo E. K. Reder, CENGAGE LEARNING Publication.
2. Ethics in Information Technology, George W. Reynolds, CENGAGE LEARNING Publication.
3. Cyber Laws & IT Protection, Harish Chander, PHI Publication.
4. Ross J. Anderson. Security Engineering: A Guide to Building Dependable Distributed Systems. John Wiley, New York, NY, 2001.
5. Matt Bishop. Computer Security: Art and Science. Addison Wesley, Boston, MA, 2003.
6. Frank Stajano. Security for Ubiquitous Computing. John Wiley, 2002.

Course Outcomes [After undergoing the course, students will be able to:]

1. Students will be able to acknowledge about the cybercrime, cyber criminal, and intellectual property rights.
2. Encouraging Open Standards.
3. Protection and resilience of Critical Information Infrastructure.
4. To enable effective prevention, investigation and prosecution of cybercrime and enhancement of law enforcement capabilities through appropriate legislative intervention.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Quantum Computing**	Course Code: **D022733(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 1 T: 1 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithms.

UNIT-1 Introduction to Quantum Computing: Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.),Origin of Quantum Computing. Overview of major concepts in Quantum Computing:Qubits and multi-qubits states, Bra-ket notation,Bloch Sphere representation,Quantum Superposition,Quantum Entanglement

UNIT-2 Math Foundation for Quantum Computing Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-3Building Blocks for Quantum Program Architecture of a Quantum Computing platform. Details of q-bit system of information representation: Block Sphere,Multi-qubits States,Quantum superposition of qubits (valid and invalid superposition),Quantum Entanglement,Useful states from quantum algorithmic perceptive
e.g. Bell State , Operation on qubits: Measuring and transforming using gates,Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc.

UNIT-4Programming model for a Quantum Computing Program: Steps performed on classical computer,Steps performed on Quantum Computer,Moving data between bits and qubits.

UNIT-5Quantum Algorithms: Basic techniques exploited by quantum algorithms.: Amplitude amplification,Quantum Fourier Transform,Phase Kick-back,Quantum Phase estimation,Quantum Walks,Major Algorithms:Shor's Algorithm,Grover's Algorithm,Deutsch's Algorithm,Deutsch -Jozsa Algorithm. OSS Toolkits for implementing Quantum program:IBM quantum experience Microsoft Q ,RigettiPyQuil (QPU/QVM)

List of Suggested Books:

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", CambridgeUniversity Press.
2. David McMahon, "Quantum Computing Explained", Wiley

Course Outcomes [After undergoing the course, students will be able to:]

1. Explain the working of a Quantum Computing program, its architecture and program model
2. Develop quantum logic gate circuits
3. Develop quantum algorithm
4. Program quantum algorithm on major toolkits

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Distributed Systems**	Course Code: **D022734(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 1 T: 1 P: 0 Credits: 2
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

1. Familiarize the students with the basics of distributed computing systems.
2. To introduce the concepts of distributed file systems, shared memory and message passing systems, synchronization and resource management.

Unit I: INTRODUCTION

Definition – Evolution- Goals of distributed systems, system models- Issues in the design of distributed systems-Distributed com-puting environment.

Unit II: COMMUNICATION

Message Passing – Features and Issues -Synchronization-Buffering – Process Addressing – Failure Handling – Remote procedure call (RPC): Model – Implementation – Stub generation – RPC messages – Marshaling – server Management – Call semantics – communication protocols for RPC-Client server binding – RMI.

Unit III: DISTRIBUTED SHARED MEMORY

Distributed shared memory- Design and implementation issues- Sequential consistency – Release consistency, Process migration Features & Mechanism

Unit IV: SYNCHRONIZATION

Synchronizing physical clocks – Logical clocks – Distributed coordination – Event Ordering – Mutual Exclusion – Deadlock – Elec-tion algorithms.

Unit V: DISTRIBUTED FILE SYSTEMS

Introduction – File Models – File accessing, sharing and caching – File Replication – Atomic transactions Case Study HADOOP. : Resource and process management – Task assignment approach – Load balancing approach – Load sharing approach

Text Books:

1. George Colouris, Jean Dollimore and Tim Kindberg, "Distributed Systems – Concepts and Design", Pearson Education Private Limited, New Delhi, 2001
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, New Delhi, 2003.

Reference Books:

1. Gerard Tel, "Introduction to Distributed algorithms", Cambridge University Press, USA, 2000.
2. Andrzej Goscinski, "Distributed Operating Systems, the logical Design", Addison Wesley Publishing Company, USA, 1991.
3. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, New Delhi, 1999.
4. Patrick Naughton and Herbert Schildt, "Java 2- The Complete Reference", Tata McGraw Hill, New Delhi, 2007.

Course Outcomes [After undergoing the course, students will be able to:]

1. Verify and analyze the time complexity of the algorithms related to distributed computing.
2. Design and develop various algorithms for problems in distributed computing
3. Compare various resource allocation stratagies.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Distributing System**	Course Code: **D022734(022)**
Total / Minimum-Pass Marks(End Semester Exam):**100 / 35**	L: 3 T: 1 P: 0 Credits: 4
Class Tests & Assignments to be conducted: 2 each	Duration (End Semester Exam): **03 Hours**

Course Objectives

3. Familiarize the students with the basics of distributed computing systems.
4. To introduce the concepts of distributed file systems, shared memory and message passing systems, synchronization and resource management.

Unit I: INTRODUCTION

Definition – Evolution- Goals of distributed systems, system models- Issues in the design of distributed systems- Distributed com-puting environment.

Unit II: COMMUNICATION

Message Passing – Features and Issues -Synchronization-Buffering – Process Addressing – Failure Handling – Remote procedure call (RPC): Model – Implementation – Stub generation – RPC messages – Marshaling – server Management – Call semantics – communication protocols for RPC-Client server binding – RMI.

Unit III: DISTRIBUTED SHARED MEMORY

Distributed shared memory- Design and implementation issues- Sequential consistency – Release consistency, Process migration Features & Mechanism

Unit IV: SYNCHRONIZATION

Synchronizing physical clocks – Logical clocks – Distributed coordination – Event Ordering – Mutual Exclusion – Deadlock – Elec-tion algorithms.

Unit V: DISTRIBUTED FILE SYSTEMS

Introduction – File Models – File accessing, sharing and caching – File Replication – Atomic transactions Case Study HADOOP. : Resource and process management – Task assignment approach – Load balancing approach – Load sharing approach

Text Books:

3. George Colouris, Jean Dollimore and Tim Kindberg, "Distributed Systems – Concepts and Design", Pearson Education Private Limited, New Delhi, 2001
4. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, New Delhi, 2003.

Reference Books:

5. Gerard Tel, "Introduction to Distributed algorithms", Cambridge University Press, USA, 2000.
6. Andrzej Goscinski, "Distributed Operating Systems, the logical Design", Addison Wesley Publishing Company, USA, 1991.
7. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, New Delhi, 1999.
8. Patrick Naughton and Herbert Schildt, "Java 2- The Complete Reference", Tata McGraw Hill, New Delhi, 2007.

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Course Outcomes [After undergoing the course, students will be able to:]

1. Verify and analyze the time complexity of the algorithms related to distributed computing.
2. Design and develop various algorithms for problems in distributed computing
3. Compare various resource allocation stratagies.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Machine Learning Lab**	Course Code: **D022721(022)**
Total / Minimum-Pass Marks(End Semester Exam):**40 / 20**	L: 0 T: 0 P: 2 Credits: 1

Course Objectives

1. To be able to use Numpy along with Matplotlib for visual representation of data.
2. To be able to create a Supervised Learning models in Python.
3. To be able to create an Un-Supervised Learning models in Python.
4. To be able to implement Artificial Neural Network in Python.

1. Write programs to understand the use of Matplotlib for Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy.
2. Write programs to understand the use of Matplotlib for Working with Multiple Figures and Axes, Adding Text, Adding a Grid and Adding a Legend.
3. Write programs to understand the use of Matplotlib for Working with Line Chart, Histogram, Bar Chart, Pie Charts.
4. Write a program in Python to implement Linear Regression for house price prediction. (Data Source: https://forge.scilab.org/index.php/p/rdataset/source/file/master/csv/MASS/Boston).
5. Write a program in Python to implement K Nearest Neighbor classifier for diabetes classification. (Data Source: https://www.kaggle.com/uciml/pima-indians-diabetes-database/data).
6. Build a Naive Bayes model in Python totackle a spam classification problem. (Data Source: (https://www.kaggle.com/uciml/sms-spam-collectiondataset/downloads/spam.csv/1).
7. Write a Python code to tackle a multi-class classification problem where the challenge is to classify wine into three types using Decision Tree.(DataSource: https://gist.github.com/tijptjik/9408623/archive/b237fa5848349a14a14e5d4107dc7897c21951f5.zip).
8. Write a program in Python to implement Support Vector Machine for diabetes classification. (Data Source: https://www.kaggle.com/uciml/pima-indians-diabetes-database/data).
9. Demonstrate the application of Artificial Neural Network using Python.

Recommended Books:

1. Hands On MachineLearning With Python– John Anderson, AI Sciences LLC.
2. Python for Data Analysis, Wes McKinney, O'Reilly.

Course Outcomes [After undergoing the course, students will be able to:]

1. ApplyNumpy along with Matplotlib for visual analysis of data.
2. Apply Supervised Learning models for problem solving.
3. Apply Un-Supervised Learning models for problem solving.
4. Apply Artificial Neural Network for problem solving.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Internet and Web Technology Lab**	Course Code: **D022722(022)**
Total / Minimum-Pass Marks(End Semester Exam):**40 / 20**	L: 0 T: 0 P: 2 Credits: 1

CourseObjectives:

- Theobjectiveofthislabistodevelopanability todesignandimplementstaticanddynamicwebsite
- Tolearnhowtocreateasimple&advancedwebpageusinghtmlalongwiththeusageofstylesheets,lists,creation or tables with borders, paddingand colors.
- TogetacquaintedwithJavaScriptproceduresandusageofregularexpressionsinJavaScript.

Expt-1: Develop and demonstrate a XHTML document that illustrates the use external style sheet, ordered list, table,borders,padding, color, and the <span> tag.

Expt-2: DevelopanddemonstrateaXHTMLfilethatincludesJavascriptforthefollowingproblems:

a) Input:Anumber *n* obtainedusingprompt
   Output:Thefirst *n* Fibonacci numbers
b) Input:Anumber *n* obtainedusingprompt
   Output:A tableofnumbers from1to *n* andtheir squaresusing alert

Expt-3: DevelopanddemonstrateaXHTMLfilethatincludesJavaScriptscriptthatusesfunctionsforthefollowingproblems:

a) Parameter:A string
   Output:Thepositioninthestringoftheleft-mostvowel
b) Parameter:Anumber
   Output:Thenumberwith itsdigitsinthereverseorder

Guideline:

1. Declarethescripttagastext/javascript inthebeginningofthe<body> ofhtmlprogram
2. Getthenumbertobereversedfromtheuserusingprompt()
3. Validate input number (should be a positive number between 0 to 9) using the regular expression "/^[0-9]+$/"and alert the user for invalid inputusing alert()
4. Reversethenumberusingmodulusoperation.
5. Usemath.floor(number/10)togetthefloorofnumberafterdivision(usedforreversing)
6. Displaythereversedstringusingalert()

Expt-4(a): Develop and demonstrate, using Java script, a XHTML document that collects the USN (the valid formatis: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-casecharacters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for theform element that collects this information to validate the input. Messages in the alert windows must be producedwhenerrors are detected.
(b) :Modify theabove programtogetthecurrentsemesteralso(restrictedtobeanumberfrom1to8)

Expt-5: Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphsof text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed oversome part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top tobecomecompletelyvisible.

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Expt-6: Design an XML document to store information about a student in an engineering college affiliated toCSVTU.

- The information must include Enrolment, Univ_Roll, Name, Name of the College, Brach, Year of Joining,ande-mail id.
- Create sampledatafor10students.Createa CSSstylesheetanduseittodisplay thedocument.

Expt-7:(a) Write a Perl program to display various Server Information like Server Name, ServerSoftware, Serverprotocol,CGIRevision etc.
(b)WriteaPerlprogramtoacceptUNIXcommandfromaHTMLformandtodisplaytheoutputofthecommandexecuted.

Expt-8: Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of4greeting messages.

Expt-9: WriteaPerlprogramtodisplayadigitalclockwhichdisplaysthecurrenttimeoftheserver

Expt-10: Write a Perl program to insert name and age information entered by the user into a table created usingMySQLandto displaythe current contents of this table.

EXPT-11: Write a PHP/.Net program to store current date-time in a COOKIE and display the "Last visited ondate-timeon the web page uponreopening ofthe samepage.

EXPT-12: Write a PHP/.Net program to store page views count in SESSION, to increment the count on each refresh,andto show the count onweb page.

EXPT-13: Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting,storethe values in MySQL table. Retrieveand display the data based onName.

EXPT-14: Using PHP/.Net develop a program to accept book information viz. Accession number, title, authors,edition and publisher from a web page and store the information in a database and to search for a book with the titlespecifiedbythe user and todisplaythe search resultswithproper headings.

EXPT-15: UsingPHP/.NetTechnologydevelopanonlineportalofanonlineBookstore.Thepagesshouldresemblewww.amazon.comthe website should consist the followingpages.

- Homepage
- RegistrationanduserLogin
- UserProfile Page
- Bookscatalog
- ShoppingCart
- PaymentBycreditcard
- OrderConformation

Validatethe Registration,userlogin,userprofileandpaymentbycreditcardpagesusingJavaScript.

Courseoutcome:

Attheendofthecourse,students shouldbeableto:

- Designandimplementdynamicwebsiteswithgoodaestheticsenseofdesigningandlatesttechnicalknow-how's.
- HaveaGoodgroundingofWebApplicationTerminologies,InternetTools,E-Commerceandotherwebservices

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Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Project (Phase I)**	Course Code: **D022723(022)**
Total / Minimum-Pass Marks(End Semester Exam):**60/40**	L: 0 T: 0 P: 6 Credits: 3

Guideline for Allocation of project:

1. Information regarding broad area must be made available to the students well in advance (may be during previoussemester).
2. Information must cover following parameters.
    I. Broad area: Subject or expertise/application area.
    II. Required skills: Knowledge of subject(s), software, tools & other characteristics.
    III. Type of project: Hardware, software, design, survey, study based etc.
    IV. Guide available: Name of Guide (S) from Department & Institute.
    V. Other related information depending upon specific branch & institute.
3. It is also recommended to give proper counseling to pick up suitable project.
4. Students must get chance to select projects as per their choice or decided mutually between students anddepartment faculty (HoD) concern.
5. One project group must contain maximum four students, however students can do project individually but it shouldbe approved by department.
6. Compiled list of projects must be submitted to the University within 25 days of start of semester.
7. Compiled list may contain following parameters.

Monitoring of project:

1. It is recommended to give projects as per the specializations of existing faculty of the department instead of outsideperson/agency.
2. Project must be allocated, developed and monitored by department / institution itself, but not by outside agencies.
3. Regular review by guide is recommended to ensure development & contribution of students.

Internal Evaluation & Submission of project:

1. Evaluation of project would be as per the examination scheme of the University, which is based on internal as well as external evaluation.
2. Internal assessment requires submission of project report for getting approved by the concern authority.
   However printing and binding would be as per the conventional format.
3. Evaluation will be based on live demonstration / presentation and Viva.
4. Final submission of project is expected as,
    - Submission of a copy to the University,
    - One copy to the Institution central library,
    - One copy to the department.

External Evaluation:

External assessment of project would be like conduction of practical exams of University, and must be executed asper the norms of practical exams.

NOTE: Completion of Project outside the department/Institution should not be encouraged.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science & Engineering**
Subject: **Industrial Training**	Course Code: **D022724(022)**
Total Marks (Internal Assessment):20	L: 0 T:0 P: 2 Credit(s): 1
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

COURSE OBJECTIVES:

1. To gain experience of working as an engineering professional, including the technical application of engineering knowledge.
2. To experience the discipline of working in a professional organisation and multidisciplinary team.
3. To develop technical, interpersonal and communication skills.

Course Outcomes

On completion of this component of curriculum, the students will be able to

1. Apply engineering knowledge in solving real-life problems.
2. Attain new skills and be aware of the state-of-art in engineering disciplines of their own interest.
3. Get exposure to real-life-working environment & practices, and to attain the professionalisms.
4. Work with multi-tasking professionals and multidisciplinary team.
5. Prepare a technical report, to improve presentation and other soft skills.

Course Content

Exposure to real life problems at various reputed industries engaged in areas of Computer Science and Engineering

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VII)**	Branch: **Computer Science &Engineering**
Subject: **Universal Human Values 2**	Course Code: **D000701(046)**
Total Marks (Internal Assessment):10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

Course Objectives

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education- Understanding the need, basic guidelines, content and process for Value Education, Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for selfexploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT 2: Understanding Harmony in the Human Being –

Harmony in Myself!, Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society-

Harmony in Human Human Relationship Understanding Harmony in the family – the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their ful fillment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.

UNIT 4: Understanding Harmony in the Nature and Existence –

A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self awareness and self-evaluation), Whole existence as Co-existence ,Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

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UNIT 5: Professional Ethics-

Value based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario, Vision for Holistic Technologies, Production System and Management Models.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. A.N Tripathy, New Age International Publishers, 2003..

Reference Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004

Course Outcomes [After undergoing the course, students will be able to:]

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

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Name of the Program: Bachelor of Technology
Semester: B. Tech – 7th
Subject: Universal Human values 2
Total Marks in End Semester Exam:
Minimum number of Class Tests: 2

Branch: Computer Science Engg.
Course Code: D000701(046)
L: T: P: 2 Credits: 0

Course Objective(s):

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I Introduction- Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
- Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in 'I'.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.
- Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life.
- Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

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- Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
- Holistic perception of harmony at all levels of existence.
- Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  - At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  - At the level of society: as mutually enriching institutions and organizations
- Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
3. Small is Beautiful - E. F Schumacher.

Course Outcome:

After completion of course, student should be able to

- To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **Cyber Law and Intellectual Property**	Course Code: **D022811(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 3 T: 1 P: 0 Credits: **4**
Class Tests & Assignments to be conducted: **2 each**	Duration (End Semester Exam): **03 Hours**

Course Objectives:

1. To make attentive to students about different cybercrimes
2. To understand key terms and concepts in cybercrimes and cyber law
3. To make attentive to students about security privacy and challenges
4. To make attentive to students about copyright and Patents

UNIT–I: Introduction to cybercrimes
Definition, cybercrime and information security, classes of cybercrime and categories, cyber offences, cybercrimes with mobile and wireless devices, cybercrime against women and children, financial frauds, social engineering attacks.

UNIT–II: Cybercrime and Cyber law
Malware and ransom ware attacks, zero day and zero click attacks, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offences, Organizations dealing with Cybercrime and Cyber security in India, Case studies

UNIT–III: Social Media Overview and Security
Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hash tag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.

UNIT–IV: Introduction to Intellectual Property Rights (IPR)
Introduction to IPR, International Instruments and IPR, WIPO – TRIPS – WTO -Laws Relating to IPR , IPR Tool Kit : Protection and Regulation, Copyrights and Neighboring Rights, Agencies for IPR Registration, Emerging Areas of IPR, Use and Misuse of Intellectual Property Rights.

UNIT–V: Patents
Introduction to Patents, Laws Relating to Patents in India, Patent Requirements, Product Patent and Process Patent, Patent Search, Patent Registration and Granting of Patent, Exclusive Rights and Limitations, Ownership and Transfer, Revocation of Patent, Patent Appellate Board, Infringement of Patent, Compulsory Licensing, Patent Cooperation Treaty, New developments in Patents, Software Protection and Computer related Innovations.

Text Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
2. Cyber Laws: Intellectual property & E Commerce Security, Kumar K. Dominant Publisher
3. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.

Reference Books:

1. Cyber Law Text & Cases, Gerald R.Ferrera, Margo E.K. Reder, CENGAGELEARNING Publication.
2. Intellectual Property (Trade Marks and the Emerging concepts of Cyber property rights (HB)", P. Narayanan, 3rd Edition. (HB), 2002, Universal Book Traders.

Course Outcomes [After undergoing the course, students will be able to:]

1. Understand the cyber security threat landscape.
2. Understand Cyber crimes and cyber laws.
3. Understand various privacy and security concerns on online Social media its legal aspects and best practices.
4. Understand the importance and applications of IPR its regulations.
5. Understand the application process of patent file and other related aspects such as search, registration and grant.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **Computer Vision Laboratory**	Course Code: **D022821(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credits: **1**

Course Objectives:

1. To be able to use Python for Image handling and processing.
2. To perform Geometric transformations and computer homography matrix in Python.
3. To be able to perform perspective transformation, edge detection, line detection and corner detection.
4. To be able to implement SIFT, SURF and HOG in Python.

Write programs to perform following activities:

1. Perform basic Image Handling and Processing operations on the image.
2. Geometric Transformation
3. Compute Homography Matrix
4. Perspective Transformation
5. Camera Calibration
6. Compute Fundamental Matrix
7. Edge Detection, Line Detection and Corner Detection
8. SIFT Feature descriptor
9. SURF and HOG feature descriptor
10. Project based on Computer Vision Applications.

Recommended Books:

1. Programming Computer Vision with Python, Jan Erik Solem, O'Reilly Media, ISBN: 9781449316549.
2. Practical Machine Learning for Computer Vision: End-to-End Machine Learning for Images, Valliappa Lakshmanan, O'Reilly Media, ISBN: 9391043836.

Course Outcomes [After undergoing the course, students will be able to:]

1. Apply Python for Image handling and processing.
2. Apply Python for Geometric transformations and computer homography matrix.
3. Apply Python for perspective transformation, edge detection, line detection and corner detection.
4. Apply Python for SIFT, SURF and HOG.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII)**	Branch: **Computer Science & Engineering**
Subject: **R Programming Laboratory**	Course Code: **D022822(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	L: 0 T: 0 P: 2 Credits: **1**

Course Objectives:

1. Demonstrate use of basic functions
2. Create their own customized functions
3. Construct tables and figures for descriptive statistics
4. Learn to understand new data sets and functions by yourself
5. Work on built in real time cases for analysis and visualization LEARNING OUTCOMES:
6. Enable to build programming logic and thereby developing skills in Programming.
7. Clear understanding on how to organize data and analyze data using real time examples.

1. Write a program to check whether a year (integer) entered by the user is a leap year or not?
2. Write an R program to find the sum of natural numbers without formula using the if–else statement and the whileloop.
3. Write a program that prints the grades of the students according to the marks obtained. The grading of the marksshould be as follows. Marks Grades 800-1000 A+ 700 – 800 A 500 – 700 B+ 400-500 B 150 – 400 C Less than 150 D
4. Write an R program to make a simple calculator that can add, subtract, multiply and divide using switch cases and functions.
5. Write a program to perform searching within a list (1 to 50). If the number is found in the list, print that the search is successful otherwise print that the number is not in the list.
6. Create a list and data frame that stores the marks of any three subjects for 10 students. Find out the total marks, average, maximum marks and minimum marks of every subject.
7. Write the steps to import data from Excel to CSV files and apply data viewer functions like rm(),dim(), head(), tail(), sorting, filtering, searching to view few set of rows.
8. Write a program to create two 3 X 3 matrices A and B and perform the following operations a) Transpose of thematrix b) addition c) subtraction.
9. Write an R program to create a list containing strings, numbers, vectors and logical values and do the followingmanipulations over the list.
   a. Access the first element in the list
   b. Give the names to the elements in the list
   c. Add element at some position in the list
   d. Remove the element
   e. Print the fourth element
   f. Update the third element
10. Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Create a histogram by using appropriate arguments for the following statements.
    a. Assigning names, using the air quality data set.
    b. Change colors of the Histogram
    c. Remove Axis and Add labels to Histogram
    d. Change Axis limits of a Histogram
    e. Create a Histogram with density and Add Density curve to the histogram
11. Design a data frame in R for storing about 20 employee details. Create a CSV file named "input.csv" that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis.
    a. Find the total number rows & columns
    b. Find the maximum salary
    c. Retrieve the details of the employee with maximum salary
    d. Retrieve all the employees working in the IT Department
    e. Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file "output.csv".
12. Create a dataset or table ['Smart Phone"] in an excel sheet that stores the mobile information [price, company name, model, Sale Percent] of five different companies. Store at least 20 rows. Write the scripts and find out theoutput for the following information.
    a. Maximum price of the mobile of each company
    b. Minimum price of mobile of each company
    c. Average price of mobile of each company
    d. Total Price of mobile of each company

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **Major Project (Phase-II)**	Course Code: **D022823(022)**
Total/Minimum-Pass Marks (End Semester Exam): **350/175**	L: 0 T: 0 P: 14 Credits: **7**

Guideline for Allocation of project:

1. Information regarding broad area must be made available to the students well in advance (may be during previous semester).
2. Information must cover following parameters.
   I. Broad area: Subject or expertise/application area.
   II. Required skills: Knowledge of subject(s), software, tools & other characteristics.
   III. Type of project: Hardware, software, design, survey, study based etc.
   IV. Guide available: Name of Guide (S) from Department & Institute.
   V. Other related information depending upon specific branch & institute.
3. It is also recommended to give proper counseling to pick up suitable project.
4. Students must get chance to select projects as per their choice or decided mutually between students and department faculty (HoD) concern.
5. One project group must contain maximum four students, however students can do project individually but it should be approved by department.
6. Compiled list of projects must be submitted to the University within 25 days of start of semester.
7. Compiled list may contain following parameters.

Monitoring of project:

1. It is recommended to give projects as per the specializations of existing faculty of the department instead of outside person/agency.
2. Project must be allocated, developed and monitored by department / institution itself, but not by outside agencies.
3. Regular review by guide is recommended to ensure development & contribution of students.

Internal Evaluation & Submission of project:

1. Evaluation of project would be as per the examination scheme of the University, which is based on internal as well as external evaluation.
2. Internal assessment requires submission of project report for getting approved by the concern authority. However printing and binding would be as per the conventional format.
3. Evaluation will be based on live demonstration / presentation and Viva.
4. Final submission of project is expected as,
   - Submission of a copy to the University,
   - One copy to the Institution central library,
   - One copy to the department.

External Evaluation:

External assessment of project would be like conduction of practical exams of University, and must be executedas per the norms of practical exams.

NOTE: Completion of Project outside the department/Institution should not be encouraged.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **Introduction to Game Theory**	Course Code: **D022831(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: **3**
Class Tests & Assignments to be conducted: **2 each**	Duration (End Semester Exam): **03 Hours**

Course Objectives:
The objective of this course is to understand the various architecture of game Theory and Game engine design, their support system and human interface.

UNIT-I: Introduction: Modeling the real world, Evolutionary Game Theory, Linear and Non Linear Dynamical Systems, 2- Player & 2-Stratey (2 x 2) Games , Dynamics Analysis of the 2 x 2 Game , Multi-player Games ,Structure of a Typical Game Team , What Is a Game? , What Is a Game Engine? , Engine Differences Across Genres , Game Engine Survey , Runtime Engine Architecture , Tools and the Asset Pipeline, Tools of the Trade : Version Control , Microsoft Visual Studio , Profiling Tools , Contents. [8 hrs]

UNIT-II: Fundamentals of Software Engineering for Games , C++ Review and Best Practices , Data, Code, and Memory in C/C++ , Catching and Handling Errors , 3D Math for Games , Solving 3D Problems in 2D ,Points and Vectors , Matrices, , Quaternions , Comparison of Rotational Representations.[7 hrs]

UNIT-III: Low-Level Engine Systems , Engine Support Systems , Subsystem Start-Up and Shut-Down , Memory Management,Containers , Strings , Engine Configuration ,Resources and the File System , File System ,The Resource Manager, The Game Loop and Real-Time Simulation , The Rendering Loop , The Game Loop , Game Loop Architectural Styles.[7 hrs]

UNIT-IV: Human Interface Devices, Types of Human Interface Devices, Interfacing with a HID , Types of Inputs , Types of Outputs , Game Engine HID Systems, Tools for Debugging and Development , Logging and Tracing , Debug Drawing Facilities, In-Game Menus & Console , Debug Cameras and Pausing the Game , Cheats, Screenshots and Movie Capture ,In-Game Profiling. [7 hrs]

UNIT-V: The Rendering Engine, Animation system : types , poses skeleton, clips, post processing, Action state machine, Rigid body dynamics, Mathematics of Sound and Audio engine architectures, Data driven game engine.[7 hrs]

Reference Books:

1. Jun Tanimoto, Fundamentals of evolutionary game theory and its applications Fundamentals of evolutionary game theory and its applications, Vol-6, Springer
2. Jason Gregory, The Game Engine Architecture, 3rd edition CRC press, Tylor & Francis group.
3. David H. Eberly, 3D Game Engine Architecture Engineering Real-Time Applications with Wild Magic, Magic Software, Inc.

Course Outcomes [After undergoing the course, students will be able to:]
1. To Structure of Game Theory and Game engine and various tools
2. Understand fundamentals of software engineering form games and and 3D maths for game
3. To understand Engine system and game loop and real time simulation
4. To study Human interface device, Cameras and pausing of games.
5. To provide a knowledge rendering engine, Action state machine ,rigid body dynamics, Mathematics of Sound and and audio engine architecture.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **R Programming**	Course Code: **D022832(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: 3
Class Tests & Assignments to be conducted: **2 each**	Duration (End Semester Exam): **03 Hours**

Course Objectives:

1. Learn Fundamentals of R.
2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.
3. Cover the Basics of statistical data analysis with examples.
4. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.

UNIT-I: Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed. packages(), package Description(), help(), find. package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.

UNIT-II: R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

UNIT-III: R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting –

UNIT-IV: R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().

UNIT-V: Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

Reference Books:

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.
2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.
3. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.
4. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

Course Outcomes [After undergoing the course, students will be able to:]

1. Understand the basics of Fundamentals of R.
2. Understands the loading, retrieval techniques of data.
3. Understand how data is analysed and visualized using statistic functions.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **Multimedia & Computer Vision**	Course Code: **D022833(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: **3**
Class Tests & Assignments to be conducted: **2 each**	Duration (End Semester Exam): **03 Hours**

Course Objective:

1. To understand the fundamental issues and problems in the representation, manipulation, and deliveryof multimedia content particularly in a networked environment.
2. To understand the concepts of multimedia components.
3. To understand the basic concepts of Computer vision.

UNIT-I: Introduction

Concept of Multimedia, media & data stream, Main properties of multimedia system, Data stream characteristics of continuous media, multimedia Applications, Hardware and software requirements, Multimedia Products & its evolution.

UNIT-II: Components Of Multimedia

Text, Basic sound concepts, MIDI, Speech, Basic concept of Images, Graphics format, Overview of image processing, Basic concepts of Video & animation, Conventional system, Transmission, Enhanced system, High-Definition system, Computer based animation, Design & authoring Tools, Categories of Authority Tools, Types of products

UNIT-III: Data Compression

Coding requirement, Source, entropy, hybrid coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffmann Technique, Statistical coding techniques.

UNIT-IV: Optical Storage Media

Videodisk and other WORMS, Compact Disk digital audio, Advantage of CD-DA Frames tracks blocks of CD-DA, CD-ROM, and Further CD-ROM based developments, Principles of CDWO, Prospects of CD technologies.

UNIT-V: Introduction To Computer Vision

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis, feature detection, image classification.

Text Books:

1. Multimedia System Design, Andleigh and Thakarar , PHI, 2003.
2. Multimedia Technology & Application, David Hillman, Galgotia Publications.
3. Computer Vision: A modern approach, Forsyth & Ponce, 2nd Ed., Pearson 2011

Reference Books:

1. Multimedia Computing Communication and Application, Steinmetz, Pearson Edn.
2. Fundamentals of Computer Graphics and Multimedia, D.P. Mukherjee, PHI

Course Outcomes [After completion of this course the students will be able to:]

1. To Know the fundamental video, audio, image, text processing techniques
2. Acquire the basic skill of designing video compression, audio compression, image compression, text compression.
3. To Know the basic techniques in designing video transmission systems: error control and rate control
4. To Identify basic concepts, terminology, theories, models and methods in the field of computer vision.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Program / Semester: **B.Tech (VIII Sem)**	Branch: **Computer Science & Engineering**
Subject: **Augmented & Virtual Reality**	Course Code: **D022833(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	L: 2 T: 1 P: 0 Credits: **3**
Class Tests & Assignments to be conducted: **2 each**	Duration (End Semester Exam): **03 Hours**

Course Objectives:
The objective of this course is to provide a foundation to the fast growing field of AR and make the students aware of the various AR devices.

UNIT-I: Introduction to Augmented Reality: Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality. Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

UNIT-II: Augmented Reality Hardware: Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception , Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.

UNIT-III: Computer Vision for Augmented Reality & A.R. Software: Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

UNIT-IV: AR Techniques- Marker based & Markerless tracking: Marker-based approach- Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication Marker types- Template markers, 2D barcode markers, imperceptible markers. Marker-less approach- Localization based augmentation, real world examples Tracking methods- Visual tracking, feature based tracking, hybrid tracking, and initialisation and recovery.

UNIT-V: AR Devices & Components: AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems. Introduction to mixed reality, Applications of mixed reality, Input and Output in Mixed reality, Computer Vision and Mixed Reality, simultaneous localization and mapping (SLAM).

Text Books:
1. Allan Fowler-AR Game Development, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494

Reference Books:
1. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381.
2. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0.

Course Outcomes [After undergoing the course, students will be able to:]
1. Describe how AR systems work and list the applications of AR.
2. Understand and analyse the hardware requirement of AR.
3. Use computer vision concepts for AR and describe AR techniques.
4. Analyse and understand the working of various state of the art AR devices.
5. Acquire knowledge of mixed reality.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 3rd
Subject: Mathematics- III

Branch: All branches
Course Code: B000311(014)

Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

L: 3 T: 1 P: 0 Credits 4

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

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Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Branch: Electronics & Telecommunication

Semester: III

Subject: **Electronic Devices**
Total Theory Periods: 40
Total Tutorial Periods: 10
ESE duration: Three Hours
Minimum Marks: 35

Code: B028312(028)
Class Tests: Two (Minimum)
Assignments: Two (Minimum)
Maximum Marks: 100

Course Objectives:

1. To study semiconductor charge carriers transport phenomena.
2. To understand practical applications of PN junction diode.
3. To understand the basic working physics of BJT and study transistor biasing arrangements.
4. To study basic principle of JFET, MOSFET their characteristics and amplifiers.

UNIT- I: Conduction in Semiconductor: Transport phenomena in semiconductors: Mobility and conductivity, Electrons and holes in an intrinsic semiconductor, Donor and acceptor impurities, Charge densities in a semiconductor, Law of mass action, Charge neutrality equation, Generation and recombination of charge carriers, Diffusion, Continuity equation, Injected minority carrier, Potential variation in a graded junction. Formation of p-n junction and its characteristics.

UNIT-II: Diode and its Application: Semiconductor Diode: Construction, current components, V-I Characteristics, Effect of Temperature on V-I Characteristics, Ideal Diode, Diode equation, Diode Resistance, Diode Capacitance: Transition and Diffusion Capacitance. Load line analysis of diode circuit, DC analysis of diode circuits: Piecewise linear model of p-n junction diode.
Rectifiers: Half wave, Full wave and Bridge rectifier: Voltage regulation, Ripple factor, Ratio of rectification, PIV, Transformer Utilization factor. Filter circuits for power supply(Qualitative analysis only): Inductor filter, Capacitor filter, CLC or π filter.
Zener diode: Break down mechanism, Characteristics, Specifications, Voltage regulator circuit using zener diode.

UNIT-III: Bipolar Junction Transistor & Its Configurations: Introduction, Construction, Types: npn and pnp, Current components. Transistor as an amplifier, Transistor Characteristics (input, output and transfer), Transistor Circuit Configuration: CB, CC, CE Configuration, Early Effect. Ebers-Moll Model. Transistor as a Switch.
Transistor biasing & Thermal stabilization: Concept of operating point, Thermal runway, Bias stability, Stability factors, Fixed bias, Collector to base bias, Voltage divider bias.

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UNIT-IV: Junction Field Effect Transistor(JFET): JFET Construction, Symbol, Basic Operation, V-I Characteristics, Cut-off and pinch off voltages, Trans-conductance, CS, CG and CD Configuration, FET as switch, FET as VVR.
Biasing arrangements for JFET: Fixed bias, Self bias and Voltage divider bias.

UNIT-V: Metal Oxide Semiconductor Field Effect Transistor (MOSFET): Introduction, Construction, Symbol, Basic Operation, V-I Characteristics. MOSFET Types: Depletion MOSFET, Enhancement MOSFET, their characteristics and parameters, Body effect, Sub threshold conduction, The MOS Switch, CMOS devices. **MOSFET Biasing:** Fixed bias, Self bias and Voltage divider bias, Feedback bias in E-MOSFET.

Text Books:

1. Integrated Electronics: Analog & Digital Circuit Systems – Jacob Millman & Halkias, Tata McGraw Hill. (Unit- I, II & III)
2. Principles of Electronics by V. K. Mehta, Khanna Publication.
3. Electronic Devices and Circuit Theory – Robert L. Boylestad & L. Nashelsky, K.. L. Kishore, 9th Edition, PHI. (Unit- IV, V)
4. Electronic Devices & Circuits – Donald A Neaman, Tata McGraw Hill.

Reference Books:

1. *Electronic Devices & Circuits – Allen Mottershead, PHI.*
2. *Microelectronic Circuits - Sedra and Smith, 5th Edition, Oxford University Press.*

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Branch: Electronics & Telecommunication

Semester: III

Subject: **Digital System Design** | **Code: B028313(028)**
Total Theory Periods: 40 | Class Tests: Two (Minimum)
Total Tutorial Periods: 10 | Assignments: Two (Minimum)

ESE Duration: Three Hours | Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To Design, Analyze and Interpret Combinational Circuits
2. To Design, Analyze and Interpret Sequential Circuits

UNIT- I: Boolean Algebra & Minimization Techniques: Logic Simplification and Combinational Logic Design, ***Boolean Algebra:*** Logic Operations; Axioms and Laws of Boolean Algebra: Complementation Laws, AND Laws, OR Laws, Commutative Laws, Associative Laws, Distributive Laws, Absorption Laws, Transposition Theorem, De Morgan's Theorem; Duality; Reducing Boolean Expressions; Functionally Complete Sets of Operations; Boolean Functions and their Representation. ***Minimization Techniques***: Expansion of a Boolean expression to SOP form; Expansion of a Boolean expression to POS form; Karnaugh maps up to 4 variables, Mapping and minimization of SOP and POS expressions; Concept of Don't Care Terms; Quine – McClusky Method (Up to 5 variable); Synthesis using AND-OR, NAND-NOR and XOR forms; Design Examples; Binary codes and code conversion(BCD, Excess-3, Gray code)

UNIT-II: Combinational Circuits: MSI devices like ***Adder & Subtractor***: Half and Full Adders, Half and Full Subtractor, Serial and Parallel Adders, BCD Adder, ***Comparators***, ***Decoder:*** 3-Line to 8-Line Decoder, 8-4-2-1 BCD to Decimal Decoder, BCD to Seven Segment

Decoder; ***Encoder:*** Octal to Binary and Decimal to BCD Encoder; ***Multiplexers:*** 2- Input Multiplexer,4-Input Multiplexer,16-Input Multiplexer; ***Demultiplexers***: 1-Line to 4-Line & 1-Line to 8- Line Demultiplexer; Applications of Multiplexers.

UNIT- III: Sequential Circuits: Building blocks of ***Flip-Flops*** like S-R latch , Gated S-R Latch; D Latch, ***Edge Triggered Flip-Flops***: S-R, D, J-K and T Flips-Flops; Master-Slave J-K Flip-Flop; ***Shift registers:*** SISO, SIPO, PISO,PIPO, Bi-Directional Shift Registers, Universal Shift register; ***Counters:*** Asynchronous Counters: Design of Asynchronous Counters; Ripple Counters: Effects of Propagation Delay in Ripple Counters; Synchronous Counters: Design of

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Synchronous Counters, 3-bit Synchronous Up counter, 3-bit Synchronous Down Counter,3-bit Synchronous Up-down Counter, Design Of Synchronous BCD Counter.

UNIT-IV: Finite State Machine: Design of synchronous Finite state machine, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.

UNIT-V Digital Logic Families: Introduction; Logic Families: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, TTL subfamilies : IIL, ECL, MOS Logic, CMOS Logic, Comparison Among Various Logic Families, Manufacturer's Specification.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd Edition ,2006.
3. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
4. Digital Fundamentals: Floyd & Jain: Pearson Education.
5. Digital Electronics: A. P. Malvino: Tata McGraw Hill.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Employ Boolean algebra and circuit minimization techniques.

2. Design and analyze combinational logic circuits such as adders, subtractors, multiplexers, flip-flops, shift registers and counters.

3. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder,

Encoder

4. Design & analyze synchronous sequential logic circuits

5. Gain knowledge about various logic families and select a suitable one for a specific application.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Branch: Electronics & Telecommunication
Semester: III

Subject: **Network Theory**	**Code: B028314(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE Duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

- To understand the basic concepts and analysis of electric circuits.
- T o make the students learn how to synthesize an electrical network from a given impedance / admittance function.

UNIT-I:Methods of Analysing Circuits & Network Theorems: Node and Mesh Analysis, Source transformation and duality. Network theorems: Superposition, Reciprocity,Thevenin's, Norton's, Maximum power Transfer, Compensation and Tellegen's theorem as applied to AC circuits.
Input Power and Power Transfer: Energy and Power, Effective or Root- Mean Square Values, Average Power and Complex Power, Problems in Optimizing Power Transfer.

UNIT-II: Initial Conditions in Networks: Initial Conditions in Elements, Geometrical Interpretation of Derivatives, A Procedure for Evaluating Initial Conditions, Initial State of a Network.

UNIT-III: The Laplace Transformation :Introduction,TheLaplace Transformation, Basic Theorems for the LaplaceTransformation, Convolution Theorem, Application of Laplace Transformation Technique in Electric Circuit Analysis.
Transforms of Signal Waveforms: The Shifted Unit Step Function, The Ramp and Impulse Functions, WaveformSynthesis, The Initial and Final Value of f(t) from F(s).

UNIT-IV: Two Port Networks: Relationship of Two-Port Variables, Short-circuit Admittance Parameters, The Open CircuitImpedance Parameters, Transmission Parameters, The Hybrid Parameters, Relationships between Parameters Sets, Interconnection of Two-Port Networks: Series, Parallel and Cascade connection.

UNIT-V: Sinusoidal Steady State Analysis: The Sinusoidal Steady State, The Sinusoid and $e^{\pm j\omega t}$; Solution Using e±jωt;Solution Using $Re^{j\omega t}$ or $Ime^{j\omega t}$; Phasors and Phasor Diagrams.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi,1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Course Outcomes:
At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Branch: Electronics & Telecommunication

Semester: III

Subject: **Data Structure using C++**	**Code: B028315(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE Duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

UNIT I: Principles of Object Oriented Programming: Basic Concepts of Object Oriented Programming, Benefits of OOPs, Classes and Objects: C Structures Revisited, Specifying a Class, Defining Member Functions, Making an Outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays Within a Class, Memory Allocation for Objects, Static Data M embers, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Destructors.

UNIT II: Operator Overloading and Inheritance: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators Using Friends, Manipulation of Strings Using Operators, Rules for Overloading Operators, Function Overloading, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical inheritance, Virtual Base Classes, Abstract Classes.

UNIT III: Pointers and Runtime Binding: Pointers and their Binding, Address Operator &, Pointer Variables, Void Pointers, Pointer Arithmetic, Runtime Memory Management, Pointers to Pointers, This Pointer, Introduction to Virtual Functions, Need for Virtual Functions, Pointer to Derived Class Objects, Definition of Virtual Functions, Array of Pointers to Base Class Objects, Pure Virtual Functions, Abstract Classes

UNIT IV: Introduction to the data structures: Searching, Types of searching: Linear Search , Binary Search, **Sorting** ,Types of Sorting : Insertion Sort, Bubble Sort and Selection Sort.

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Introduction to the Stack and Queue, Types of Queue : Simple Queue, Circular Queue and Priority Queue.

UNIT V: Linked List, Tree and Graphs: Introduction to the Linked List. **Trees:** Introduction, Different Types of Tree: Binary Tree, Binary Search Tree, Tree Traversal, AVL Tree. **Graph:** Graph Theory Terminology, Sequential Representation of Graphs, Graph Traversal.

Text Books:

1. Object oriented Programming with C++, E Balaguruswamy, 3rd Edition, Mcgraw-Hill .(Unit I, II & V)

2. Mastering C++, K.R.Venugopal, Raj Kumar and T.Ravi Shankar , Mcgraw-Hill. (Unit III)

3. Theory and Problems of Data Structures, Seymour Lipschutz, Schaum's Outline Series. (Unit IV)

Reference Books:

1. **C++ Complete Reference, H. Schildt , Mcgraw-Hill.**
2. **Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia Pub.**
3. **C++ Primer plus, Stephen Prata, Galgotia Pub**
4. **The C++ Programming Language, Bjarne Stroustrup, Pearson**

Course Outcome:

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort,
5. Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
6. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: III

Subject: **Electronic Devices Laboratory** **Code: B028321(028)**
Total Lab Periods: 36 Batch Size: 20
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To draw the characteristics of a semiconductor p-n junction diode and to find cut-in voltage, reverse resistance, static resistance and dynamic resistance.

2. To simulate characteristics of pn junction using SPICE model.

3. To draw the characteristics of a zener diode and to find cut-in voltage, reverse resistance, static resistance and dynamic resistance.

4. To design a half wave rectifier and to determine its efficiency and ripple factor.

5. To design a centre tap full wave rectifier and determine the ripple factor and efficiency with and without filter.

6. To design a bridge full wave rectifier and determine the ripple factor and efficiency with and without filter.

7. To draw the characteristics of CE configuration of a transistor amplifier.

8. To draw the characteristics of CB configuration of a transistor amplifier.

9. To draw the characteristics of CC configuration of a transistor amplifier.

10. To simulate characteristics of BJT using SPICE model.

11. To design a Zener regulator circuit and to find the regulation characteristics.

12. To draw the load line and find Q-point of a transistor amplifier under CE configuration.

13. To design and verify the self bias circuit operation.

14. To design and verify the voltage divider biasing circuit.

15. To draw the characteristics of FET.

16. To simulate characteristics of FET using SPICE model.

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17. To draw the characteristics of MOSFET.

Equipment/Machines/Instruments/Tools/Software Required:

Circuit components, Breadboard, Hook-up wire, Power supply, CRO, Function generator, Any simulation software –Package like SPICE or MATLAB.

Recommended Books:

1. Laboratory Manual for Electronic Devices and Circuits, 4th Ed., David A. Bell, PHI
2. Lab Manual of Electronic Devices by Paul B Zbar.
3. Microelectronics' An integrated approach' by Roger T. howe and Charles G. Sodini.
4. Electronic Devices Systems and Applications by Robert Diffenderfer, Cengage learning.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: III

Subject: **Digital System Design Laboratory** — **Code: B028322(028)**
Total Lab Periods: 36 — Batch Size: 20
Maximum Marks: 40 — Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To Verify The Properties of NOR & NAND Gates As Universal Building Block.
2. Realization of Boolean Expression Using NAND Or NOR Gates.
3. To design and implement an X- OR Gate Using Only NAND Or NOR Gates Only.
4. To design and implement a Half Adder Circuit using Logic Gates And Verify its Truth table.
5. To design and implement a Full Adder Circuit And Verify its truth table (Using Two X-OR And 3 NAND Gates).
6. To design and implement a Half Subtractor Circuit by Using Basic Gates And Verify its truth table.
7. To design and implement a Full Subtractor Circuit by Using Basic Gates And Verify its truth table.
8. To design and implement a Circuit of 4 -Bit Parity Generator and Checker & Verify its truth table.
9. To design and implement a 4x1 Multiplexer using Logic Gates And Verify its truth table.
10. To design and implement a 1x4 De-Multiplexer using Logic Gates And Verify its truth table.
11. To design and implement a Programmable Inverter Using X-OR Gates & Verify its truth table.
12. To design Octal to Binary Encoder using Logic Gates and Verify its truth table.
13. To design BCD to Excess-3 Decoder using Logic Gates And Verify its truth table.
14. To design Binary to Gray Code Converter and Verify its truth table.
15. To Design A Comparator Circuit & Verify its truth table.

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16. To Construct A RS Flip Flop Using Basic & Universal Gates (NOT, NOR & NAND)

17. To Construct A J.K. Master Slave Flip Flop & Verify its truth table

18. To Verify The Operation of A Clocked S-R Flip Flop And J. K. Flip Flop

19. To Construct A T & D Flip Flop Using J. K. Flip Flop And Verify Its Operations & truth table.

20. To Construct and study the operation of a 4-bit Shift Register in following modes:

   a. Serial In Serial Out

   b. Serial In Parallel Out

   c. Parallel In Serial Out

   d. Parallel In Parallel Out

21. To Verify the Operation of 4-bit Binary Asynchronous Counter.

22. To Verify The Operation of a Synchronous Decade Counter.

23. To perform the operation of BCD Counter Using 7490.

Equipment/Machines/Instruments/Tools/Software Required:

Various ICs , Power Supply, Hook-Up Wires.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Branch: Electronics & Telecommunication

Semester: III

Subject: **Electronics Workshop Laboratory** **Code: B028323(028)**
Total Lab Periods: 36 Batch Size: 20
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To understand the operational features of Analog and Digital Multimeter.

2. To understand the operational features of Cathode Ray Oscilloscope.(Calibration, Time/div, Volt/div, X-Y, single channel, Dual channel)

3. To understand the operational features of Function Generator (Measurement of volt and frequency, attenuation).

4. Measurement of capacitors (mica, ceramic, paper, electrolytic and variable) using CRO and LCR Meter and verify with color coding.

5. Measurement of resistors- Fixed (carbon, wire wound, metal film and variable) using CRO and Multimeter and verify with color coding and identification of special resistors like Thermistor, LDR and VDR (FET)

6. Measurement of inductors (fixed) using CRO and LCR meter.

7. Study of Diodes (Ge and Si), Zener diodes and LEDs.(terminals, resistance and capacitance in forward biased and reversed biased conditions).

8. Study of Transistors (npn, pnp) using multimeter and CRO. (terminals, forward biased and reversed biased junction conditions.)

9. To understand the types of PCB.

10. To understand PCB designing rules (Art Work and layout) using EDA tools.

11. To design and fabricate a DC power supply using bridge rectifier on PCB.

12. To learn the use of SMD rework station.

13. Mini project (compulsory)

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Equipment/Machines/Instruments/Tools/Software Required:

- Film Making unit
- Deep coating machine
- UV exposure unit
- PCB curing machine
- PCB etching machine
- PCB drilling machine
- PCB tining machine
- Magnifying lamp
- Soldering &desoldering iron
- LCRQ meter
- Digital & analog multimeter
- PCB making software (ULTIBOARD, PROTEL, EXPRESS LAB, EDWin XP)
- Resistance color code chart
- Capacitor color code chart
- Transistor chart
- CRO.
- SMD work station

Recommended books:

1. A Monograph on Electronic design Principles – by N.C. Goyal& R.K. Khetan

2. Electronic Measurement and Instrumentation – by A.K. Shawney.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: III

Subject: **Software Laboratory**	**Code: B028324(028)**
Total Lab Periods: 36	Batch Size: 20
Maximum Marks: 40	Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. A book shop maintains the inventory of books that one being sold at the shop. He list includes details such as authors, title, price, publisher and stock position. Whenever a customer wants a book, the sales person input the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is then the system displays the book details and requests for the number of copies required.

2. Write a program which will show the order of execution of constructor, destructor, static data member, static function and member functions.

3. Create class Distance having private data feet(type integer), inches(type float) and function getdist() and showdist() . Overload + operator to add two distance values and > operator to compare them.

4. Create a class called employee containing protected data name(20 characters), employee number(long integer). Also write its constructor and destructor functions. Create two derived classes called hourly _employee containing private data rate and hours and salary_ employee containing basic salary and allowances as data members. The class employee is inherited as public by these derived classes. Write appropriate functions in each class to calculate total salary of each employee and to display name, number and total salary.

5. Create a class dimension containing three float type data and a constructor to accept values, also declare a pure virtual function area() in it. Now create three derived classes rectangle, square and triangle, each inheriting dimension as public.Define corresponding constructors and redefine

virtual function area() in each to give area of respective figure. A main() program should create suitable objects to implement this inheritance.

6. Create a class STRING that contains a character array as a data member. Overload + and = operators respectively to concatenate and compare strings.

7. Create two classes DM and DB respectively represent the distance in meters, centimeters and distance in feet, inches. Write a program that can read values for the class objects and add one object DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

8. Write a program to read the contents of a text file and count the number of words present in the file.

9. Write a program that reads a text file and creates another file that is identical except that every sequence of consecutive blank spaces is replaced by single space.

10. Write a program that will ask the users to enter the details of 5 students and transfer those details into a binary file Stud.dat. Write another file that will read the details of the students and print the names of all those students who have total marks greater that a particular given value.

11. Write a program that will take the details of 10 employees as input and transfer those details into a binary file. Write another program that will provide a menu to the user for the following purpose.

   a. To sort the file on the basis of their employment number.
   b. To sort the file on the basis of their name.
   c. To search the record for a particular employee on the basis of their employee number or name.

12. Write a program that will take two strings from the command line as argument and print the appropriate message if both the strings are same.

13. Write a program to implement a stack and it's operations.

14. Write a program to implement a linear queue, circular queue using an array.

15. Write a program to convert an infix expression into its equivalent postfix expression using a stack.

16. Write a program to evaluate a postfix expression using a stack.

17. Write a program to create and display a linked list of integers.

18. Write a program to create a linked list and define functions to add a node (at the beginning, end and middle), delete a node, search a node and display all the nodes.

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19. Write a program to create two linked list and append one list at the end of another using function.

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Analog Communication**	Code: **B028411(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1.To understand the signal analysis performed in communication.

2. To gain knowledge about various analog communication system.

3. To study about various Noise sources and its impact on analog communication system.

UNIT-1: Introduction to Communication System: Introduction: Overview of Communication system, Communication channels , Need for modulation, Baseband and Pass band signals .Classification of signals and study of Fourier transforms for standard signals, definition of signal bandwidth, Distortion less transmission, Parseval's Theorem. Introduction to Convolution and correlation of signals, comparison between correlation and convolution. Frequency division multiplexing.

UNIT-11: Amplitude Modulation: Amplitude Modulation: full carrier system and Suppressed carrier system . Double side band with full Carrier, Generation and Detection of Double side band without Carrier (DSB-SC), SSB-SC, VSB-SC, Single Side Band Modulation, Phasor representation, Bandwidth, Modulation Index Superposition Theorem of Spectra. Power Content in AM signal. Generation of AM using LTI circuits and Non-linear circuits. Demodulation of AM waves: Square law detectors and Envelope detectors

UNIT-III: Angle Modulation: Angle modulation, Phase & frequency modulation, Relationship between phase and frequency modulation, Phase and frequency deviation, Spectrum of an FM signal, Bandwidth and power of a sinusoidal modulated FM signal, Types of FM: Narrowband FM and Wideband FM. Phasor diagram for FM signals. FM generation: Parameter-variation method, an indirect method of frequency modulation (Armstrong system), Frequency multiplication, and Frequency multiplication applied to FM signals, FM demodulators : Slope detectors and Phase difference discriminators. Comparison of AM and FM.

UNIT-1V: Transmitters and Receivers: AM Transmitters: Generation of AM, low level and high level modulation, comparison of levels, AM transmitter block diagram, collector class C modulator, Base Modulator, DSB -SC modulator. FM transmitter: Direct Method , Armstrong Indirect Method Radio Receivers and Demodulators :Introduction, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Image frequency and IFRR, Tracking and Double spotting, TRF, Super heterodyne receivers AGC. PLL for FM demodulation.

UNIT-V Noises in Analog Communication: Noise Introduction, Sources of Noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure for cascaded amplifiers, Noise Factor, Effective input Noise Temperature.

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Noise calculation (SNR, FOM) of Various AM system: DSB-SC, SSB-SC, AM-FC system(Envelope detector) Threshold Effect in Envelope detector. Noise in angle modulated system: , Capture effect, Threshold effect and its improvement in Discriminators

Text Books:

1. Principles of Communication Systems, Taub and Schilling, 2nd Edition., Tata McGraw Hill.(unit-II,III,V)
2. Electronic Communication Systems, George F Kennedy, Tata McGraw Hill. (unit-IV)
3. Communication Systems, Simon Haykins, Wiley India.
4. Communication Systems, R P singh ,S D Sapre, Tata McGraw Hill, Second Edition (unit-I)

Reference Books:

1. Communication Systems Engineering, Proakis, 2 nd Edition, Pearson Education.
2. Modern Digital and Analog Communication, B.P. Lathi, Oxford University Press.

Course outcomes:

1. The student will be able to draw spectral plots and visualize signals in frequency domain.
2. Understand the amplitude modulation process and effect of noise in AM systems.
3. Understand the angle modulation process and effect of noise in FM/PM systems.
4. Get the overview of transmitters and receivers for both AM and FM systems.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Analog Circuits**	Code: **B028412(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To understand Operating point calculations and working of BJTs at low and high frequencies.
2. To study Frequency response of BJT.
3. To study the design of multistage amplifiers.
4. To understand the working of different types of feedback amplifiers.
5. To understand the working of different types of oscillators.

UNIT- I: BJT AT LOW FREQUENCY: Transistor as a two port device and its Hybrid Model: Models for CB, CE, CC configurations and their Interrelationship, Analysis and Comparison of the three Configurations. Classification of Amplifiers, Amplitude and Frequency, Linear analysis of Transistor Circuits. Miller's Theorem and its dual. Cascading transistor Amplifiers. Simplified Models and Calculation of CE and CC Amplifiers. The Common Emitter Amplifier with an Emitter Resistance. Methods of increasing the input resistance of an Amplifier.

UNIT-II: BJT AT HIGH FREQUENCY: CE hybrid- π model, Hybrid $-\pi$ Conductances and Capacitances. Validity and parameter Variation, CE Short Circuit Current Gain, Current Gain with Resistive load. Frequency response of a single stage CE Amplifier, Gain-Bandwidth product, CC stage High frequencies.

UNIT- III MULTISTAGE AMPLIFIERS: Introduction, Distortion in Amplifiers, Frequency Response, Step Response of an amplifier, Band Pass of Cascaded Stages.
Coupling of amplifiers: Coupling Types: Direct, RC and Transformer. RC Coupled Amplifier, Low Frequency response of an RC-coupled Stage, Effect of an Emitter bypass capacitor, High Frequency response of two cascaded CE Transistor stages.

UNIT-IV FEEDBACK AMPLIFIERS: Classification, Feedback concept, Transfer gain with Feedback, Characteristics of Negative Feedback Amplifiers, Analysis of Input and output Resistance. Topologies: Method of Analysis of Feedback amplifiers, Voltage series Feedback, Voltage series Feedback pair, Current series, Current shunt and Voltage shunt feedback.

UNIT-V OSCILLATOR (BJT): Concept of positive Feedback. Barkhausen criterion for oscillation, Mechanism for start of oscillation and Stabilization of amplitude. Sinusoidal oscillator: Phase shift oscillators, Wien Bridge oscillator, Resonant circuit oscillators, Colpitts and Hartley oscillator. Amplitude Frequency and Phase stability analysis of all Oscillators, Crystal oscillator.

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Text Books:

1. Integrated Electronics – Millman & Halkias, Tata McGraw Hill. (Unit I to V)
2. Microelectronics – Millman and Grabel, Tata McGraw Hill.
3. Electronic Devices & Circuits – Donald A Neaman, Tata McGraw Hill.

Reference Books:

1. Electronic devices and circuits- A.K. Maini & Varsha Agrawal, 1stEdition ,Wiley Publication.
2. Electronic Devices & Circuits – David A. Bell, PHI.
3. Microelectronic Circuits- Sedra and Smith, 5th Edition, Oxford University Press.

Course outcomes:

1. Student will be able to understand ac analysis of BJT amplifier at Low and High frequencies.
2. Understand the concepts of multistage amplifier and coupling of amplifiers.
3. Understand the concepts of feedback used in amplifier .
4. Able to understand the concepts of Oscillator.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Electromagnetic Field Theory** Code: **B028413(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course objective: - The students will learn and understand

1. Behavior of Electrostatic and electromagnetic field and their application in electric and electronics Engineering fields.
2. Maxwell's equations in differential and integral form their interpretation and applications.
3. Propagation of Electromagnetic wave in free space, conductors and dielectrics.

Unit I: Coordinate Systems and Transformation: Cartesian coordinate system, circular cylindrical coordinate system, Spherical coordinates, vector calculus, Differential length area and volume, line surface and volume integral, del operator, gradient of a scalar, divergence and curl of a vector, divergence and stokes theorem, Laplacian form of a scalar.

Unit II: Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Electric Potential, Relationship between E and V, Gauss law, boundary conditions, Poisson's and Laplace equations.

Unit III : Magneto statics: Biot Savart law, amperes circuit Maxwell's equations, Applications of amperes law, Maxwell's equations for static field, Magnetic scalar and vector potential. Magnetic forces, Material and Devices: Force due to magnetic field, Magnetic Torque and moment, A magnetic dipole, magnetization in Materials, Magnetic Boundary Conditions.

Unit IV: Waves and Applications: Maxwell's equations, Faradays law, Displacement current, Maxwell's Equations in Differential and Integral Form, Electromagnetic Wave Propagation: Wave propagation in lossy dielectrics, plane wave in lossless dielectric, Plane wave in free space, plane wave in good conductor, Power and Poynting vector, Reflection of plane wave at normal and oblique incidence.

Unit V : Transmission Lines: Transmission line parameter, Transmission line equations, Lossless and distortion less Transmission line, Input impedance, Characteristics Impedance, standing wave ratio ,reflection coefficient, power, smith chart, Open circuited and short circuited transmission line, Applications of transmission Lines, introduction to wave guide.

Text Books:

1. M.N.O. Sadiku," Elements of Electromagnetic" 5th edition Oxford University Press
2. G.S.N. Raju , "Electromagnetic field theory and Transmission line" Pearson Education.

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Reference Books.

1. W.H. Hayt and J A Buck," Electromagnetic field Theory" 7th Edition Tata Mcgraw Hill

Course Outcomes:

On completion of this course, the students will be able to

1. Calculate electric and magnetic field from stationary and dynamic charge and current distribution
2. Gain Knowledge of static and time varying field
3. Define electric and magnetic field and solve simple electrostatic boundary problems
4. Understand the phenomenon of wave propagation with the aid of Maxwell's equations

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Signals and Systems** Code: **B028414(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To describe continuous time and discrete-time signals and systems.
2. Proficiently use various methods and approaches to solve problems with signals and systems prepared for upper-level courses in communication systems, control systems, and digital signal processing.

UNIT I: CLASSIFICATION OF SIGNALS AND SYSTEMS: Representation of signals: Graphical Representation, Functional Representation, Sequence Representation, Elementary signals: Unit Step ,Unit ramp, Unit Impulse, Sinusoidal Signal, Basic Operation on Signals: Time Shifting, Time Reversal, Time Scaling, Signal Addition , Signal Multiplication, Classification of Signals: Periodic and non-periodic, Energy and power, Causal and non-causal, Even and odd Signals, Classification of Systems: Causal and non-causal, linear and non-linear, time variant and time invariant, stable and unstable.

UNIT II : FOURIER REPRESENTATION OF PERIODIC SIGNALS: Representation of Continuous time Fourier series (CTFS): Trigonometric form and Exponential form, Existence of Fourier series, Fourier spectrum, Power, Properties of CTFS: linearity, Time Shifting, Time Reversal, Time Scaling, Time Differentiation, Time Integration and Convolution Property

UNIT III: FOURIER REPRESENTATION OF APERIODIC SIGNALS: Fourier transform of non-periodic functions, Magnitude and phase representation of Fourier transform, Existence of Fourier transform, Fourier transform of standard signals: Impulse Function, Double Sided Real Exponential Function, Complex Exponential function, Signum Function, Unit Step, Rectangular Pulse and Triangular Pulse, Properties of continuous time Fourier transform: Linearity ,Time Shifting ,Frequency Shifting, Time Reversal, Time Scaling, Differentiation in time domain and Frequency Domain, Time Integration and Convolution Property.

UNIT IV: Z-TRANSFORM: Introduction, Z transform of some common sequences: Unit Impulse , Unit Step, Unit Ramp, Exponential Sequence and Sinusoidal Sequence, Z transform and region of convergence of finite duration sequences, Properties of region of convergence, Properties of Z transform: Linearity, Time Shifting, Time Reversal, Time Expansion, Multiplication by an Exponential Sequence ,Multiplication by n ,Conjugation and Convolution Property, Initial and Final Value Theorem, Inverse Z transform: Long Division Method, Partial Fraction Expansion Method.

UNIT V: LINEAR TIME INVARIANT SYSTEMS: Response of a continuous time LTI System and Convolution integral using graphical method, Properties of continuous time LTI systems, System described by Differential Equation, Response of a Discrete time LTI System and Convolution sum, Properties of discrete time LTI system, Systems described by difference equations.

Text Books:

1. Signals &Systems: A. Anand Kumar, 2nd Edition,PHI.(Unit–I, II , III and IV)
2. Signals & Systems: H. P. Hsu, McGraw-Hill Publication. (Unit- V)
3. Signals & Systems: Alan Oppenheim & Alan Wilsky, S Nawab, PHI. (Unit-V)

Reference Books:

1. Simon Haykin, Signals and Systems, 2nd Edition, Wiley India.
2. Signals, Systems and Communications: B.P. Lathi, BS Publications.

Course outcomes:

1. The student will be able to understand the classification of signals and systems.
2. Gain knowledge about the frequency domain analysis of continuous time and discrete time signals.
3. Use the Z-transform techniques to solve the system equations.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Probability Theory and Stochastic Processes** Code: **B028415(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To study basics of probability theory.
2. To understand the basic concepts of random variables & processes

UNIT-I: PROBABILITY: Sets and set operations; Probability introduced through Sets and Relative Frequency, Joint and conditional probability, Bayes' theorem, Independent events, combined experiments, Bernoulli Trials.

UNIT-II RANDOM VARIABLES: Random variable concepts, probability mass function, probability distribution function, Example random variables and distributions: Uniform, Gaussian, Poisson, Rayleigh, Exponential, Conditional distribution and density, Joint cumulative distribution and probability density functions and their properties.

UNIT-III EXPECTATION AND MOMENTS OF RANDOM VARIABLES: Average value of a random variable, Variance of a random variable, moments of random variables, Distribution and density of sum of random variables, Mean and variance of the sum of random variables, Correlation of random variables.

UNIT-IV RANDOM PROCESSES - TEMPORAL CHARACTERISTICS: The random process concept, Stationarity and independence, Mean and covariance functions, Ergodicity, Correlation functions, Gaussian random process, Poisson random process.

UNIT-V SPECTRAL CHARACTERISTICS OF RANDOM PROCESSES: Power density spectrum and its properties, Relationship between power spectrum and autocorrelation function, White and colored noise, Response of a product device for random signal input, Transmission of random process through LTI system, autocorrelation and spectral density of response.

Text Books:

1. Principles of Communication Systems by Taub and Schilling, Tata McGraw Hill.
2. Probability, Random Variables and Random Signal Principles, P. Z. Peebles, Tata McGraw Hill.

Reference Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education

2. A. Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.

3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International

Course Outcomes:

At the end of this course students will be able to

1. Define probability and interpret probability by modeling sample spaces.
2. Formulate fundamental probability distribution and density functions
3. Determine various moments of one and multiple random variables.
4. Investigate temporal and spectral characteristics of random processes
5. Understand propagation of random signals in LTI systems.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Analog Communication Laboratory** Code: **B028421(028)**
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1.To study Amplitude Modulation on trainer kit.

2. To study Amplitude Demodulation on trainer kit.

3. To study Frequency Modulation and to trace the frequency modulated waveform on CRO using trainer kits.

4. To study Frequency Demodulation using trainer kits.

5. Design of a Frequency Demodulator Using PLL

6. To study a radio receiver having medium frequency reception.

7. To plot amplitude modulated signal and to calculate modulation index

8. To design and obtain characteristics of a mixer Circuit.

9. To generate SSB-SC signal and to study its characteristics.

10. To generate DSB-SC signal using Balanced Modulator and to study its characteristics.

11. To design a Ring Modulator and to study its characteristics.

12. To design a Square Law Detector using diode and to study its V-I characteristics.

13. To design and study an Envelope Detector.

14. To study the Time division multiplexing and de-multiplexing.

15. To study the Frequency division multiplexing and de-multiplexing.

16. To observe the effect of pre-emphasis and de-emphasis on a given input signal.

(Along with the above experiments, Simulators may be used to give idea about various communication techniques.)

List of Equipments/Machine Required:

Discrete Components, Function Generator, Power Supply, CRO, Communication trainer kits, Modulated Signal Generator, Transmission Line, related software like COMMSIM etc..

Reference Books: 1.Radio Communication by G.K Mithal, Khanna Publishers.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Analog Circuits Laboratory** Code:B028422(028)
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To draw Static input characteristics curves of CE transistor and determine its h-parameter values.
2. To draw Static output characteristic curve CE transistor and determine its h-parameter values.
3. To draw Static input characteristic curve of CB transistor and determine its h-parameter values.
4. To draw Static output characteristic curve of CB transistor and determine its h-parameter values.
5. To design and study the frequency response of single stage CE transistor amplifier and determine its Bandwidth.(with and without bypass capacitor).
6. To find input and Output impedances of single stage CE amplifier.
7. To study the frequency response of RC coupled double stage CE transistor amplifier and determine its Bandwidth.
8. To study the frequency response of RC coupled double stage CE transistor amplifier with voltage feedback and determine its Bandwidth.
9. To study the frequency response of RC coupled double stage CE transistor amplifier with current feedback and determine its Bandwidth.
10. To Design Wein Bridge Oscillator and determine the frequency of Oscillation.
11. To Design RC phase shift oscillator and determine the frequency of Oscillation.
12. Study of various topologies of feedback amplifier.
13. Experiment with Darlington pair amplifier.

List of Equipment's/Machine Required:

Circuit components, Power supply, CRO, Function generator, Multimeter, Breadboard.

Reference Books:

1. Lab Manual Of Electronic Devices by Paul B Zbar.
2. Lab Manual of Basic Electronics by David Bell.
3. Electronic Devices Systems and Applications by Robert Diffenderfer, Cengage learning.

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Programming using Python** Code:B028423(028)
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Write a program to demonstrate basic data type in python.
2. Write a program to takes 2 numbers as command line arguments and perform their arithmetic operation (addition, subtraction, multiplication, division).
3. Write a program for checking whether the given number is an even number or not.
4. Write a program to calculate the Simple Interest and Compound Interest.
5. Write a program to find the largest of three numbers. (Without MAX or MIN function call).
6. Write a Python program to convert binary to decimal and decimal to binary.
7. Write a program to compute the exponential series.
8. Write a program for checking whether a given string is palindrome or not.
9. Write a program to Compute a sine series and plot the same using matplotlib module.
10. Write a program to Compute a cosine series and plot the same using matplotlib module.
11. Write a program to find a factorial of a number.
12. Write a program to generate a Fibonacci series.
13. Write a program to calculate the GCD of two numbers.
14. Write a program to demonstrate while loop and While loop with else in python.
15. Write a program to construct a pyramid of digits.
16. Write a program to illustrate the function with no arguments and no return value.
17. Write a program to illustrate the function with arguments and no return value.
18. Write a program to illustrate the function with arguments and return value.
19. Write a program to illustrate the function to compute the standard deviation of a list of numbers.
20. Write a program to print all the odd, even and prime numbers up to 100 in a table like format.
21. Write a program to open a website.
22. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
23. Write a program to compute the number of characters, words and lines in a file.
24. Write a program to count frequency of characters in a given file, Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
25. Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation.
26. Write a program to implement Merge sort.

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List of Equipment's/Machine/Software Required:

- **Software Tools:** Anaconda, Python(x,y),
- **Online Compiler**
  1. **https://www.w3schools.com/python/python_compiler.asp**
  2. **https://www.programiz.com/python-programming/online-compiler/**

Reference Books:

1. Beginning Python, by Peter Norton, Alex Samuel, David Aitel, Eric Foster-Johnson,

   Leonard Richardson, Jason Diamond, Aleatha Parker, Michael Roberts

   Publisher: Wiley Publishing, Inc

2. Python For Beginners: A Crash Course Guide To Learn Python in 1 Week, by Timothy C. Needham
   Publisher: White flower publishing

Online Resources:

https://docs.python.org/3/tutorial/

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: IV

Subject: **Virtual Laboratory** — Code:B028424(028)
Total Lab Periods: 36 — Batch Size: 30
Maximum Marks: 40 — Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Washing machine control using basic AND and NOT gates
2. Basics of OR gate and its application in industrial control
3. Basics of NOT gate and its application in an eight bit ones complement circuit
4. Basic NOT gate and its application in fuel level indicator
5. Seat belt warning system using basic AND and NOT gates
6. Basics of AND gate and its application in car wiper control
7. Water level control using basic AND and NOT gates
8. Electronic lock using basic logic gates
9. Universal NAND gate and its application in level monitoring in chemical plant
10. Universal NOR gate and its application in automobile alarm system
11. XOR gate and its application in staircase light control
12. Majority circuit using basic logic gates
13. Cockpit warning light control using basic logic gates
14. DIY Build your own combinational logic circuit using generalized simulator

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Common to All Branches** Semester: **IV**

Subject: **Indian Culture and Constitution of India** Code: B000406(046)

Total Theory Periods: **2/Week** Total Tutorial Periods: **NIL**

Assignments: **Two (Minimum)** Total Marks in ESE: **NIL** Marks in TA: **10**

Objective: The Constitution is the supreme law and it helps to maintain **integrity** in the society and to promote unity among the citizens to build a great nation. The main objective of the Indian Constitution is to promote harmony throughout the nation.

Course Objectives

Upon completion of this course, the student shall be able

- To understand Meaning and concepts of Traditional and Modern of Culture
- To understand Sources of the Study of Indian Culture
- To Enable the student to understand the history and importance of constitution
- To understand philosophy of fundamental rights and duties
- To understand the powers and functions of executive, legislature and judiciary
- To understand the powers and functions of state government
- To understand the recent trends in Indian constitutional and election commission of India.

To understand the central and state relation, financial and administrative.

UNIT-I

Meaning and concepts of Culture: Traditional and Modern concepts of Culture-Notions of Culture in textual tradition, anthropological, archaeological and sociological understanding of the term culture. Elements of Culture, concept of Indianness and value system. Relation between culture and civilization. Historiography and approaches to the study of Indian Culture– Stereotypes, Objectivity and Bias, Imperialist, Nationalist, Marxist and Subaltern. Heritage of India and world's debt to Indian Culture.

UNIT–II

Sources of the Study of Indian Culture: Archaeological: cultural remains, Monuments, Numismatics, Epigraphy; Literary sources and Oral traditions; Foreign Accounts; Archival sources.

UNIT–III

History of Indian Constitution Constitutional History, Preamble salient features, citizenship, Method of Amendment and Recent Amendments. **Rights and Duties** Fundamental Rights and Directive Principles of State Policy. Fundamental Duties. Difference between Fundamental Rights and Directive Principles of State Policy

Union Government a) President-powers and functions. Vice president powers and functions, Prime Minister and council of ministers powers and functions. b) Parliament- Loksabha, Rajyasabha- composition powers and functions.
c) Judiciary (Supreme Court) composition powers and functions Judicial Activism

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UNIT–IV

State Government a) Governor: powers and functions b) Chief minister: powers and functions c) State Legislative Assembly and Legislative Council- composition powers and functions. d) High Court : composition powers and functions

UNIT–V

Recent Trends in Indian Constitutional a) Basic structure of Indian Constitution. b) Electoral Reforms c) Panchayati Raj system in India.

Books of Reference

1. Dr. P. K. Agrawal **Indian Culture, Art and Heritage,**

2. P. Raghunadha Rao **Indian Heritage and Culture**

3. M.V.Pylee, An Introduction to the Constitution of India,NewDelhi,Vikas,2005.

4. Subhash C.Kashyap, Our Constitution: An Introduction to India's Constitution and constitutional Law, New Delhi, National Book Trust, 2000.

5. Durga Das Basu, Introduction to the Constitution of India ,NewDelhi,Prentice Hall of India,2001.

6. D.C.Gupta, Indian Government and Politics,VIII Edition,New Delhi, Vikas, 1994.

7. V.D.Mahajan, Constitutional Development and National Movement inIndia, New Delhi, S. Chand and Co., latest edition.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Digital Communication**	Code: **C028511(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To study signal space representation of signals and discuss the process of sampling, quantization that are fundamental to the digital transmission of analog signals.
2. To study baseband and band pass signal transmission and reception techniques.
3. To study digital modulation methods and optimum receiver.
4. To study the noise in digital communication, correlator, optimum filter, matched filter.

Unit-1-Basics of Digital Communication: Sampling theorem: Low pass signal, Band-pass signal, Aliasing effect, Interpolation Formula, Natural sampling, Flat-top sampling, Signal recovery through holding, Generation and Detection of PAM, PWM, PPM. TDM-PAM, Aperture Effect, Channel bandwidth for PAM signal, TDM, Multiplexing T1 Lines-The T2, T3, T4 Lines.

Unit-11-Digital transmission of analog data: Quantization: Quantization of signals, PCM, TDM-PCM system, Companding (u-law, A- law) DPCM, Delta modulation, Adaptive delta modulation, Continuously variable slope delta modulator (CVSD). Noise in PCM and DM: PCM transmission: Calculation of SNR in PCM. Delta modulation transmission: signals to quantization noise ratio Calculation.

Unit-111-Principle of digital data transmission: Digital communication system, Line coding: PSD of various line codes, Polar signaling, On-Off signaling, Bipolar signaling, Pulse shaping: Nyquist criterion for zero ISI, Scrambling, Regenerative repeater: Eye diagram, Detection error probability for polar signal, ON-Off and bipolar signals.

Unit 1V-Digital modulation techniques: Fundamentals of BASK, BPSK and BFSK, Generation, detection, spectrum and geometrical representation of BPSK and BFSK, Fundamentals of DPSK, DEPSK and QPSK, Generation and detection of DPSK, DEPSK and QPSK, Signal space representation of QPSK. M-ary PSK. MSK Signaling Scheme.

Unit-V-Spread spectrum modulation : Introduction , Direct sequence (DS) Spread Spectrum, use of spread spectrum with CDMA, ranging using DS spread spectrum, Frequency hopping spread spectrum, generation and characteristics of PN sequences, acquisition of FH signal, tracking of FH signal, acquisition and tracking of a DS signal.

Name of Text Book:

1. Principles of communication system by Taub & Schilling, 3 rd Ed., McGraw-Hill Education (unit I, unit II, unit IV, unit V)

2. Modern Digital and Analog Communication Systems by B.P. Lathi,3 rd Ed., Oxford university press (unit III).

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Reference books

1. Fundamentals of communication systems by John.G. Proakis, Pearson education, 2006.
2. Communication system by A. Bruce Carlson, Paul Crilly, Paul B. Crilly, McGraw-Hill Education
3. Digital communications by Simon Haykin, Wiley India Private Limited,2006.

Course outcome:

1. Design digital communication systems, given constraints on data rate, bandwidth, power, fidelity, and complexity.
2. Analyze the performance of a digital communication in terms of probability of error of digital modulation Technique.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Design of Electronics Circuit** Code: **C028512(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To design simple circuits like amplifiers using op-amps.
2. To design linear and non-linear applications of operational amplifiers.
3. To Gain knowledge about A/D and D/A converters
4. To gain knowledge in designing a stable voltage regulators
5. To introduce the theory and applications of analog multipliers and PLL.

UNIT I Fundamentals of differential amplifiers and operational amplifiers: Current mirror, BJT differential amplifier analysis using r-parameters. Introduction to operational amplifier :op-amp Symbol , Block schematic of op-amp, Ideal op-amp characteristics, AC and DC characteristics, Open loop configuration of op-amp, Closed loop configuration of op-amp: Voltage series feedback amplifier, Voltage shunt feedback amplifier, Differential amplifier. The practical opamp: Input offset voltage, Input bias current, Input offset current, Total output offset voltage, Thermal drift. Frequency response of an op-amp: Frequency response, Compensating networks, Slew rate.

UNIT II Operational amplifier applications: Basic op-amp circuits: Summing, Scaling and Averaging amplifiers. Current to voltage and Voltage to current converter, Bridge amplifier, Instrumentation amplifier, Differentiator, Integrator, Non-linear Circuits: Logarithmic Amplifiers, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square wave generator and Triangular Wave Generator, Monostable Multivibrator. IC Analog Multiplier applications: Divider circuit, Square rooting circuit, RMS detector.

UNIT III Active Filters: Introduction to filtering: Frequency response, Characteristics and terminology, advantage of Active filters, Design of Low –pass Butterworth Filters, Sallen and key Circuits, Resistive gain Enhancement, RC-CR Transformation, Design of Band – pass Butterworth Filters, Deliyannis-Friend Circuit, Stagger-Tuned Band pass filter Design, Q Enhancement of the Friend circuit. Design of Low – pass and Band-pass Chebyshev Filters, Sensitivity concepts and their Application to Sallen and key Circuits.

UNIT IV Special ICs: 555 Timers ICs and their Applications: missing pulse detector, Pulse Width modulation, FSK Generator, Pulse position modulator. IC 565 PLL and its Applications: Phase locked loops operation, Lock and Capture range, LM565PLL-Application of PLL as AM/FM/FSK/ detectors, frequency translators, phase shifter, tracking filter, signal synchronizer and frequency synthesizer. IC 566 Voltage controlled oscillator, Voltage Regulators: OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS.

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UNIT V Analog to digital and digital to analog converters: Sample and hold circuits and sample and hold IC (LF 398), Types of D/A converter : The binary weighted resistor network, The R-2R ladder network, The inverted ladder, D/A specification. A/D converter : Parallel-comparator type, Dual slope, Successive approximation, Voltage to time and Voltage to frequency converters, A/D specification.

Text Book:

1. Integrated Circuits by K. R. Botkar, 9th Ed., Khanna Publications (Unit-I,II)
2. Operational Amplifiers by R. Gayekwad, 4th Ed., Pearson Education(Unit-I, II,IV)
3. Analog Filter Design; Van –Valkenburg ; Holt –Standers International Edn. (Unit-III)
4. Linear Integrated Circuits by D.Roy Choudhary and Shail B Jain,3rd Ed., New Age International (Unit-IV)
5. Digital integrated Electronics by Herbert Taub and Donald Schilling, McGraw Hill (Unit- V)

Reference Books:

1. Integrated Electronics by Millman& Halkias,6th Ed., TMH Publishing Co.
2. Operational Amplifiers and Linear Integrated Circuits, Lal Kishore,2nd Ed., PHI
3. Operational Amplifiers and Linear Integrated Circuits, Coughlin and Driscoll, 6th Ed., PHI

Course Outcomes:

1. Gain knowledge about Differential amplifier and operational amplifier.
2. Designing circuits for op-amp applications.
3. Gain knowledge about A/D and D/A converters.
4. Get knowledge about various types of voltage regulator.
5. Understand PLL circuits and multiplier circuits.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Microcontroller & Embedded system** Code: **C028513(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course objectives:

- To make students familiar with the basic blocks of microcontroller device and Embedded system in general.
- To provide comprehensive knowledge of the architecture, features and interfacing with 8051 microcontroller.
- To use assembly and high level languages to interface the microcontrollers to various applications.

UNIT I Introduction to Microcontroller: A brief History of Microcontrollers, Harvard Vs Von-Neumann Architecture; RISC Vs CISC, Classification of MCS-51family based on their features (8051, 8052, 8031, 8751, AT89C51), Pin configuration of 8051.
8051 Processor Architecture and Instruction Set: Registers of 8051, Inbuilt RAM, Register banks, stack, on-chip and external program code memory ROM, power reset and clocking circuits, I/O port structure, Addressing modes, Instruction set and programming.

UNIT II Counter/Timer and Interrupts of 8051: Introduction, Registers of timer/counter, Different modes of timer/counter, Timer/counter programming, Interrupt *Vs* Polling, Types of interrupts and vector addresses, register used for interrupts initialization, programming of external interrupts, Timer interrupts.

UNIT III Asynchronous Serial Communication and Programming: Introduction to serial communication, RS232 standard, GPIB, Max 232/233 Driver, 8051 Serial Port Programming.

UNIT IV Interfacing with 8051: Interfacing and programming of: ADC (0804,0808/0809,0848) & DAC (0808), stepper motor , 4x4 keyboard matrix, LCD, Interfacing (only) of different types of Memory , Address decoding techniques.

UNIT V Embedded Systems: Introduction to an Embedded Systems, Defining the Embedded System, Real Life Examples of Embedded Systems, Characteristics of Real-Time Embedded Systems, Basics Of Developing For Embedded Systems.

Names of Text Books:

1. The 8051 Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi & McKinlay, 2nd Ed., PHI.(Unit-I,II,III,IV)
2. Embedded system, Frank Vahid.(Unit-V)

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Names of Reference Books:

1. 8051 Programming, Interfacing and Applications K. J. Ayala, Penram Pub.
2. 8 bit Microcontrollers & Embedded Systems Manual.
3. Programming and Customizing the 8051 Microcontroller, Predko; TMH
4. Microcontrollers: Architecture, Programming, Interfacing and System Design, Rajkamal, Pearson Education.

Course Outcome:.

1. To understand Microcontroller 8051 its architecture and its instruction set.
2. Gain knowledge about Counter/timer and interrupts in 8051 Microcontroller and Programming concepts.
3. Students will be able to do serial communication programming and gain knowledge of serial communication.
4. Students will be able to understand interfacing Microcontroller 8051 with devices.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Control Systems** — Code: **C028514(028)**
Total Theory Periods: 40 — Class Tests: Two (Minimum)
Total Tutorial Periods: 10 — Assignments: Two (Minimum)
ESE duration: Three Hours — Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To Impart the knowledge of fundamental concepts of Feedback control system
2. To develop the concept of Mathematical Modeling in control system
3. To analyze the concept of Stability Analysis in Time and Frequency Domain
4. To understand the designing concept of State Model

UNIT – I: **Representation of Control system :** Types of Control System : Open loop , Closed loop with examples. Evaluating Transfer function of a system using Block Diagram Representation and Signal Flow Graph techniques.

UNIT-II: Feedback Characteristics & Time response analysis of Control Systems: Reduction of parameter variation by use of feedback, Control over system dynamics by use of feedback, Control of the effects of disturbance signals by use of feedback.

Time Response Analysis: Time response of second order control system, Performance specifications, steady state error and error constants. Response with P, PI, PD and PID Controllers.

UNIT – III: Stability Analysis using Routh Hurwitz & Root Locus Technique : The concept of Stability, Routh- Hurwitz stability criterion , Relative stability analysis, Introduction to The Root locus concept, Construction of Root loci, Performance analysis of control system using Root loci

UNIT – IV: Frequency Response Analysis using Polar and Bode Plot: Introduction, Correlation between Time and Frequency Response, Polar Plots, Bode Plots, Gain Margin, phase Margin , All-Pass , Minimum and non minimum phase System.

UNIT – V:Frequency Response Analysis and State Variable Analysis : Nyquist Stability Criteria, Assessment of stability using Nyquist Plot.

State Variable Analysis: Concepts of state, state variables and state model, State models for linear continuous time systems, Diagonalization, Solution of state equations, Concepts of controllability and observability.

Names of Text Books:

1. Control System Engineering , Nagrath and Gopal , New Age International Publications
2. Automatic Control System, B. C. Kuo, PHI publication
3. Linear Control System, B.S. Monke, Khanna Publishers

Names of Reference Books:

1. Modern Control Engineering, Ogata , Pearson Publication
2. Modern Control Engineering, Roy Choudhury, PHI publication

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Course Outcome:.

On successful completion of the course, the student will be able to:

1. Model physical control systems using BDRT, SFG.
2. Analyze feedback characteristics and time response analysis of P, PI, and PD & PID Controllers.
3. Analyze the stability of control system in time domain using Routh- Hurwitz and Root-locus techniques.
4. Analyze the stability of control system in frequency domain using Polar plots, Bode plots and Nyquist Plots.
5. Analyze and design the state model of feedback controllers.

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Digital Communication Laboratory** Code: **C028521(028)**
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To study Signal sampling and reconstruction techniques.
2. To study the effect on reconstructed waveform of the use of sample / hold circuit.
3. To study the TDM Pulse Amplitude Modulation / Demodulation & to draw their waveforms.
4. To study Time Division Multiplexing of Pulse Code Modulation /Demodulation
5. To study A-Law and μ-Law Companding.
6. To perform experiment with delta modulation techniques and to study the waveforms.
7. To perform experiment with adaptive delta modulation techniques and to study the waveforms.
8. To study the Equalizers Circuits.
9. To study ASK Modulation.
10. To study FSK Modulation.
11. To study PSK Modulation.
12. To study ASK Demodulation.
13. To study FSK Demodulation.
14. To study PSK Demodulation.
15. To study DPSK generation and detection.
16. To study QPSK generation and detection.
17. To study the effect of Noise in digital modulation techniques.

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List of Equipments/Machine Required:

- Communication Trainer Kits, Function Generator, Power Supply, CRO, Discrete Components.
- Experiments can be implemented in hardware circuits or Simulated using C, C++, Simulation Software.

Recommended Books:

1. Principles of Communication Systems –Taub and Shilling, Tata McGraw Hill.
2. Handbook of Experiments in Electronics and Communication Engineering, Rao, Vikas Publishing House Pvt. Ltd.

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Design of Electronics Circuit lab** Code:**C028522(028)**
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To design an inverting and non-inverting amplifier using OPAMP (741) and study its frequency response.
2. To design a summing amplifier using op-amp (741).
3. To design a differential amplifier using op-amp (741) and find its CMRR.
4. To determine SVRR and slew rate of an op-amp (741).
5. To measure the input impedance of an voltage follower using op-amp (741)
6. To measure input offset voltage, input bias current and input offset current for op-amp 741.
7.To design an op-amp integrator circuit and analyze outputs for different input signals.
9. To design an op-amp Differentiator circuit and analyze outputs for different input signals.
10.To design and study comparator circuit using op-amp (741).
11.To design a Sample & Hold circuit and to study its output response
12.To design a square rooting circuit using multiplier.
13. To design chebyshev filter using OPAMP and to plot its frequency response.
14. To design All Pass filter using OPAMP and to plot its frequency response.
15. To design Band-pass filter using OPAMP and to plot its frequency response.
16. To design HPF using OPAMP.
17. To design LPF using OPAMP.
18. To design an application of 555 timer in monostable mode.
19.To design an application of 555 timer in astable mode.
20. To study the voltage regulation of 78XX and 79XX series of voltage regulators.
21. To design a DAC using Weighted Resistor method.
22. To design a ADC using parallel comparator method.

List of Equipments/Machine Required:
Discrete components, Power Supply, Function Generator, CRO

Recommended Books:
Laboratory Manual for Operational Amplifiers and Linear ICs, David Bell, PHI

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Microcontroller & Embedded systems Laboratory** Code: **C028523(028)**
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Write a microcontroller 8051 program to transfer the bytes into RAM locations starting at 50H,assuming that ROM space starting at 240H contains CHHATTISGARH by using – a) Counter, b) null char. for end of string .
2. Write a microcontroller 8051 program to get hex data on the range of 00-FFh from port 0 and convert itto decimal. Save the digits in R7, R6 and R5, where the least significant digit is in R7.
3. Write a microcontroller 8051 program to add two 16 Bit unsigned numbers. Operands are two RAM variables. Results to be in R1-R0 pair.
4. Write a microcontroller 8051 program to subtract an unsigned 16 Bit number from another. Operandsare two RAM variables. Results to be in R1-R0 pair.
5. Write a microcontroller 8051 program to add two unsigned 32-bit numbers. Operands are two RAMvariables. Results to be in R1-R0 pair.
6. Write a microcontroller 8051 program to add two 16 Bit signed numbers.
7. Write a microcontroller 8051 program to convert a binary number to equivalent BCD
8. Write a microcontroller 8051 program to convert a packed BCD number to two ASCII numbers and place them in R5 and R6.
9. Write a microcontroller 8051 program to calculate the square root of an 8-bit number using iterative method.
10. Write a microcontroller 8051 program that generates 2kHz square wave on pin P1.0, 2.5 kHz on pin P1.2and 25 Hz on pin P1.3.
11. Write a microcontroller 8051 program for counter 1 in mode 2 to count the pulses and display the state of the TL1 count on P2. Assume that the clock pulses are fed to pin T1.
12. Write a microcontroller 8051 program to transfer letter "N" serially at 9600 baud, continuously. Assume crystal frequency to be 11.0592 MHz.
13. Write a microcontroller 8051 program to transfer word "CSVTU" serially at 4800 baud and one stop bit, continuously. Assume crystal frequency to be 11.0592 MHz.
14. Write a microcontroller 8051 program to receive bytes of data serially, and put them in P1. Set the baud rate at 2400 baud, 8-bit data, and 1 stop bit. Assume crystal frequency to be 11.0592 MHz.

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List of Equipments/Machine Required:

Microcontroller kit, Interfacing kit, Keyboard, Monitor, SMPS for Microcontroller

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Computer Networks**	Code: **C028531(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To make students understand the basic model of data communication, OSI Model, TCP/IP suite and various concepts of networking.
2. To make students acquainted with Data Link Layer and various flow control and error control protocol.
3. To familiarize students with different LAN protocols like Ethernet, Token ring and Token Bus and FDDI.
4. To teach students about connecting devices, Network and transport layer protocols.
5. To give knowledge of the Application layer functions, protocols, switching and switched networks like ATM.

UNIT-I Introduction to Data Communication, Data networking and Internet: Communication System Model, Data Communication Networks, Protocol, Need of Protocol, TCP/IP Protocol Suite, OSI Model, Transmission Modes, Categories of Network, Topologies of Network. Signal Encoding Techniques: Digital to Digital Conversion- Unipolar, Polar: NRZ, RZ, Biphase, Bipolar, Transmission of Digital Data: DTE DCE Interface, EIA-232D,Null Modem, Modems: Traditional Modem, 56KModem.

UNIT-II Data Link Control Protocol: Data Link Layer: Design Issues, Framing, Error Detection and Correction: CRC, Elementary Protocols-Flow Control: Stop and Wait, Sliding Window, Error Control: Stop-and-Wait, Go Back-N, Selective Repeat. HDLC: Modes, Frames, Data Transparency, Bit Stuffing.

UNIT-III Local Area Network: Project802,Basicof–IEEE802.1,LLC,MAC,PDU;ETHERNET:Access Method: CSMA/CD, Implementation: Thick Ethernet, Thin Ethernet, Twisted Pair Ethernet, Switched Ethernet, Fast Ethernet, Gigabyte Ethernet, Token Ring, FDDI, Introduction to Wireless LAN-IEEE802.11 : Architecture, MAC: CSMA/CA.

UNIT-IV Internet and Transport Protocol: Principle of Internet working, Connecting devices: Repeaters, Hubs, Bridges, Routers. Internet Protocol: IP Addressing, IPV4Header,Comparison ofIPV4andIPV6, Sub netting, ARP,RARP, ICMP, IGMP. Transport Layer Protocols: UDP, TCP: TCP Header format, ISDN services.

UNIT-V Application layer and Wide Area Network: Application Layer: The Web and HTTP, FTP, SMTP, DNS, WAN: Circuit and Packet switching, Asynchronous Transfer Mode-ATM architecture: Virtual Connection, Identifiers, Cells, Connection Establishment and Release. Switching: VPC switch; ATM Layers: AAL

Name of Text Books:

1. DataCommunicationandComputerNetworkingbyB.A.Forouzan,3rdEd.,TataMcGrawHill.
2. DataandComputerCommunicationsbyWilliamStalling,7thEdition,PearsonEducation.

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Name of Reference Books:

1. Computer Networks by Andrew S Tanenbaum, 4th Edition. Pearson Education / PHI
2. An Engineering Approach to Computer Networks- S.Keshav,2nd Edition, Pearson Education
3. Understanding communications and Networks,3rd Edition, W.A Shay, Thomson

Course Outcomes:

1. Students will be able to understand the working of internet based on OSI model and TCP/IP protocol suite.
2. Students will be able to analyze practical requirements of LAN on the basis of various topologies , signaling techniques and various interfaces.
3 Students will have deep understanding of various protocols usedat Data Link Layer and will be able to analyze the advantages and disadvantages of various available protocols for flow and error control.
4. Students will be able to analyze various Ethernet standards ,other standards and will be able to choose an appropriate standard according to requirement of LAN.
5. Students will be able to identify various internetworking devices and formation of Headers of IP and TCP.
6. Students will get idea about various Application layer functions and some protocols along with switching techniques and ATM.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Computer organization & Architecture**	Code: **C022534(022)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course objective:

- To know about Central processor organization.
- To know about Control unit organization.
- To provide an Insight into Arithmetic processor design.
- To provide an insight into Input/output organization & Memory organization.

UNIT I Central Processor organization: Bus organized computer, Memory address structure, Memory data register, program counter, Accumulator, Instruction register, Program counter, Accumulator, Instruction register, Instruction field, Micro operations, Register transfer languages, Instruction field, Decoding and execution, Instruction formats and addressing modes.

UNIT II Control unit organization : Instruction sequencing, Instruction interpretation, Hardwired control, Micro- programmed control organization, Control memory, Address sequencing, Micro-instruction, Formats, Micro-program sequence, Microprogramming.

UNIT III Arithmetic processor design: Addition and subtractions algorithm, Multiplication algorithm, Division algorithm Processor configuration, Design of control unit and floating point arithmetic.

UNIT IV Input Output organization: Programmed I/O., I/O, addressing, I/O instruction, Synchronization, I/O interfacing, Interrupt mechanism, DMA, I/O processors and data communication, RISC, CISC, Loosely Coupled & Tights Coupled system.

UNIT V Memory organization and multiprocessing: Basic concepts and terminology, Memory hierarchy, Semiconductor memories (RAM, ROM), Multiple module, Memories and interleaving (Virtual memory, Cache memory, Associative memory), Memory management hardware requirements, RISC & CISE Processor.

Name of Text Books:

1.Computer System Architecture by M. Morris Mano, PHI
2.Computer Organization Architecture by J.P. Hayes, PHI

Name of Reference Books:

1.Digital Computer Logic Design By M. Morris Mano, PHI
2.Structured Computer Organization by Andrew S. Tanenbaum PHI
3.Computer Organization and Design, Pal-Chauduri, PHI

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Course Outcomes:

At the end of the course

- Student will be able to understand Central processor organization.
- Student will be able to understand Instruction set and micro programming.
- Student will be able to understand Algorithm in arithmetic control unit.
- Student will be able to understand Input/output and memory organization

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Nano Electronics**	Code: **C028532(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives

The objective of this course is to familiarize the students with the concepts of Nano electronics. The course intends to give students a broad understanding of:

a) Fundamentals, fabrication technologies and applications of nanoscale structures.
b) Device application of nanostructures in electronics.
c) Concepts of Carbon nanotubes and their applications.
d) Fundamentals of molecular electronics and their applications.

UNIT I -INTRODUCTION TO NANOTECHNOLOGY : Background to Nanotechnology: General concepts in Nanotechnology, Introduction to the principles of quantum mechanics, Quantization effects, Wave-particle duality, Classification of different areas of Nanotechnology, Top- down and Bottom -up approach.

Nano material preparation- Plasma Arcing, Chemical Vapor Deposition, Sol-Gels, Electro deposition, Ball Milling, Molecular Beam Epitaxy.

Characterization techniques: Electron Microscopy, Scanning Probe Microscopy, Raman Microscopy, UV-Vis absorption spectroscopy, Fourier Transform Infra- red Spectroscopy

UNIT II -FUNDAMENTALS OF NANOELECTRONICS : Electron transport in semiconductors and nanostructures: Time and length scales of the electrons in solids, Statistics of electrons in solids and low-dimensional structures - Electron transport in nanostructures.
Two-dimensional semiconductor nanostructures, Quantum wells, wires and dots, Strained layers, Effect of strained layers, MOSFET structures, Heterojunctions, Superlattices.
Fundamentals of logic devices: requirements, dynamic properties, threshold gates, classifications of logic devices: two terminal devices, field effect devices, coulomb blockade devices, spintronics.

UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES : Silicon MOSFETs - Novel materials and alternate concepts: -Scaling rules, Silicon-dioxide based gate dielectrics, Metal gates, Junctions & contacts, Advanced MOSFET concepts. Quantum transport devices based on resonant tunneling: Electron tunneling – resonant tunneling diodes, Resonant tunneling devices;

Single electron devices for logic applications, applications of single electron devices to logic circuits.

UNIT IV-CARBON NANOTUBES : Fullerenes, types of nanotubes, Formation of nanotubes, Assemblies, Purification of carbon nanotubes, Electronic properties, Synthesis of carbon nanotubes.

Functionalization of Carbon Nanotubes: covalent functionalization of CNTs, non-covalent functionalization of CNTs, Carbon nanotube interconnects, Carbon nanotube FETs, Nanotube for memory applications, Prospects of all carbon nanotube nanoelectronics, Graphene transistors and circuits. Sensor applications of CNTs. Computer applications (Nano chip), Optical and telecommunication applications.

UNIT V-MOLECULAR ELECTRONICS

Electrodes & contacts, Functions, Molecular electronic devices, First test systems, Simulation and circuit design, Fabrication, Future applications: MEMS, NEMS, Robots, Random access memory – mass storage devices.
Electronic Circuits & Applications**:** Vertical Transistors: Fin-FET circuits and applications, Surround Gate FET,MODFETs.
Heterojunction bipolar transistor, Hybrid Nano/CMOS circuits and applications, Nanowire arrays, Quantum dot lasers, Quantum Well modulators, OLED'S.

Text Books

1. Nanoelectronic Circuit Design, N.K Jha, D Chen, Springer
2. Nanotechnology and Nanoelectronics, W.R.Fahrner, Springer
3. Nanotechnology in Microelectronics & Optoelectronics, J.M Martine Duart, R.J Martin Palma, F. Agullo Rueda, Elsevier

Reference Books

1. Nanoelectronics, K. Iniewski, McGraw-Hill
2. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003.
3. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007

Course Outcomes

Upon the successful completion of the course, students will be able to:

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- Discuss the types of nanotechnology, molecular technology and the preparation of nano materials.
- Explain the fundamentals of electron transport, semiconductor nanostructures and devices such as logic devices, field effect devices, and spintronics.
- Describe the concepts of silicon MOSFET and Quantum Transport Devices and single electron devices.
- Explain the functionalization as well as summarize the types, synthesis, interconnects and applications of carbon nano tubes.
- Explain the concepts, functions, fabrications and applications of molecular electronics.

Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: V

Subject: **Optoelectronic devices and circuits** Code: **C028533(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives

1. Explain key concepts in quantum and statistical mechanics relevant to physical, electrical and optoelectronic properties of materials and their applications to optoelectronic devices and photonic integrated circuits that emit, modulate, switch, and detect photons
2. Describe fundamental and applied aspects of optoelectronic device physics and its applications to the design and operation of laser diodes, light-emitting diodes, and photo detectors.
3. Describe techniques to improve the operation of optoelectronic devices and device characteristics that have to be optimized for new applications by employing their understanding of optoelectronic device physics

UNIT I Optical processes in semiconductors – electron hole recombination, absorption, Franz-Keldysh effect, Stark effect, quantum confined Stark effect, deep level transitions, Auger recombination

UNIT II Lasers – threshold condition for lasing, line broadening mechanisms, axial and transverse laser modes, heterojunction lasers, distributed feedback lasers, quantum well lasers, tunneling based lasers, modulation of lasers.

UNIT III Optical detection – PIN, APD, modulated barrier photodiode, Schottky barrier photodiode, wavelength selective detection, microcavity photodiodes.

UNIT IV Optoelectronic modulation - Franz-Keldysh and Stark effect modulators, quantum well electro-absorption modulators, electro-optic modulators, quadratic electro-optic effect quantum well modulators, optical switching and logic devices

UNIT V Optoelectronic ICs – hybrid and monolithic integration, materials and processing, integrated transmitters and receivers, guided wave devices

Name of Text / Reference Books:

1. Semiconductor Optoelectronic Devices, Pallab Bhattacharya, 2 nd Ed; Pearson Education, 2002
2. Photonics: Optical Electronics in modern communication, Amnon Yariv & Pochi Yeh, 6 th Ed; Oxford Univ. Press, 2006
3. Fundamentals of Photonics, B E Saleh and M C Teich, Wiley-Interscience; 1991

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Course Outcomes

By the end of the course, students are expected to learn

- The skill of designing and setting up experiments to characterize LEDs, laser diodes, optical amplifiers, photodiodes, solar cells and electro-optics modulators.
- Understand the basic working mechanism of the devices,
- Have the practical knowledge and an understanding of the trade-offs when using these devices in their respective applications.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: V

Subject: **Advanced Data Structures and Algorithms**	Code: **C022535(022)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

- Understand and apply linear data structures-List, Stack and Queue.
- Understand the graph algorithms.
- Learn different algorithms analysis techniques.
- Apply data structures and algorithms in real time applications
- Able to analyze the efficiency of algorithm.

UNIT I Linear Data Structures : Introduction - Abstract Data Types (ADT) – Stack – Queue – Circular Queue - Double Ended Queue - Applications of stack – Evaluating Arithmetic Expressions - Other Applications - Applications of Queue - Linked Lists - Singly Linked List - Circularly Linked List - Doubly Linked lists – Applications of linked list – Polynomial Manipulation.

UNIT II Non - linear Tree Structures Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm - Binary search tree - Balanced Trees - AVL Tree - B-Tree - Splay Trees – Heap operations- -Binomial Heaps - Fibonacci Heaps- Hash set.

UNIT III Graphs: Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs - Topological sort – shortest-path algorithms - Dijkstra‟s algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms.

UNIT IV Algorithm and Analysis: Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Optimal Binary Search Tree - Warshall‟s Algorithm for Finding Transitive Closure.

UNIT V Advanced Algorithm Design and Analysis: Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem-Amortized Analysis.

Text / Reference books:

1.Anany Levitin “Introduction to the Design and Analysis of Algorithms” Pearson Education, 2015
2. E. Horowitz, S. Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, 2007

3. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms/C++", Second Edition, University Press, 2007
4. Gilles Brassard, "Fundamentals of Algorithms", Pearson Education 2015
5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford University Press 2015
6. John R. Hubbard, "Data Structures with Java", Pearson Education, 2015
7. M. A. Weiss, "Data Structures and Algorithm Analysis in Java", Pearson Education Asia, 2013
8. Peter Drake, "Data Structures and Algorithms in Java", Pearson Education 2014
9. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Thrid Edition, PHI Learning Private Ltd, 2012
10. Tanaenbaum A.S., Langram Y. Augestein M.J, "Data Structures using C" Pearson Education , 2004.
11. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983

Course Outcomes:

1: Describe, explain and use abstract data types including stacks, queues and lists
2: Design and Implement Tree data structures and Sets
3: Able to understand and implement non linear data structures - graphs
4: Able to understand various algorithm design and implementation

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: **B Tech**
Subject: **Environmental Studies**
Period per week (L-T-P): **(2-0-0) / Week**
Total Contact Hours: **40**

Semester: **V**
Code: C000506(020)
Non-Credit
No. of assignments to be submitted: **05**

PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:
1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

COURSE DETAILS:

UNIT I: Introduction to environmental studies, ecology and ecosystems **(06 hours)**

Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II: Biodiversity and conservation **(06 hours)**

Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III: Natural resources and environment **(08 hours)**

Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV: Human communities, social issues and environment **(08 hours)**

Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V: Environmental pollution, policies, legislations, assessment and practices **(12 hours)**

Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

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On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO):
On completion of the course, students will able to:

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.

TEXT BOOKS:

1. De, A.K., (2006).*Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006).*Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971).*Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005).*Ecology and Environment*. Rastogi Publications.

OPEN SOURSE LEARNING:

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **VLSI design**	Code: **C028611(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To understand the IC design aspects, basic fabrication steps.
2. To study the design rules & representation of circuits at lower level of abstraction.
3. To understand the layout design of few combinational and sequential circuits.
4. To study one of the HDL (hardware description language) for front end design.
5. To study internal structure of programmable logic devices.

UNIT I An Overview & Analysis of CMOS Integrated Circuits: Complexity and Design: Design Flow, VLSI Chip Types, Moore's Law; MOSFETs as Switch: FET Threshold Voltages, Pass Characteristics; Basic Logic Gates in CMOS: NOT Gate, NOR Gate, NAND Gate; Complex Logic Gates in CMOS: Structured Logic Design, XOR and XNOR Gates; Transmission Gate Circuits: Multiplexers, OR Gate, XOR/XNOR Gate. DC characteristics of the CMOS inverter, Switching Characteristics: Fall Time, Rise Time, Propagation Delay; Power Dissipation.

UNIT II Fabrication & Physical Design of CMOS Integrated Circuits: CMOS Layers; Designing FET Arrays; Basic Gate Designs; Complex Logic Gates; Euler Graph; Overview of Silicon Processing; Material Growth and Deposition; Lithography; CMOS Process Flow; CMOS Design Rules; Layout of Basic Structures: nWell, Active Areas, Doped Silicon Regions, MOSFETs, Active Contacts, Metal, Vias; Physical Design(Stick diagram &Layout Design) of Logic Gates: NOT, NAND & NOR.

UNIT III CMOS Subsystem Design: Schematic and Layout of CMOS Combinational Circuits: Full adder circuit, Multiplexer, Parity Generator, Schematic and Layout of CMOS Sequential Circuits: SR FlipFlop, JK Flip-Flop, & D Flip-Flop, 4x4 NOR based ROM Array, 4x4 NAND based ROM Array; Schematic of SRAM Schematic and operation of DRAM: 3-T DRAM 6-T DRAM;

UNIT IV Implementation Technology & Introduction to VHDL: Implementation Technology: CPLD Architecture, FPGA Architecture, LUT Design; Brief history of VHDL, Entity Declaration, Architecture Declaration, Modeling styles: Data Flow, Structural, Behavioral and Mixed Style. Assignment Statements, Select Signal Assignment, Conditional Signal Assignment, Component Declaration, Generate Statements, Concurrent and Sequential Assignment Statement, Process Statement, Case Statement. VHDL operators. VHDL programming of Multiplexer, Decoder, Encoder, Half Adder, Full Adder, 4-bit Adder, ALU.

UNIT V Sequential Logic Design using VHDL: VHDL Programming for D-Latch, SR Flip-Flop, JK Flip-Flop, T Flip-Flop& D Flip-Flop, Shift Registers, Synchronous Counter: UP counter, Down counter, BCD counter; Moore Finite State Machine for Sequence Detector, MOD counter & Serial Adder. Mealy

Finite State Machine for Sequence Detector, MOD counter & Serial Adder. Test Bench design for Half Adder, Full adder & D Flip-Flop.

Textbooks:

1. Introduction to VLSI Circuits and Systems: John P. Uyemura, John Wiley & Sons (Unit-I & II).
2. CMOS Digital Integrated Circuits: Analysis & Design; Sung-Mo Kang & Yusuf Leblebici, TMH, (Unit-III)
3. Fundamentals of Digital Logic with VHDL Design, Brown, TMH Pub. (Uni- IV & V)
4. VHDL Primer by J. Bhaskar, PHI(Unit-IV & V)

Reference Books:

1. CMOS VLSI Design: A Circuits and Systems Perspective by Weste, Pearson Education Pub.
2. Basic VLSI Design by Pucknell&Esharghian,3rd Ed., PHI Pub.
3. CMOS circuit design, layout and simulation by Jacob Baker, PHI

Course Outcomes:

1. Students are expected to understand CMOS fabrication details.
2. Students are expected to understand schematic, layout of combinational circuits.
3. Students are expected to understand schematic, layout of sequential circuits.
4. Students are expected to understand VHDL programming concepts.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **Antenna & Wave Propagation** Code: **C028612(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To study uniform plane wave propagation in different media and wave polarization
2. To study guided wave propagation in metallic wave guides
3. To study radio wave propagation
4. To study the concept of radiation and analyze radiation characteristics of a current element and dipole
5. To study antenna fundamentals and antenna arrays: uniform and tapered and their design
6. To study some practical antennas like Rhombic, Loop, Yagi and microstrip antenna.

UNIT – I Waveguides: Wave propagation between two infinite parallel conducting plane: TE and TM modes; Properties of TE and TM modes, TEM waves; Rectangular and Circular waveguides: TE and TM modes, dominant modes, characteristics: attenuation and phase constants, phase and group velocities, cut-off wavelengths and frequencies, guide wavelength, field pattern and wave impedance.

UNIT – II Wave Propagation: Sky wave, surface wave and space wave; Ionospheric propagation- refractive index at high frequencies; Mechanism of radio wave bending, critical frequency; effect of earth's magnetic field; Effective dielectric constants and conductivity, MUF, skip distance, optimum working frequency; Multihop propagation; Ionoshperic abnormalities; Troposhperic propagation, field strength of troposhperic wave; Effect of earth's curvature and dielectric constant; Troposhperic scatter and Duct propagation.

UNIT – III Antennas and Radiation: Electromagnetic radiation; Retarded potentials; Short electric dipole, radiation from a small current element, radiated power and radiation resistance; Radiation from a half wave dipole and its radiation resistance; Isotropic radiator; radiation pattern; Radiation Intensity; Antenna Gain: directive gain and power gain; Antenna directivity; Effective length and effective aperture of antennas; Beam width; Bandwidth; Beam area; FBR, Self impedance of antennas, Antenna efficiency; Reciprocity theorem and its application.

UNIT – IV Antenna Arrays and their design: Various form of array: broadside, end fire, collinear and parasitic arrays; Arrays of two isotropic point sources; Principle of pattern multiplication; Linear arrays with 'n' isotropic point sources of equal amplitude and spacing: broadside and end fire case; Tapering of arrays: Binomial and Dolph Tchebysceff array.

UNIT – V Practical Antennas: Effect of earth on antenna performance; Grounded and ungrounded antennas; Antenna top loading and tuning; Resonant and non-resonant antennas; Beverage antenna; Tower radiator; Long-wire antenna; V-antenna; Rhombic antenna; Loop antenna and Adcock antenna; Yagi antenna; Log periodic antenna; Horn and Microstrip antenna.

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Name of Text Books:

1. Engineering Electromagnetic, William H. Hyat, Jr. John A. Buck 7th Ed. TMH, 2006. (Unit: I)
2. Antennas and Wave Propagation, K. D. Prasad, Satya Prakashan, 3rd Ed., 2001.(Unit: I, II, III,IV &V)

Name of Reference Books:

1. Antenna Theory, Balanis, 2nd Edition, John Wiley & Sons, 2003.
2. Antenna and Wave Propagation, R.L. Yadava, PHI, 2011.
3. Antenna and Wave Propagation, G. S. N. Raju, , 5th Impression, Pearson, 2011.
4. Antennas and Radio Propagation, R.E. Collins, McGraw-Hill, 1987.
5. "Antennas", John D. Kraus and Ronalatory Marhefka, Tata McGraw-Hill Book, 2002.

Course outcome:

1. Students will be able to understand the guided and unguided wave propagation.
2. Students will acquire knowledge of Basic antennas, their radiation and characteristics.
3. Students will knowledge of antenna arrays and their design.
4. Students will able to understand some different practical antennas.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **Digital Signal Processing**	Code: **C028613(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objective:

- To Study the Basic Mathematical Techniques needed for analysis of discrete time Signals and Systems.
- To Study the Various Digital Filter Design Techniques.
- To Study the Multirate Digital Signal Processing Techniques.

UNIT I Analysis of Discrete Time Signals and Systems: Discrete Fourier analysis, Classification, Discrete Time Fourier Transform (DTFT) & its properties, Inverse DTFT. Discrete Fourier Transform (DFT) & its Properties, Inverse DFT. Fast Fourier Transform, Properties, Types of FFT, N-point Radix-2 FFT, Inverse FFT. Discrete Linear Convolution, Circular Convolution, Fast Convolution, Frequency Response of LTI system using Discrete Fourier Analysis.

UNIT II Implementation of Discrete-time Systems: Structures for the Realization of discrete-time systems, Structures for FIR systems: Direct, Cascade, Frequency Sampling & Lattice structures. Structures for IIR systems: Direct, Signal Flow Graphs & Transposed, Cascade, Parallel, Lattice & Lattice-Ladder structures.

UNIT III FIR Filter Design: Symmetric and Anti-symmetric FIR filters, FIR Filter design by window method (Rectangular, Bartlett, Hamming, Hanning, Blackman and Kaiser window), Frequency Sampling method, Optimum approximation of FIR filters, Design of FIR differentiators, Design of Hilbert transformers.

UNIT IV IIR Filter Design: Design of Discrete-time IIR filters from Continuous-time Filters: Filter design by Impulse invariant and bilinear transformation method: Butterworth, Chebyshev & Elliptic approximation Filter, Frequency transformation.

UNIT V Multirate Digital Signal Processing: Introduction, Decimation, Interpolation, Sampling rate conversion by rational factor, Filter design and implementation for sampling rate conversion: Direct form FIR digital filter structure, Polyphase filter structure, Time varying digital filter structure, Sampling rate conversion by an arbitrary factor.

Text Books:

1. Discrete Time Signal Processing by A.V. Oppenheim, R. W. Schafer, & John R. Buck, , 2nd Edition, Prentice Hall, 1999. (Unit I, Unit II, Unit III, Unit IV)

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2. Digital Signal Processing: Principles, Algorithms and Applications by John G. Proakis & D.G. Manolakis, Prentice Hall, 1997. (Unit II, Unit III, Unit IV, Unit V)
3. Digital Signal Processing by S. K. Mitra, 3rd edition, McGraw-Hill, 2007. (Unit V)

Reference Books:

1. Signals and Systems by A. V. Oppenheim, A. S. Willsky & S. H. NAWAB, 2nd edition, Prentice Hall, 1996.
2. Digital Signal Processing by S. Salivahanan, A. Vallavaraj, C. Gnanapriya, Tata McGraw-Hill, 2000.
3. Digital Signal Processing by A. Anand Kumar, PHI Learning Pvt. Ltd, 2012.

Course Outcomes:

At the end of the course student will get the ability to

- Synthesize discrete time signals from analog signal.
- Use time domain and frequency domain analysis tools.
- Apply forward and Reverse Transformation.
- Visualize various applications of DSP and explore further possibilities.
- Design IIR and FIR filters

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: VI

Subject: **VLSI Design lab** Code: **C028621(028)**

Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To Study Architecture of CPLD
2. To Study Architecture of FPGA
3. To Design Half Adder in Data Flow Style of Modeling and Implement it in the CPLD.
4. To Design Full Adder in Structural Style of Modeling and Implement it in the FPGA.
5. To Design 4:1 Multiplexer in Behavioral Modeling and Implementation in CPLD.
6. To Design 16:1 Multiplexer using Generate statement and Implementation in FPGA.
7. To Design 8bit adder using Generic statement and Implementation in CPLD.
8. To Design D Flip-Flop in Behavioral Modeling.
9. To Design Sequence Detector using Moore Machine in Behavioral Modeling.
10. To Design Serial Adder using Mealy Machine in Behavioral Modeling.
11. To Prepare and Verify the Layout for NOT Gate.
12. To Prepare and Verify the Layout for NAND Gate.
13. To Prepare and Verify the Layout for NOR Gate.
14. To Prepare the Layout for D-FF.
15. To Prepare the Layout for the logic equation (a * (b+c))'

EDA Tools to be used:

Front End: Modelsim, FPGA Advantage, Xilinx, EdWinXP, Active HDL.

Back End: Cadence, Zeni-EDA, Calibre, Tanner, Synopsis, H-Spice

CPLD: XC9572, XC95108.FPGA:XC3S400

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: VI

Subject: **Digital Signal Processing Laboratory** Code: **C028622(028)**
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To generate the basic Analog and Discrete Signals.
2. Implementation of Linear convolution, Circular convolution, linear convolution using circular convolution.
3. DFT Implementation for a given signal.
4. To plot Fourier Transform amplitude spectrum and phase spectrum for a given function.
5. To plot frequency response in Z-domain for the given transfer function.
6. To plot frequency response in S-domain for a given transfer function.
7. To plot Fast Fourier Transform (amplitude & phase).
8. To sample a sinusoidal signal at Nyquist rate, above the Nyquist Rate and below the Nyquist Rate.
9. Design & implementation of IIR filters[LPF,HPF,BPF,BSF].
10. Design & implementation of FIR filters[LPF,HPF,BPF,BSF].
11. To design various filters using Simulink.
12. To design a Graphical User Interface to display various basic signals [sinewave ,sinc wave, etc].
13. To perform Interpolation and decimation [Multirate DSP].
14. To design a digital notch filter and embed it on a digital signal processor block.
15. Experiments with application of DSP in Communication / Speech Processing / Image Processing.

(Institutes may append more programmes / Experiments based on the infrastructure available)

List of Equipments /Machine Required:

C++Compiler, Simulation Software, DSP Processor kit, Digital Storage CRO, Spectrum Analyzer.

Recommended Books:

1. Digital Signal Processing, Vallavaraj, Salivahanan, Gnanapriya, TMH
2. Stein, J. Digital Signal Processing-a computer science perspective. Wiley

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: VI

Subject: **Machine Learning Lab** | Code: **C028623(028)**
Total Lab Periods: 36 | Batch Size: 30
Maximum Marks: 40 | Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Heuristics and search strategy for Travelling sales person problem.
2. Implement n-queens problem using Hill-climbing, simulated annealing, etc.
3. Tic-tac-toe game simulation using search and heuristics.
4. Solve 3-SAT, 3-CNF algorithms using agents.
5. Describe the Sudoku game and represent the actions using First-order / Propositional logic.
6. Sorting algorithms employing forward chaining.
7. Logical reasoning examples for E-commerce stores using forward/backward chaining.
8. Study of Machine learning tool.
9. Exercises on decision trees, SVM using the tool.
10. K-means clustering implementation using tool.
11. Agglomerative, divisive, fuzzy clustering using tool.
12. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
13. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
14. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
15. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
16. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
17. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file.
18. Compute the accuracy of the classifier, considering few test data sets.
19. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set.
20. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. Apply EM algorithm to cluster a set of data stored in a .CSV file.
21. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
22. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
23. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Requirements:

Java/Python ML library classes/API etc.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Electronics & Telecommunication

Semester: VI

Subject: **Soft Computing lab** Code: **C028624(028)**
Total Lab Periods: 36 Batch Size: 30
Maximum Marks: 40 Minimum Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To design, implement and simulate the combinational logic circuit for the function f{A,B,C) = ∑(0,4,5,8,II,I5) + d (1)
2. To design, implement and simulate the Full adder using two half adder.
3. To design, implement and simulate the 8 bit adder using Full adder.
4. To design, implement and simulate the 3 : 8 Decoder.
5. To design, implement and simulate the 16 : 1 Multiplexer using 4 : 1 Multiplexer.
6. To design, implement and simulate the Binary to BCD code Converter by Showing BCD No. on7segment Display.
7. To design, implement and simulate the Look ahead carry.
8. To design, implement and simulate the Flip-Flop.
9. To design, implement and simulate the Ring Counter.
10. To design, implement and simulate the Decade counter using D-Flip-Flop.
11. To design, implement and simulate the Divide by 32 (+32) digital logic by counter and flip-flop.
12. To design, implement and simulate the Hamming code converter.
13. To design, implement and simulate the 4 bit comparator.
14. To design, implement and simulate the Finite State Machine by Moore method.
15. To design, implement and simulate the Finite State Machine by Mealy circuit.
16. To design, implement and simulate the Digital clock.
17. Design and simulation of rectifiers. a) Half-wave rectifier b) Half-wave rectifier with capacitor filter. c) Full-wave rectifier d) Bridge rectifier.
18. Plot the output response of clipper and clamper circuits a) Positive clipper. b) Negative clipper c) Combination clipper d) Clamper
19. Design and simulation of RC phase shift oscillator
20. Plot output response of following op-amp based circuits a) inverting and non-inverting amplifier. b) integrator. c) differentiator.

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21. Design and simulation of static CMOS logic circuits a) Inverter b) NAND gate c) NOR gate
22. Plot the output response of a level triggered and edge triggered D- Flip-Flops.
23. Extract parasitic capacitances of NMOS and PMOS transistors.
24. Study the impact of channel length, width and power supply variations on rise time and fall time of an inverter. Further, investigate the impact of these parameters on static and dynamic power.
25. Perform transient and ac analysis of CE amplifier and plot the magnitude and phase response

List of Equipments/Machine Required:

PCs with simulation software like SPICE, MULTISIM, COMSIM, MATLAB, TINA PRO installed

Recommended Books:

D. V. Bout : The Practical Digital Circuit Designer Lab Book ; Prentice-Hall., 1999.

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Program / Semester: **B.Tech (VI)**	Branch: **Humanities**
Subject: **Technical Communication & Soft Skills**	Course Code: **C000601(046)**
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication &writing CVs, Cover Letters for correspondence. Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting.On Saying "Please", How to say "NO".

UNIT-5Positive Pschycology: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger, Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman & amp; Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three "As" of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **Information Theory and coding**	Code: **C028631(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

- To understand the role of information theory and coding for an efficient, error-free and secure delivery of information using binary data streams.

UNIT I Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information, Discrete Memory less Source ,Entropy of Binary Memory Less source and its extension to Discrete Memory Less Source, ,Information Rate, Information Measures for Continuous Random Variables, Kraft Inequality, Rate Distortion Function, Source Coding Theorem, Shannon Fano coding, Huffman coding, The Lempel-Ziv algorithm, Run Length Encoding and the PCX Format, Introduction to JPEG Standard for Lossless and Lossy Compression.

UNIT II Channel Capacity and Coding: Channel Models, Channel Capacity ,Discrete Memory less Channel: Lossless Channel, Deterministic Channel, Noiseless Channel, Binary Symmetric Channel, Binary Erasure Channel, Channel Coding Theorem, Information Capacity Theorem, Shannon's Limit, Gaussian Channel, Parallel Gaussian Channel

Unit III Error Control Coding (Block codes and Cyclic Codes): Linear Block Codes for Error Correction & Cyclic Codes: Introduction to Error Correcting Codes, Basic Definitions, properties of Linear Block Codes ,Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Hamming Codes. Cyclic Codes: Polynomials, The Division algorithm for Polynomials, Encoding and Decoding of Cyclic Codes, Matrix Description of cyclic codes.

UNIT IV Error Control Coding (Convolutional Codes) : Convolutional Codes: Introduction to Convolutional Codes, Tree codes and Trellis Codes, Polynomial Description of Convolutional Codes (analytical Representation),Graphical Representation: The State diagram, Code Trellis and Code Tree , Distance Notions for Convolutional Codes, The Generating Function, Matrix Description of Convolutional Codes, Viterbi Decoding.

UNIT V Error Control Coding(TCM,BCH codes and LDPC codes): Introduction to TCM:TCM Encoder, Mapping by Set Partitioning, Ungerboeck's TCM Design Rules. Bose-Chaudhuri-Hocquenghem (BCH) Codes: Introduction to BCH Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials in Terms of Minimal Polynomials, Generation of BCH Codes, Decoding of single error in BCH Codes, Introduction to LDPC codes, Representation of LDPC codes using Tanner graph.

Text Books:

1. Information Theory coding & Cryptography by Ranjan Bose,(Unit- I,II,III,IV,V) ,3rd Ed.,Tata McGraw-Hill.

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2. Communication Systems, Simon Haykin, Wiley India.

Reference Books:

1. Principles of Digital Communication - Das MullickChatterjee, Willey Eastern Publications
2. Digital communication –B.Sklar, Pearson Publication
3. Digital communication - Prokais, Tata McGrawHill
4. Channel Codes – Classical and Modern, William Ryan, Shu Lin, CUP, 2009.

Course Outcomes

1. Students will be able to analyze source coding techniques like the Huffman encoding, Shannon Fano encoding , Lempel Ziv encoding and Run Length encoding.
2. Students will be able to categorize different types of channels and can determine capacity of a given channel.
3. Students will be able to encode and decode using Block codes and Cyclic codes
4. Students will be able to use graphical method ,polynomial and polynomial matrix to describe convolutional codes.
5. Students will be able to use the mathematical tools developed including primitive element to study BCH codes, and can draw tanner graph of LDPC codes.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **Microelectronics Technology** — Code: **C028632(028)**
Total Theory Periods: 40 — Class Tests: Two (Minimum)
Total Tutorial Periods: 10 — Assignments: Two (Minimum)
ESE duration: Three Hours — Maximum Marks: 100 Minimum Marks: 35

Course Objectives:
1. To get and overview of the field of integrated circuit design.
2. To understand various oxidation techniques.
3. To understand diffusion and ion implantation methods.
4. To understand steps of wafer preparation.
5. To understand MOSFET technology.

UNIT – I Introduction: The Historical Prospect of Integrated Circuits, Silicon Wafers, Wafer Terminology. Crystal Growth: The Czochralski Technique, Bridgeman Technique, Float Zone Process.

UNIT – II Oxidation: Thermal Oxidation, Kinetics of Thermal Oxidation, Film Deposition, Dielectric Deposition, Polysilicon Deposition.

UNIT – III Diffusion: Diffusion Mechanics, Diffusion Equation, Diffusion Profile. Ion Implantation: Implantation Mechanism, Ion Implantation System, Low Energy Implantation, High Energy Implantation.

UNIT – IV Epitaxy: Vapor Phase Epitaxy, Liquid Phase Epitaxy, Molecular Beam Epitaxy. Lithography: Optical Lithography, Electron Beam Lithography, X-Ray Lithography, Ion Beam Lithography. Etching: Wet Chemical Etching, Reactive Chemical Etching. Metallization: Physical Vapor deposition, Chemical Vapour deposition, Aluminum Metallization, Metallization with Silicides. Process Simulation and Integration

UNIT – V MOSFET Technology: Introduction, MOS Structure. MOS Transistor: MOSFET Structure, Enhancement MOSFET, Threshold Voltage, Depletion MOSFET, Operation of MOSFET. MOSFET Characteristics: Gradual Channel Approximation, Charge Control Model, Velocity Saturation Effects, Channel Length Modulation, Subthreshold region. MOS Capacitance and Equivalent Circuit. Scaling of MOSFET: Short channel Effects, SPICE model for MOSFETs. MOSFET Fabrication.

Text Book:

1. VLSI Design by Sujata Pandey & Manoj Pandey, Dhanpat Rai & co.
2. VLSI Technology by S.M. Sze, TMH Book Company

Reference Book:

1. VLSI Fabrication Principles by Sorab K. Gandhi, Wiley & Sons, New York.
2. Physics & Technology of Semiconductor Devices by A.S. Grove, Wiley & Sons, New York.

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Course Outcomes

1. Student gets brief historical overview specific to VLSI design field.
2. Student learns about oxidation techniques.
3. Student gets an insight into diffusion and ion implantation mechanism.
4. Student is able to understand different steps of wafer preparation.
5. Student gets an overview of microelectronics devices and MOSFET technology.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **ARM System Architecture & Design** Code: **C028633(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

The objective of this course is to give the students a thorough exposure to ARM architecture and make the students to learn the ARM programming & Thumb programming models.

UNIT I ARCHITECTURAL FEATURES OF ARM PROCESSOR: Processor modes, Register organization, Exceptions and its handling, Memory and memory-mapped I/Os, ARM and THUMB instruction sets, addressing modes, ARM floating point architecture and DSP extensions, ARM co-processors.

UNIT II ARM 9 TDMI ARCHITECTURAL STUDY: H/W architecture, Timing diagrams for various accesses, Memory buses: AMBA, ASB, APB, Case study of Intel Xscale architecture or Samsung ARM implementations

UNIT III ARM AND THUMB INSTRUCTION SETS: Conditional execution and flags, Branch instructions, The barrel shifter, Immediate constants, Single register data transfer, Block data transfer, Stack management, Coprocessor instructions, Register access in Thumb, ARM architecture V5TE new instructions, Assembler workbooks ARM / THUMB INTERWORKING: Switching between states, Branch exchange example, Mixing ARM and Thumb subroutines, ARM to thumb veneer, Thumb-to-ARM veneer, Interworking calls, and Interworking using codewarrior.

UNIT IV ARM DEVELOPPER SUITE (ADS) OVERVIEW: Using the core tools, C/C++ compilers key features, Supplied libraries, Code warrior introduction, Debugging with multi-ICE.
ADS INTRODUCTORY WORKBOOK: Compiling and running an example, Creating a header file, Creating a new project, Viewing registers and memory. E
XCEPTION HANDLING: Exception return instructions, Exception priority, Vector table instructions, Chaining exception handlers, Register usage in exception handlers, FIQ vs IRQ, Example C interrupt handler, Software managed interrupt controller, Issues when re-enabling interrupts, C nested interrupt example, Invoking SWIs, Data abort with memory management, The return address

UNIT V EMBEDDED SOFWARE DEVELOPMENT: ROM or RAM at 0x0, ROM/RAM remapping, Exception vector table, Reset handler, Initialization : stack pointers, code and data areas, C library initialization, Scatter loading, Linker placement rules, Long branch veneers, C library functionality, Placing the stack and heap, Debugging ROM images.

Text Books:

1. ARM System Developer's Guide: Designing and Optimizing, Sloss Andrew N, Symes Dominic, Wright Chris, Morgan Kaufman Publication.
2. ARM System-on-Chip Architecture, Steven Furber, Pearson Education

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Reference Books:

1. Technical references on www.arm.com.
2. Technical reference manual for ARM processor cores, including Cortex, ARM 11, ARM 9 & ARM 7 processor families.
3. User guides and reference manuals for ARM software development and modeling tools.
4. David Seal, ARM Architecture Reference Manual, Addison-Wesley.

Course Outcomes

Students are able to

- Describe the programmer's model of ARM processor and create and test assembly level programming.
- Analyze various types of coprocessors and design suitable co-processor interface to ARM processor.
- Analyze floating point processor architecture and its architectural support for higher level language.
- Become aware of the Thumb mode of operation of ARM.
- Identify the architectural support of ARM for operating system and analyze the function of memory Management unit of ARM.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **Image Processing & remote sensing** Code: **C028634(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:
1. To know the basic components of an image processing system..
2. To understand the basics of the human visual system as they relate to image processing including spatial frequency resolution and brightness adaptation.
3. To teach the students about various image enhancement techniques and transformation of images.
4. To have an illustrative idea about various edge detection techniques.
5. To give knowledge about the need of thresholding and types of thresholding techniques.
6. To have a brief idea about approaches to restoration and image compressions

Unit – I: Introduction and Basic Concepts: Introduction, Basic Concepts of remote sensing, Airborne and space-borne sensors, Passive and active remote sensing, EMR Spectrum, Energy sources and radiation principles. Energy Interactions in the atmosphere. Energy interactions with earth surface features, Spectral reflectance curves , Energy interactions with earth surface features.

Unit – II: Remote Sensing System : Satellites and orbits, Geo-Synchronous, sun synchronous and polar orbiting satellites, Spatial, Spectral and radiometric resolutions, Temporal resolution, Spatial, Spectral and radiometric resolutions, Multispectral, thermal and hyper spectral remote sensing. Remote sensing satellites and their features.

Unit – III : Digital Image Processing – Image Restoration: Geometric Corrections, Ground Control Points (GCP), Co-registration of data, Atmospheric corrections, solar illumination correction.

Unit – IV: Digital Image Processing – Image Enhancement: Concept of Color, RGB and HIS color schemes, Color composites. Contrast Stretching – Linear and non-linear stretching. Filtering techniques, Edge enhancement, Density slicing, Thresholding, Intensity-Hue-Saturation (HIS) images, Time Composite images, Synergetic images.

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Unit – V: Digital Image Processing – Information Extraction: Supervised and unsupervised classification, Fuzzy classification, Image transformations, Ratio images, Vegetation Indices, Principal component analysis.

Text Books:

1. Digital Image Processing by Gonzalez & Woods, Pearson Education.
2. Introduction to Digital Image Processing by Alasdair Mc Andrew, Cengage learning.
3. Fundamental of Digital Image Processing by AK Jain, PHI.
4. Joseph, G. (2004): Fundamentals of Remote Sensing, Universities Press, Hyderabad, India
5. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi

Reference Book:

1. Image Processing, Analysis and Machine Vision by Milan Sonka,T homson Learning.
2. Digital Image Processing by Pratt W.K, John Wiley & Sons.
3. Digital Image Processing by Madhuri A. Joshi, PHI
4. Sabins, F. F. (1996): Remote Sensing: Principles and Interpretation, W. H. Freeman and Company, San Francisco
5. Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey
6. Campbell, J. (2002): Introduction to Remote Sensing, Taylor & Francis, London

Course Outcomes:

1. Students will understand the basic concepts of image and remote sensing.
2. Emphasis will be to develop engineering skills and intuitive understanding of the tools used in Image Processing.
3. Students will be able to do various operations on images like Image enhancement, transformation, sharpening etc.
4. Students can analyze various edge detection techniques and their algorithms.
5. Students will be able to use various thresholding techniques and segmentations.
6. Students will be able to visualize approaches used in image restoration.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai
Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VI

Subject: **Wireless Sensor Networks** Code: **C028635(028)**
Total Theory Periods: 40 Class Tests: Two (Minimum)
Total Tutorial Periods: 10 Assignments: Two (Minimum)
ESE duration: Three Hours Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To understand the WSN node Architecture and Network Architecture
2. To identify the Wireless Sensor Network Platforms
3. To program WSN using embedded C
4. To design and Develop wireless sensor node

UNIT I: Introduction to wireless sensor networks (WSN), Hardware of wireless sensor node, Network deployment, Localization, Coarse grained and fine grained localization, Network wide localization, Theoretical analysis of localization techniques.

UNIT II: Time synchronization, Traditional approaches, Fine grained clock synchronization, Coarse grained data synchronization. Medium access and sleep scheduling.

UNIT III: Sleep based topology control, Topologies for connectivity, topologies for coverage, Cross layer issues. Energy efficient and robust routing, Metric based approaches, Routing with diversity, Multipath routing, Energy aware routing.

UNIT IV: Distributed detection and estimation in sensor networks.

UNIT V: Data centric networking, Data centric routing, Data gathering with compression, Querying, Data centric storage and retrieval.

Text Books:

1. Networking wireless sensor nodes, B Krishnamachari, Cambridge University Press, New York 2005.

2. Wireless sensor networks: An information processing approach, F Zhao, L J Guibas, Morgan Kaufman Publishers/ Elsevier, New Delhi 2004.

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Reference Books

1. Sabrie Soloman, SENSORS HANDBOOK by Mc Graw Hill publication.

2. Feng Zhao, Leonidas Guibas, Wireless Sensor Networks, Elsevier Publications.

3. Kazem Sohrby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley-Inderscience

4. Philip Levis, And David Gay Tinyos Programming by Cambridge University Press.

Course Outcomes:

After completing this course the students should:

1. Understand and explain common wireless sensor node architectures.
2. Be able to carry out simple analysis and planning of WSNs.
3. Demonstrate knowledge of MAC protocols developed for WSN.
4. Demonstrate knowledge of routing protocols developed for WSN.
5. Understand and explain mobile data-centric networking principles.
6. Be familiar with WSN standards.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**RF & Microwave Engineering**	**Code:**	**D028711(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

- To inculcate understanding of the basics required for circuit representation of RF networks.
- To deal with the issues in the design of microwave amplifier.
- To instill knowledge on the properties of various microwave components.
- To deal with the microwave generation and microwave measurement techniques

UNIT I	**Introduction:** RF & Microwave spectrum, Historical Background, Typical application of RF & Microwaves, **Two port Network Theory:** Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.
UNIT II	**RF Amplifiers and matching networks:** Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, High power and Multistage Amplifiers, Impedance matching using discrete components, Two component matching Networks, Frequency response and quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks
UNIT III	**Microwave Generation:** Limitation of conventional tubes in microwaves, working principles and characteristics of Two cavity and multicavity Klystron, Reflex Klystron, Traveling wave tube, Magnetron, Backward wave Crossed field amplifier and oscillator
UNIT IV	**Passive and active Microwave Devices:** Tunnel diode, Gunn diode, IMPATT diode, TRAPATT diode, Microwave bipolar transistor, hetero-junction bipolar transistor, parametric amplifier, Varactor diodes Passive Components: S- matrix, Directional couplers, Bethe-hole coupler, T-junctions, Magic tee, Hybrid ring, Circulator, Isolator, matched Terminators, Attenuators, Phase shifters, Power dividers.
UNIT V	**Microwave Measurements:** Measurement of VSWR-Low, Medium and High, Measurement of power, Bolometer, Measurement of Impedance, Frequency, Q-factor, Attenuation, S-parameters. **Measuring Instruments :** Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, **Application of Microwaves:** Introduction to satellite communication, Radar, Industrial application of microwaves.

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Text books:

1. Microwave Devices & Circuits S.Y.Liao Pearson Education/PHI
2. Microwave Engineering ,Monojit Mitra ,Dhanpath Rai New Delhi
3. Microwaves ,K.C.Gupta ,New Age Publishers
4. Microwave Engineering , Kulkarni , Dhanpat Rai New Delhi
5. Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design: Theory and Applications", Pearson Education Inc., 2011
6. Robert E Colin, "Foundations for Microwave Engineering", John Wiley & Sons Inc, 2005

REFERENCES:

1. R. F. Soohoo, "Microwave Electronics", Wesley publication, 1971.
2. D.M.Pozar," Microwave Engineering (3/e)", Wiley India, 2009.
3. Thomas H Lee, "Planar Microwave Engineering: A Practical Guide to Theory, Measurements and Circuits", Cambridge University Press, 2004.
4. Mathew M Radmanesh, "RF and Microwave Electronics", Prentice Hall, 2000.
5. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2005.

Course Outcomes:
Upon completion of the course, students will be able to:

1. Explain the active & passive microwave devices & components used in Microwave communication systems.
2. Analyze the multi- port RF networks and RF transistor amplifiers.
3. Generate Microwave signals and design microwave amplifiers.
4. Measure and analyze Microwave signal and parameters.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Instrumentation & IoT**	**Code:**	**D028712(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

The course intends to provide an overview of the principles, operation and application of the different transducer and sensors like, Resistive, Inductive and capacitive transducers, Piezo-electric transducers and photo electric transducers. And to equip the students with the basic and advanced knowledge of Pressure, Temperature, flow and optical measurements.

The course also intends to understand about the fundamentals of Internet of Things and its building blocks along with their characteristics& understand the protocols and standards designed for IoT and the current research on it.& to understand the recent application domains of IoT in everyday life

UNIT I	**Introduction to Sensors & Transducer:** Transducer definition, classification, and Static and Dynamic performance characteristics of Transducer, selection criteria for sensors, Resistive: Piezo-resistive effect, Basics of Strain Gauge, Inductive: LVDT, RVDT, Capacitive: Differential capacitance cell.
UNIT II	**Pressure and Photoelectric Sensor: Pressure Measurement:** Terminology, pressure units, manometers-U-tube Single and double column, elastic pressure transducer: Bourdon Tube, Dead weight piston gauge. Piezoelectric transducer, photoelectric transducer: Photoconductive cell, Photo emissive cell and Photo Voltaic Cell
UNIT III	**Thermal and Flow Sensor: Temperature Measurement:** Temperature scales units and relations, Bimetallic thermometer, Resistance thermometers, Thermocouple: Its types & characteristics, Thermistor, radiation & optical pyrometers Flow Sensors: Theory of variable head meters, constructional details of variable head meters–Venturimeter, Flow Nozzle, Orifice flow meter, Pitot tube, Ultrasonic flow meter.
UNIT IV	**Introduction to Internet of Things:** Introduction to Internet of Things: Overview of Internet of Things-the Edge, Cloud and the Application Development, Industrial Internet of Things (MOT - Industry 4.0), Quality Assurance, Predictive Maintenance, Real Time Diagnostics, Design and Development for IOT, Understanding System Design for IOT, Design Model for IOT.
UNIT V	**Understanding Internet Protocols & Domain specific IOT:** Simplified OSI Model, Network Topologies, Standards, Types of Internet Networking - Ethernet, WiFi, Local Networking, Bluetooth, Bluetooth Low Energy (BLE), Zigbee,6LoWPAN, Sub 1 GHz, RFID,NFC, Proprietary Protocols, Simplicity, Networking Design - Push, Pull and Polling, Network APIs. Domain specific IOT and their challenges: Illustrated domains-home automation, smart cities, health and

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	life style issues.

Text books:

1. Mechanical Measurements & Control, D.S.Kumar, Metropolitan Publication.
2. Electrical & Electronics Measurement & Instrumentation, A. K. Sawhney, Dhanpat Rai Publication.
3. Foundational Elements of an IOT Solution - The Edge, Cloud and Application Development, Joe Biron & Jonathan Follett, Oreilly media inc.
4. Internet of Things A Hands-On- Approach, Vijay Madisetti, Arshdeep Bahga, Orient Blackswan Private Limited.

REFERENCES:

1. "Measurement Systems Application and Design" , fourth edition, Doebelin, E.O , McGraw Hill International .
2. The Internet of Things (A Look at Real World Use Cases and Concerns), Lucas Darnell, International Kindle paper white Edition

Course Outcomes:

On successful completion of the course, the student will be able to:

1. Be acquainted with different characteristics of Transducer and working of Resistive, Inductive and Capacitive Transducer.
2. To analyze constructional and operational features of different types of Pressure and Optical sensor.
3. To Analyze the constructional and operational features of different types of Thermal and Flow sensor.
4. To be acquainted with design and development issues of IOT.
5. To Analyze Internet protocol and design issues and use the IoT technologies in practical domains of society

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Wireless Communication**	**Code:**	**D028713(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

1. To give students brief history of the evolution of mobile communications throughout the world.
2. To give knowledge of cellular concepts and its designing aspects.
3. To give students a detailed overview of modern communication model used in 5G.
4. To familiarize students about GSM and advances in modern communication Technology
5. To educate students about the useful limitations on the performance of wireless communication systems.

UNIT I	**Introduction to wireless communications:** Evolution of Mobile Radio Communication, Different Wireless Communication Systems. Comparison of Various Wireless Communication System, Introduction to Modern Wireless Communicating System- Third Generation (3G) ,Fourth Generation (4G)and Fifth (5G)Generation, Wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks, Over view of WIMAX Technologies, architecture, spectrum allocation
UNIT II	**Cellular concept,** hand off strategies, Interference and system capacity: Cell Splitting, Sectoring, Repeaters, and Microcells. Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity
UNIT III	**Wireless propagation mechanism,** free space propagation model, ground Reflection model, knife edge diffraction model, path loss prediction in hilly Terrain, introduction to fading and diversity techniques, Introduction to MIMO system, Channel Estimation in MIMO System, spatial diversity and spatial multiplexing.
UNIT IV	**GSM system architecture,** radio link aspects, network aspects Introduction to new data services like High Speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), Digital Enhanced Cordless Telecommunications (DECT) , Enhanced Data Rate for Global Evolution (EDGE), Ultra wideband systems (UWB), Push To Talk (PTT) technology, Mobile IP, Modulation Techniques: Constant Envelop Modulation, MSK, GMSK, Combined Linear and Constant Envelope Modulation Technique, MPSK, QAM,
UNIT V	**Introduction to Radio Wave Propagation:** The basic Propagation Mechanisms: Reflection, Diffraction, Scattering .Path Loss, Shadowing, Time dispersion, Time Alignment, Wireless Networking, Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, Wireless standards,

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Text books:

1. .Simon Haykin, Michael Mohar, Modern wireless communication, Pearson Education, 2008.

2.Theodore S. Rappaport: Wireless communication principles and practice,2/e, Pearson Education, 1990

REFERENCES:

1.Jochen Schiller, Mobile Communications, Pearson, 2008.

2. Mishra, Wireless communications and Networks, McGraw Hill, 2/e, 2013.

3. Nathan, Wireless communications,PHI, 2012.

4. Singal, Wireless communications, Mc Graw Hill, 2010.

5. Tomasi, Advanced Electronic Communication Systems, 6/e, Pearson, 2015

Course Outcomes:

1. Students will have idea about the growth in mobile communications that gives rise to technological improvements.
2. Students will be able to visualize the use of frequency reuse to increase the systems capacity and also other designing aspects.
3. Students will be able to understand the architecture of the GSM and mechanism to support mobility of the GSM terminals.
4. Students will see how modulation techniques are used to transport the message signal via a radio channel with best possible quality with minimum radio spectrum.
5. Students will be able to understand various transmission problems and their counter measures

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Microwave Engineering Lab**	**Code:**	**D028721(028)**
Total Lab Periods	36	Batch Size	30
Max Marks	40		Min Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. V-I characteristics of Gunn diode and to measure output power and frequency vs voltage.
2. Study of different characteristics of klystron amplifier
3. Study of different characteristics of reflex klystron amplifier and hence to determine mode number, transit time, Electronic Tuning Sensitivity(ETS) and Electronic Tuning Range (ETR).
4. Measurement of Q of a cavity.
5. To determine the standing wave ratio and reflection coefficient.
6. To study the characteristic and behavior of a Magic Tee.
7. Determination of S matrix of Magic Tee, E plane Tee & H plane Tee
8. To study the characteristics and behavior of Isolator and Circulators
9. To study the characteristics and behavior of Attenuator(fixed and variable type).
10. To measure the VSWR at all the three open ports of a Directional Coupler.
11. To measure the Coupling Factor, directivity and insertion loss of a Directional Coupler.
12. To measure Microwave Frequency using Frequency Meter.
13. To study various Frequency measurements techniques.
14. To measure VSWR using various methods
15. To measure Attenuation
16. Impedance measurement techniques
17. To study and measure square wave modulation through PIN voltage.
18. To energize a GUNN Oscillator.
19. To energize a Reflex Oscillator.
20. To calibrate Phase Shifter.
21. To measure Dielectric Constant.

List of Equipments Required: Microwave source, Isolator, Variable attenuator, Fixed Attenuator, Frequency meter, Slotted line, Tunable probe, Circulators, Matched terminations, Gunn/Klystron power supply, Detector mount, Cooling fan, Magic Tee, Phase shifter, Movable short, Dielectric Material.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Instrumentation & IoT Laboratory**	**Code:**	**D028722(028)**
Total Lab Periods	36	Batch Size	30
Max Marks	40		Min Marks: 20

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Measurement of linear displacement using Linear Variable Differential Transformer (LVDT).
2. To study LVDT as displacement transducer and observe displacement versus output voltage characteristics.
3. To study measurement of humidity using Humidity Transmitter set up.
4. To study the characteristics of IC temperature sensor (LM 335).
5. To study the characteristics of NTC Thermistor.
6. To study the characteristics of Temperature Sensor Setup (Thermocouple, RTD, Thermistor Setup). 11. To study working of Pressure sensor (Piezo resistive/strain) and to observe characteristics of air pressure versus output voltage.
7. To study Dead Weight Pressure Gauge Tester.
8. To study calibration of flow meters setup with Electromagnetic Flow Meter.
9. To measure liquid flow using Orifice, Ventury, Rotameter and Turbine type flow sensor.
10. To study the characteristics of Filament Lamp.
11. To study the characteristics of Photovoltaic Cell.
12. To study the characteristics of Photoconductive Cell.
13. Measurement of displacement using Light Dependent Resistor (LDR).
14. To study Rotary Encoder for speed and angular measurement.
15. To study Strain gauge working as displacement sensor.
16. Interfacing Arduino to GSM module
17. Interfacing Arduino to Bluetooth Module
18. Introduction to Raspberry PI platform and python programming
19. Interfacing sensors to Raspberry PI
20. Communicate between Arduino and Raspberry PI using any wireless medium

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Digital Circuit Design with Verilog HDL (Professional Elective III)**	**Code:**	**D028731(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

1. To understand basics of Verilog HDL Language, including its use in synthesis of digital designs.
2. To gain knowledge of modeling, simulation and verification of designs with Verilog HDL
3. To understand combinational circuit design of digital systems with Verilog HDL.
4. To understand sequential circuit design of digital systems with Verilog HDL.
5. To understand designing using Mealy State and Moore State Model.

UNIT I	**Overview of Digital Design with Verilog-HDL:** Emergence of HDLs, Typical Design Flow, Importance of HDLs, Popularity of Verilog HDLs. Design Methodologies, Modules, Instances, Lexical conventions, Data Types, System Tasks and Compiler directives.
UNIT II	**Modeling in Verilog- HDL:** Modules and Ports, Gate- Level Modeling: Gate Types, Gate Delays; Data flow Modeling: Assignment Statement, Delays, Expressions, Operator Types, Operands; Behavioral Modeling: Structured Procedures, Procedural Assignment, Timing Controls, Conditional Assignment Statements, Loops, Sequential and Parallel, Blocks, Generate Blocks.
UNIT III	**Combinational Circuit Design:** Multiplexers, Demultiplexers, Encoder, Decoders, Code Converters, Arithmetic Comparisons Circuits, Tasks and Functions.
UNIT IV	**Sequential Circuit Design:** Flip-Flops: SR, JK, T and D; Registers: Shift Registers, Parallel Access Shift Registers; Counter: Asynchronous Counters, Synchronous Counters, Counters with Parallel load, BCD counter.
UNIT V	**FSM:** Basic Design Steps, State Diagram, State Table, State Assignment, State Assignment Problem, One Hot Encoding, Mealy State Model, Moore State Model, Design Example: Serial Adder, Vending Machine, Bus Architecture.

Text books:

1. VERILOG HDL: A Guide to Digital and Synthesis, IEEE1364-2001 Compliant, Samir Palnitkar, Pearson Ed.
2. Fundamentals of Digital Logic with Verilog Design, Stephen Brown & Zvonko Vranesic, The McGraw-Hill.

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REFERENCES: 1. Design Through Verilog- HDL, T. R. Padmanbhan and B. Bala Tripura Sundari; IEEE Press 2. Verilog HDL Synthesis: A Practical Primer,J. Bhasker PHI.
Course Outcomes : Students will be able to: 1. Use VLSI design methodologies to understand and design complex digital systems. 2. Create circuits that realize specified digital functions. 3. Identify logic and technology-specific parameters to control the functionality, timing, power, and parasitic effects. 4. Complete a significant VLSI design project having a set of objective criteria & design constraints.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Adaptive Signal Processing (Professional Elective III)**	**Code:**	**D028732(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

1. Understand the concepts of gradient and mean square error performance in adaptive systems
2. Explain gradient descent algorithms and gradient estimate
3. Derive LMS algorithms and formulate conditions of convergence
4. Explain applications of adaptive signal processing

UNIT I	**Introduction: Adaptive Systems** – Definition and characteristics, General properties, Open and Closed Loop Adaptations, Applications. The Adaptive Linear Combiner: Performance function, Gradient and Mean Square Error, Examples.
UNIT II	**Theory of Adaptation with Stationary Signals:** Properties of the Quadratic Performance Surface, Significance of eigen values, eigen vectors, correlation matrix. **Searching the Performance Surface:** Basic ideas of gradient search A simple gradient search algorithm, Stability and Rate of convergence, the learning curve. Newton's method, Steepest descent method, Comparison.
UNIT III	**Gradient Estimation and its effects on adaptation:** Gradient component estimation by derivative measurement, The performance penalty, Variance of the gradient estimate, Misadjustment. **Adaptive Algorithms and Structures:** The LMS Algorithm, Derivation, Convergence of the weight vector, learning Curve, Performance analysis, Filtered X LMS algorithm.
UNIT IV	**Adaptive Lattice predictor, Adaptive filters with orthogonal signals. Applications of Adaptive signal** processing: Adaptive modeling of a multi-path communication channel, adaptive model in geophysical exploration, Adaptive interference canceling: applications in Bio-signal processing.
UNIT V	**Adaptive Control Systems using Filtered X LMS Algorithm, Adaptive Noise Cancellation using Adaptive filter , Adaptive Modeling and System Identification using adaptive filter, Inverse Adaptive Modeling, Deconvolution, and equalization using adaptive filter.**.

Text books:

1. Adaptive Signal Processing, Bernard Widrow and Samuel D. Stearns, Pearson Education, 2nd impression, 2009.
2. Simon Haykin Adaptive Filter Theory Fourth Edition Prentice Hall
3. B. Widrow and S. D. Sterns Adaptive Signal Processing Pearson Education

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REFERENCES:

1. M. J. Larrimore, C. R. Johnson and J. R. Treichler Theory and Design of Adaptive Filters
2. Ingle and Kogon Manalokis, Statistical and Adaptive signal processing- Artech House INC., 2005.
3. Sayed A H, Adaptive filters-, John Wiley.
4. Poularikas A, Z M Ramadan, Adaptive filtering primer with MATLAB –, Taylor and Francis Publications.

Course Outcomes

After the course the student will be able to

1. Understand the concepts of gradient and mean square error performance in adaptive systems
2. Apply gradient descent algorithms, gradient estimate and LMS algorithms in adaptive systems
3. Formulate conditions of convergence
4. Implement applications of adaptive signal processing
5. To design adaptive filters for different applications

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	Industrial Automation **(Professional Elective III)**	**Code:**	**D028733(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

1. To develop and apply Mathematical and Engineering skills to identify, formulate and solve industrial process problems.
2. This subject seeks to close the gap between Instrumentation and Mechanical Engineering.
3. This subject provides the knowledge of different types of controller & their applications.
4. This subject provides the basic knowledge of PLC and DCS.

UNIT I	**Introduction to Process Control:** Process Control Block Diagram, Control System Evaluation, Digital Control, Supervisory Control, Direct Digital Control, Networked Control Systems, Distributed Digital Control, Smart Sensor, Definitions of the terms used to describe Process Control. Data Acquisition Systems: DAS Hardware, DAS Software, Data Logger.
UNIT II	**Controller Principles:** Process Characteristics, Process Equation, Process Load, Process Lag, Self Regulation, Control System Parameters: Error, Variable Range, Control Parameter Range, Control Lag, Dead Time, Cycling, Controller Modes: Discontinuous Controller Mode, Two Position Mode, Multi Position Mode, Floating Control Mode, Continuous Control Mode, Proportional Control Mode, Integral Control Mode, Derivative Control Mode, Composite Control Modes: PI Control, PD Control, PID Control.
UNIT III	**Analog Controllers:** Introduction, Electronic Controllers: Error Detector, Single Controller Modes, Composite Controller Modes, Pneumatic Controllers: General features, Mode Implementation.
UNIT IV	**Programmable Logic Controller:** PLC Architecture, Basic Structure, PLC Programming: Ladder Diagram, Ladder Diagram symbols, Ladder Diagram circuits, PLC Communications and Networking, PLC Selection, I/O Quantity and Type, I/O Remoting requirements, Memory size and type, Programmer Units, PLC Installation, Advantages of using PLCs.
UNIT V	**Distributed Control System:** Introduction, Overview of Distributed Control Systems, DCS Software configuration, DCS Communication, DCS Supervisory Computer Tasks, DCS Integration with PLCs and Computers, Features of DCS, Advantages of DCS.

Text books:

1. Process Control Instrumentation Technology by C.D. Johnson, PHI
2. Computer Aided Process Control by S. K. Singh, PHI

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REFERENCES:

1. Reference Books: 1.IntroductiontoInstrumentation&Controlby A.K. Ghosh,Eastern Economy Edition
2.IntelligentInstrumentation, by George C.Barney, Prentice Hall India.

Course Outcomes:
The students will be able to:

1. Understand process variables, degrees of freedom, and Self regulation, first & second order Process System.
2. Know the importance of on-off, proportional, integral and derivative modes, composite control modes-PI, PD and PID controllers.
3. Understand, Communication in DCS, DCS system integration with PLC and computers, Data loggers, Data Acquisition systems (DAS),computer control hierarchy levels and Direct Digital control (DDC).

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Speech and Audio Processing (Professional Elective III)**	**Code:**	**D028734(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

To provide an introduction to basic concepts and methodologies for the analysis, modeling, synthesis and coding of speech and music. To provide a foundation for developing applications and for further study in the field. To introduce software tools for the analysis and manipulation of speech and music and to gain practical experience in the design and implementation of speech and music processing algorithms

UNIT I	**Introduction**: Anatomy and physiology of speech production, categorization of speech sounds, Prosody, Parameters of Speech: Pitch and Formants.
UNIT II	**Analysis and Synthesis of Speech and Audio signals**: Spectral Analysis Models, Linear Predictive Coding Model for Speech Recognition, The autocorrelation method, The covariance method, Short-Time Fourier Transform Analysis and Synthesis, Short-Time Fourier Transform Magnitude, Filter Bank Summation method, Overlap-Add method.
UNIT III	**Frequency Domain Pitch Estimation:** A correlation-based Pitch Estimator, Pitch Estimation based on Comb Filter, Pitch Estimation based on a Harmonic Sine wave Model.
UNIT IV	**Speech Coding** Vector Quantization, Frequency-Domain Coding, Model-based Coding. Enhancement of Speech and Audio Signals Spectral subtraction, Cepstral Mean Subtraction, Wiener Filtering.
UNIT V	**Speaker Recognition** Spectral Features required for Speaker Recognition, Minimum Distance classifier, Gaussian Mixture Model.

Text books:

1. L.R. Rabiner, R. W. Schafer, Theory and Applications of Digital Speech Processing, Prentice Hall
2. B. Gold, N. Morgan, D. Ellis, Speech and Audio Signal Processing: Processing and Perception of Speech and Music, Wiley-Blackwell
3. Ian Vince Mcloughlin. Speech and Audio Processing: A MATLAB-based Approach, Cambridge University Press

REFERENCES:

1. T. Dutoit, F. Marqués, L.R. Rabiner, Applied signal processing: a MATLAB-based Proof of Concept, Springer
2. T.F. Quartieri, Discrete-Time Speech Signal Processing: Principles and Practice, Prentice Hall

Course Outcomes: At the end of the course, the students will be able to

1. Comprehend the speech production and hearing models.
2. Design and apply models for speech and audio signal processing.
3. Apply speech coding, speech enhancement and speaker recognition algorithms for speech and audio processing.
4. Implement the methods for speech enhancement and speech coding for speech signals.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	Bachelor of Technology.		
Branch:	**Electronics & Telecommunication**	Semester:	VII
Subject:	**Power Electronics (Professional Elective III)**	**Code:**	**D028735(028)**
Total Theory Periods:	40	Total Tutorial Periods:	Ten (Minimum)
Class Tests:	Two (Minimum)	Assignments:	2 (Minimum)
ESE Duration:	Three Hours	Max Marks:100	Min Marks: 35

Course Objectives:

1. To understand basic knowledge of Thyristor family members.
2. To understand the various firing schemes for convertors.
3. To understand the operation of power conditioning circuits.

UNIT I	**Silicon Controlled Rectifiers:** Introduction to SCR and its Construction, Principle of Operation, Characteristics & SCR Terminologies, Two-Transistor Analogy of SCR. **General idea of Modern Power Semiconductor Devices:** Power Diode, Power BJT, Power MOSFET,GTO, DIAC, TRAIC, IGBT, SIT, SITH, MCT, SUS, SBS, SCS.
UNIT II	**Switching and Triggering of SCRs:** Different Methods of Turning-ON & Turning-OFF of SCRs, Typesof Triggering Circuits, Series & Parallel Operation of SCRs. **Phase Controlled Rectifier I:** Phase Angle Control Techniques, Classification of Converter, Single Phase Half and Full Wave Converters with R, RL and RLE Loads
UNIT III	**Phase Controlled Rectifier II:** Symmetrical and Asymmetrical Bridge Converters with R and RL Load, Three-Phase three and six pulse Converters, Three-phase fully Controlled Bridge Converters, Dual Converters: Phase Controlled Dual Converter, Single-Phase Dual Converter, Three-Phase Dual Converter, Circulating Current Type Dual Converter: Mid-Point Configuration & Dual Bridge Configuration.
UNIT IV	**Power Conditioning Circuits I: Inverters:** Single Phase - Half and Full Bridge Inverter with R and RL Load, 3-Phase Bridge Inverter, Mcmurray Full Bridge Inverter. **Choppers:** Principle of Operation, Chopper Control Technique, Voltage Step-Down (Buck) Chopper & Step-Up (Boost) Chopper, Buck-Boost Chopper, Jones Chopper.
UNIT V	**Power Conditioning Circuits II:** A C Voltage Controller: Types of Power Control, Integral Cycle Control, Full Wave AC Voltage Regulator with R and RL, TRIAC based AC Voltage Regulators, **Cycloconverters:** Single Phase to Single Phase: Midpoint Configuration & Bridge Configuration, Three Phase to Single Phase Cyclo converter: Circulating Current Type, Non-Circulating Current Type.

Text books:

1. Industrial Electronics & Control by B. Paul, PHI.
2. Power Electronics by M. D. Singh, Khanchandani, TMH.
3. Power Electronics by P.S Bhimbra, Khanna publications

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REFERENCES: 1. Industrial & Power Electronics by H.C. Rai, Umesh Publications. 2. Power Electronics by K. Hari Babu, SCITECH Publications. 3. Power Electronics by P.C. Sen, TMH.
Course Outcomes: 1. Students will be able to understand the controlled and uncontrolled rectifications. 2. Students will be able to understand phase control operation of different power electronics devices. 3. Students will be able to understand mechanism of invertors and choppers. 4. Students will be able to understand mechanism of cyclo converters and AC voltage controllers.

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Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program: Bachelor of Technology
Semester: B. Tech – 7th **Branch: ET&T**
Subject: Universal Human values 2 **Course Code: D000701(046)**
Total Marks in End Semester Exam: **L: T: P: 2 Credits: 0**

Course Objective(s):

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I Introduction- Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
- Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in 'I'.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.
- Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life.
- Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

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- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
- Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
- Holistic perception of harmony at all levels of existence.
- Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
    - At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    - At the level of society: as mutually enriching institutions and organizations
- Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

Reference Books:

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1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
3. Small is Beautiful - E. F Schumacher.

Course Outcome:

After completion of course, student should be able to

- To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology	Branch: Electronics & Telecommunication
Subject: **Advanced Communication**	Course Code: **D028811(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Minimum Marks: 100, Minimum Marks: 35

Course Objectives:

1. To become familiar with fundamentals of satellite communication
2. To learn about the satellite link design
3. To gain knowledge about the different access techniques used in satellite communication.
4. To understand the concepts of Optical communication.
5. To learn about optical transmitters and receivers.

UNIT-I : **Introduction to Satellite:** Satellite Communication systems, introduction, Kepler's laws, orbits, orbital effects, orbital perturbations, Earth, Look Angles, Earth Coverage and Slant Range, Satellite sub systems, Antennas, Transponders, earth station technology, Satellite systems- GEO systems, non-GEO communication systems, Satellite Applications- Global Positioning System, Very Small Aperture Terminal system, Direct to Home Satellite Systems.

UNIT-II: Communication Satellite Link Design: Link Design Equation, System Noise Temperature, C/N, G/T Ratio, Atmosphere and Ionosphere Effects on Link Design, Uplink Deign, Complete Link Design, Interference effects on complete Link Design, Earth Station Parameters, Satellite Communication Links: Analog Baseband Signal, FDM Techniques, SNR and CNR in FM in Satellite link.

UNIT-III: Multiple Access Techniques: TDMA-Frame and Burst Structure, Frame Efficiency, Super frame, TDMA Frame Acquisition and Synchronization, TDMA burst TME Plan, Multiple Beam TDMA. Introduction: Principle of OFDM, implementation of transceivers, frequency selective Channels, Peak to average power ratio, inter-carrier interference, adaptive modulation and capacity, multiple access, multi-carrier code division multiple access.(Must be covered in abstract form only)

UNIT-IV: Optical Fiber Fundamentals: Numerical Aperture, Optical Fiber Modes and Propagation, Single Mode and Multi-Mode Fibers, Step Index and Graded Index Fibers Structures, Different types of Attenuations in Optical Fiber Communication.

UNIT-V: Light Sources, Detectors & Optical Networks: Light Emitting Diodes, LASER Principles, Laser Diode, Operating Characteristics and Modulation Circuits of LED and LASER Diodes Principle of Photo-Detection, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode, Optical Networks: SONET/SDH Networks.

Name of Textbooks:

1. Fundamentals of Satellite Communication by Raja Rao, Pearson.
2. Satellite Communication by Monojit,Mitra, PHI.
3. Optical Fiber Communication by Keiser, TMH.
4. Fiber Optic Communications by Palais, 4th Edition, Pearson Education.
5. Theory and Applications of OFDM and CDMA: Wideband Wireless Communications by- Henrik_Schulze & Christian _Lueders

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of Reference Books:

1. Satellite Communications by Dr. D.C. Agarwal, Khanna Publisher.
2. Satellite Communication System Engineering by Pritchard, Pearson Education.
3. Satellite Communication, Timothy Pratt, John Wiley & sons
4. Opto Electronics and Fiber Optic Communication by Sarkar & Sarkar, New Age International Publishers
5. Fundamentals of Optical Fiber Communication by Satish Kumar, PHI
6. Optical Fiber Communication-Principles and Practice by John Senior, PHI
7. Multi-Carrier Digital Communications: Theory and Applications of OFDM By- Burton_R. Saltzberg & Mustafa_Ergen_

Course Outcomes:

1. Understand the basic concepts of Satellite.
2. Able to calculate the complete C/N ratio of satellite link design.
3. Able to understand multiple access techniques related to satellite.
4. Able to understand the concepts of optical fiber communication.
5. Student gains knowledge how optical signal is transmitted and received
6. Student gets an insight into SONET/SDH networks.

DIPALI SOREN TUDU

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Subject: **VLSI and Microelectronics**
Course Code: **D028831(028)**
Total Theory Periods: 40
Class Tests: Two (Minimum)
Total Tutorial Periods: 10
Assignments: Two (Minimum)
ESE duration: Three Hours
Maximum Marks: 100, Minimum Marks: 35

Course Objective:

1. Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
2. Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
3. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.
4. Design for higher performance or lower area using alternative circuit families
5. Describe and avoid common CMOS circuit pitfalls and reliability problems
6. Design functional units including adders, multipliers, ROMs, SRAMs, and PLAs

UNIT-I: Introduction, Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit, Design and VLSI Design issues. Stick Diagrams; Physical Design Rules; Layout Designing; Euler's Rule for VLSI Physical Design.

UNIT-II: MOSFET fundamentals, Enhancement Mode MOSFETs, Depletion Mode MOSFETs, Weak & strong Inversion Conditions, Threshold Voltage Concept in MOSFETs, IV Characteristics of a MOSFET, Limitations in IV Model and MOSFET capacitance.

UNIT-III: Basic VLSI Design Styles-NMOS, CMOS Process flow; Noise Margin; Inverter Threshold Voltage; NMOS Inverter design and characteristics; CMOS Inverter Design and Properties; CMOS transmission gates, Delay, Power Dissipation and scaling in CMOS circuits.

UNIT-IV: Parallel & Series Equivalent circuits; Static CMOS Circuit Design: case study; VLSI Interconnects. High Speed Dynamic CMOS logic families; Precharge-Evaluate logic; Dynamic CMOS logic circuits, cascading , charge sharing and clock distribution.

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UNIT-V: Memory / Regular Structure Design; ROM Design, SRAM and DRAM Design.

Name of Text Books:

1. CMOS Digital Integrated Circuits-Analysis & Design, S.M. Kang & Y. Leblibici, TMH, Ed. 2003.
2. Principles of CMOS VLSI Design: A System Perspective, N.H.E. Weste & K. Eshraghian, Pearson Education India, 2004.

Name of Reference Books:

1. Digital Integrated Circuits-A Design Perspective, J.M. Rabaey, PHI.
2. Introduction to VLSI, K. Eshraghian & Pucknell, PHI.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Course Outcomes:

Students will

1. Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
2. Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
3. Have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.
4. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Subject: **Radar and Navigational Aids**
Code: **D028832(028)**
Total Theory Periods: 40
Class Tests: Two (Minimum)
Total Tutorial Periods: 10
Assignments: Two (Minimum)
ESE duration: Three Hours
Maximum Marks: 100, Minimum Marks: 35

Course Objectives:

1. Main objective of this course is to make the students understand the basic concept in the field of Radar and Navigational aids.
2. Students are taught about different types of Radar Systems.

UNIT-I: Principles and Applications: Basic Radar, Radar Block Diagram, Radar Frequencies, Applications of Radar, Radar Range Equation, Probabilities of Detection of False Alarm Integration of Radar Pulses, Radar Cross Section of Targets.

UNIT-II: MTI And Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line Cancellers, Staggered PRF, Range Gated Doppler Filter, Limitations to MTI Performance, Tracking with Radar, Monopulse Tracking, Conical Scan and Sequential Lobing, Limitations to Tracking Accuracy, Low Angle Tracking, Tracking in range, Comparison of Trackers

UNIT-III: Propagation of Radar Waves: Forward Scattering from a Flat Earth, Scattering from Round Earths Surface, Atmospheric Refraction–Standard Propagation, Non-Standard Propagation, Diffraction, Attenuation by Atmospheric Gases, External or Environmental Noise, Other Propagation Effects.

UNIT-IV: Antennas for Detection of Radar Signals: Parabolic Antennas, Introduction to Phased Array, Cosecant Squared Antenna , Radome

UNIT-V: Radar Transmitter and Receiver: Radar Receiver, Receiver Noise Figure, Super heterodyne Receiver, Duplexers and Receiver Protectors, Radar Displays, introduction to ECM and ECCM, Linear Beam Power Tubes, Solid State Power Sources, Magnetron.

Name of Text Books:

1. Introduction to Radar Systems by M. I Skolnik, TMH Pub. Co.
2. Microwave Radar and Navigational Aids by A.K. Sen and A. B. Bhattacharya, Khanna Publisher

Name of Reference Books:

1. Radar: Principles, Technology, Applications by Edde, Pearson Education Pub.
2. Elements of Electronic Navigation by Nagaraj, TMH Pub.

Course Outcomes :

1. To become familiar with fundamentals of Radar.
2. To gain in depth knowledge about the different types of Radar and their operation.
3. Need for signal detection in Radar and various Radar signal detection techniques.
4. To become familiar with Radio Navigation techniques

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Subject: **Consumer Electronics**
Course Code: **D028833(028)**
Total Theory Periods: 40
Class Tests: Two (Minimum)
Total Tutorial Periods: 10
Assignments: Two (Minimum)
ESE duration: Three Hours
Maximum Marks: 100, Minimum Marks: 35

Course Objectives:

1. To understand fundamentals of television.
2. To gain knowledge of color TV fundamentals.
3. To understand working of microphones and know concepts of optical recording.
4. To gain knowledge of public address system.
5. To gain knowledge of use of electronics in home and automobiles.

UNIT–I: Fundamentals of Television: Elements of Television system, Scanning Process, Scanning Methods and Aspect Ratio, Persistence of Vision and Flicker, Vertical Resolution, Picture Elements, Kell Factor, Horizontal Resolution and Video Bandwidth, Interlacing of Scanning Lines, Video Signals, Control Pulses, Composite Video Signal, TV Standards: 625 Line System.

UNIT–II: Color TV: Introduction, Color Spectrum, Compatibility Consideration, Color TV Signal, Luminance Signal, Chrominance Signal, Luminance and Chrominance, Recombination to Natural Color Voltages, Interleaving Process, Color Subcarrier Frequency, Phase Errors, Composite Color Signal, High Definition TV, Digital TV.

UNIT–III: Microphone and Optical Recording: Microphone: Characteristics of Microphones, Construction and working Principles of Microphones, Carbon Microphone, Dynamic Microphone, Capacitor Microphone, Tie Clip Microphone, Wireless Microphone. Optical Recording of Audio Signal: Disc, Processing of Audio signal, Readout from the Disc, Reconstitution of the Audio Signal.

UNIT–IV: Public Address System: Loudspeaker: Ideal Loudspeaker, Basic Loudspeaker, Capacitor Loudspeaker, Permanent Magnet Loudspeaker, Voice coil, Loudspeaker Impedance, Acoustic Impedance and Resonance, Woofers, Horn Type Tweeters. Loudspeaker System: Horns, Indoor Acoustics. Public Address system: Introduction to PA system, Planning a PA System, Speaker Matching System, PA System Characteristics, PA Amplifiers.

UNIT–V: Electronics in Home Appliances and Automobiles: Microwave Oven: Block diagram, LCD Timer with Alarm, Single Chip Controller, **Washing Machine:** Electronic Controller for Washing Machine, Washing Machine Hardware, Washing Cycles-Hardware and Software Development, Fuzzy Logic Washing Machine, **Electronics in Automobiles:** In Car Computers: Applications, Electronic Ignition, Electronic Ignition Lock System, Anti Lock Braking System, Electronically Control Suspension, Instruments Panel Displays, Ultrasonic Car Safety Belt System Air Bag System, Vehicle Proximity Detection System, Car Navigation System.

Text Book:

1. Consumer Electronics by S. P Bali, Pearson Publication
2. Color Television by S.P Bali, McGraw Hill.

Reference Book:

1. Monochrome and color TV by R.R. Gulati, 3 rd Edition, New Age International.
2. Basic TV and video systems by Benard Globb.
3. Audio and Video System by R.G. Gupta, 2nd Edition, McGraw Hill.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Course Outcomes:

1. Students will be able to understand the concepts of television.
2. Students gain a deep insight into concepts of color television.
3. Students will be able to know about various microphones and also optical recording technique.
4. Students learn the design aspect of PA system.
5. Students will be able to get complete knowledge of working of microwave oven, washing machine and in car computers.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology	Branch: Electronics & Telecommunication
Subject: **Smart Antennas**	Course Code: **D028834(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100, Minimum Marks: 35

Course Objectives:

1. Students will be familiar with the Types of Smart Antenna Systems.
2. What are the benefits of smart antenna technology.
3. Gain an understanding and experience with smart antenna environments and implementation.

UNIT-I: Introduction To Smart Antennas: Need for Smart Antennas, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Accesses (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Mutual Coupling Effects

UNIT-II: **DOA Estimation Fundamentals** Introduction The Array Response Vector, Received Signal Model, The Subspace-Based Data Model, Signal Auto covariance Matrices ,Conventional DOA Estimation Methods, Conventional Beamforming Method, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation ,The MUSIC Algorithm, The ESPRIT Algorithm, Uniqueness of DOA Estimates.

UNIT-III: **Beam forming Fundamentals** The Classical Beam former-Statistically Optimum Beam forming Weight Vectors, The Maximum SNR Beam former, The Multiple Side lobe Canceller and the Maximum, SINR Beam former- Minimum Mean Square Error (MMSE),Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV) , Adaptive Algorithms for Beam forming ,The Least Mean-Square (LMS) Algorithm, The Recursive Least-Squares (RLS) Algorithm.

UNIT-IV: Space–Time Processing: Introduction, Discrete Space–Time Channel and Signal Models, Space–Time Beamforming, Inter symbol and Co-Channel Suppression, ISI Suppression, CCI Suppression, Joint ISI and CCI Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems, Single-User Data Rate Limits, Multiple-Users Data Rate Limits, Data Rate Limits Within a Cellular System, MIMO in Wireless Local Area Networks

UNIT-V: Mobile Stations' Smart Antennas Introduction -Multiple-Antenna MS Design, Combining Techniques, Selection (Switched) Diversity, Maximal Ratio Combining, Adaptive Beamforming or Optimum Combining ,RAKE Receiver Size, Mutual Coupling Effects, Dual-Antenna Performance Improvements ,Downlink Capacity Gains

Text Books:

1. Smart Antennas, Tapan k. Sarkar, IEEE Press Wiley Interscience
2. Constantine A. Balanis, Panayiotis I. Ioannides, Introduction to Smart Antennas Morgan & Claypool Publishers
3. hmed El Zooghby, Smart Antenna Engineering, Artech House

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Reference Books:

1. M.J. Bronzel, Smart Antennas, John Wiley, 2004
2. T.S. Rappaport & J.C. Liberti, Smart Antennas for Wireless Communication, Prentice Hall (PTR), 1999.
3. R. Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless Communication, Kluwer, 2001

Course Outcomes:

Students will

1. Compare the performances of digital radio receivers and software radios.
2. Study the CDMA spatial processors to analyze the multi-cell systems.
3. Analyze the channel models for smart antenna systems.
4. Study the environmental parameters for signal processing of smart antenna systems.
5. Evaluate the requirements for the design and implementation of smart antenna systems.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology	Branch: Electronics & Telecommunication
Subject: **Bio-medical Signal Processing**	Course Code: **D028835(028)**
Total Theory Periods: 40	Class Tests: Two (Minimum)
Total Tutorial Periods: 10	Assignments: Two (Minimum)
ESE duration: Three Hours	Maximum Marks: 100, Minimum Marks: 35

Course Objectives:

1. To make them understand the fundamentals of signal processing for various bio-signal analysis.
2. To impart knowledge about filter characteristics and to design various filters,
3. To provide an in-depth knowledge about the basic concepts of wavelet and speech analysis.
4. To apply various signal processing techniques in analyzing the various biosignal.
5. To study about the characteristics of non stationary signals.

UNIT – I: FUNDAMENTALS OF SIGNAL PROCESSING : Sampling and aliasing, Signal reconstruction, Signal conversion systems, Circular convolution Correlation, Autocorrelation, Cross correlation, FFT, decimation in time algorithm, Decimation in Frequency algorithm.

UNIT – II: DIGITAL FILTER DESIGN : Basics of filter, Design of IIR filter-impulse invariant method, Bilinear Transformation Method Warping and pre-warping effect, Frequency transformation, Characteristics of FIR filter, FIR filter design using windowing techniques, Rectangular window, Hamming window, Hamming window

UNIT – III : WAVELET AND SPEECH PROCESSING : Introduction to wavelets, Time frequency representation, Discrete wavelet transform, pyramid algorithm, Comparison of Fourier transform and wavelet transform, Speech analysis, Cepstrum, Homomorphic filtering of speech signals, EEG signal characteristics, EEG analysis.

UNIT – IV: ANALYSIS OF BIOSIGNALS : Automatic analysis and classification of ECG, P-wave detection, QRS complex detection, Correlation analysis of ECG signals, Signal averaged ECG, Analysis of Heart Rate variability, Synchronized averaging of PCG envelopes, envelogram, Analysis of PCG signal, Analysis of EMG signal.

UNIT – V: ADVANCEMENT IN BIOMEDICAL SIGNAL PROCESSING : Analysis of non-stationary signals, time variant system, Fixed segmentation, Short time Fourier transform, autocorrelation function method, Spectral error measure method, generalized likelihood ratio, Introduction to Adaptive filters, Adaptive segmentation.

Text Books:

1. John G, Proakis and Dimitris Manolakis G. "Digital Signal Processing, Algorithms and Applications", PHI of India Ltd., New Delhi, fourth Edition, 2007.
2. Rangaraj M Rangayyan, "Biomedical signal processing", IEEE press, first edition, 2002.

Reference Book:

1. Reddy D.C, "Biomedical Signal Processing: Principles and Techniques", Tata McGraw-Hill, New Delhi, 2nd edition, 2005.
2. Sanjit. K, Mitra "Digital Signal Processing", A Computer Based Approach", Tata McGraw-Hill, New Delhi, fourth edition 2011.

Course Outcomes:

1. To learn the fundamental concepts of signal processing
2. To apply common signal processing techniques for various biomedical signals.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology | Branch: Electronics & Telecommunication
Semester: VIII | Course Code: **D028821(028)**
Subject: **Advanced Communication (Lab)** | Batch Size: 30
Total Lab Periods: 36 | Minimum Marks: 20, Maximum Marks: 40

List of Experiments: (At least ten experiments are to be performed by each student)

1. To measure bending loss of a fiber.
2. To measure propagation or attenuation loss in a fiber.
3. To obtain amplitude modulation and to transmit the same over fiber optic cable and to demodulate the same at the
4. receiver end.
5. To determine the numerical aperture of a fiber.
6. To measure various types of losses occur in an optical fiber.
7. To study the AC characteristics of intensity modulation of laser and fiber optic system.
8. To measure optical power of a laser diode vs forward current.
9. To monitor photo diode current vs laser optical output.
10. Demonstration of voice transmission through optical fiber using FM.
11. Communication between two computers using RS232 interface via optical fiber.
12. To measure plastic fiber patch cord loss for various lengths of fiber.
13. To study voice transmission through fiber optic cable using PWM.
14. To transmit and receive text files over fiber optic cable.
15. To transmit, receive and observe digital signals over fiber optic cable.
16. To measure rise time, fall time, pulse width distortion of a laser and to determine transmission delay.

List of Equipments/Machine Required:

Fiber optic trainer kit, Optical fiber, Splicing unit, Data Acquisition card for optical signal, O/E & E/O Converter, CRO.

Recommended Books:

1. Fundamentals of Optical Fiber Communication – Sathish Kumar, PHI.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology
Branch: Electronics & Telecommunication
Semester: VIII
Course Code: **D028822(028)**
Subject: **Power Electronics (Lab)**
Batch Size: 30
Total Lab Periods: 36
Minimum Marks: 20, Maximum Marks: 40

<u>List of Experiments:</u> (At least ten experiments are to be performed by each student)

1. Study of VI characteristic of a silicon controlled Rectifier (SCR).
2. Study of VI characteristic of a DIAC.
3. Study of VI characteristic of a TRIAC.
4. Study of VI characteristic of a UJT.
5. Application of UJT as relaxation Oscillator.
6. Study of Half wave gate controlled rectifier-using SCR.
7. RC triggering Scheme of SCR.
8. Study of Voltage Commutation.
9. Study of Current Commutation.
10. Study of single-phase, Half –controlled, full-wave rectifier using two SCRs, and two diodes.
11. Speed controls of a dc shunt Motor using SCR.
12. Study of a three –phase rectifier using power diodes.
13. Study of a three phase full-wave half –controlled rectifier.
14. To study a TRIAC power control circuit
    (i) use to control the speed of a fan
    (ii) used as a dimmer.
15. To observe how a Photoconductive cell may be used to trigger an SCR.

Apparatus required:

1. Diodes	2. SPST switch.	3. Transformer	4. Oscilloscope
5. Photo cells	6. CRO	7. Voltmeter, Ammeter	8. DC shunt motor

Reference books:-

1. Fundamentals of Power Electronics ISTE S .K Bhattacharya.
2. Fundamentals of Power Electronics by S. Rama Reddy.
3. Industrial and Power Electronics by Harish C. Rai.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology Branch:All Branches
Semester: III
Subject: Mathematics – III
Code: B000311(014)
Total Theory Periods: 03
Total Tutorial Periods: 01
Class Tests: Two (Minimum)
Assignments: Two (Minimum)
ESE Duration: Three Hours
Maximum Marks: 100 Minimum Marks: 35

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

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Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III
Subject: Electrical Circuit Analysis
Total Theory Periods: 36
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering
Code: B024312(024)
Total Tutorial Periods: 12 Total Credits: 4

Course Outcomes:

1. CO1: Evaluate the responses by applying network theorems to electrical circuits.
2. CO2: Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
3. CO3: Obtain and analyze the transient and steady-state response of electrical circuits.
4. CO4: Obtain and analyze the response of electrical circuits using Laplace Transform for standard inputs.
5. CO5: Analyze two port circuit behavior with different parameters.

UNIT I: Network Theorems (10 Hours)
Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem (all theorems - analysis with dependent current and voltage sources). Super node and Super mesh Analysis, Concept of duality and dual networks. Series and parallel resonance conditions.

UNIT II: Sinusoidal steady state analysis (11 Hours)
Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits (balanced circuit), Mutual coupled circuits, Dot Convention in coupled circuits,

UNIT III: Solution of First order networks (7 Hours)
Solution of first order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response

UNIT IV: Electrical Circuit Analysis Using Laplace Transforms (10 Hours)
Review of Laplace Transform, initial and final value theorem. Analysis of electrical circuits using Laplace Transform for standard inputs (step, ramp and impulse functions), convolution integral, inverse Laplace transform, transformed network with initial conditions..

UNIT V: Two Port Network and Network Functions (10 Hours)
Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks, Reciprocity & Symmetry, cascade, series, parallel and series-parallel connections of Two port Networks, Barlett's bisection Theorem.

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

Reference Books:

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
2. Alexander &Sadiku, "Fundamentals of Electric Circuits", TMH Publications.
3. C. L. Wadhwa, "Network Analysis and Synthesis", New Age Publications.
4. Kuriakose, "Circuit theory", PHI Learning Publications.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III
Subject: Electrical Machines – I
Total Theory Periods: 36
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering
Code: B024313(024)
Total Tutorial Periods: 12
Total Credits: 4

Course Outcomes: After successful completion of this course students will be able to-

1. CO1: Calculate various magnetic circuit variables and app for force/torque generation.
2. CO2: Develop equivalent circuit, phasor diagram of transformer and use them for performance analysis.
3. CO3: Analyze different type of connections of single and three phase transformer.
4. CO4: Appreciate various tests on transformer and DC machines.
5. CO5: Analyze the performance and operation of transformer and DC machines.

UNIT I: Magnetic Circuits and Electromagnetic Force/Torque (8 hours)

Review of magnetic circuit - MMF, flux, reluctance, inductance, B-H curve of magnetic materials, linear and non-linear magnetic circuits.

Electromechanical energy conversion - Energy stored in magnetic circuit, force as a partial derivative of stored energy with respect to position of a moving element, torque as a partial derivative of stored energy with respect to angular position of a rotating element; Examples-galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency.

UNIT II: Single Phase Transformer (10 hours)

Review of single phase transformer - Constructional features, operating principle, EMF equation, ideal transformer, phasor diagram of transformer on no-load and on load, excitation phenomenon.

Performance and Testing-Equivalent circuit, per unit representation, voltage regulation, losses, efficiency, condition for maximum efficiency, all-day efficiency, open circuit and short circuit test, back-to-back test, polarity test, separation of losses, parallel operation (equal and unequal voltage ratios)

Auto-transformer-Equivalent circuit, phasor diagram, comparison with two winding transformer, conversion from auto-transformer to two winding transformer and vice versa.

UNIT III: Three Phase Transformer (10 hours)

Three-phase transformers-Constructional details (three and five limb), bank of three single phase units, three phase single unit transformer, different connections and vector groups, calculation of efficiency and regulation **Applications** - Power transformer, distribution transformer, parallel operation of three-phase transformer, Scott connection, open delta connection, tap changing transformer.

UNIT IV: DC Machine-I (10 hours)

Electromagnetic principle of DC machine, BLV and BLI concept, constructional details, production of voltage and torque, classification of DC machine, armature reaction and its effect, methods to reduce armature reaction, commutation, methods of improving commutation, effect of brush shift, Operating characteristics of DC separately excited, series and shunt generator, condition of self excitation, critical speed and critical resistance.

UNIT V: DC Machine-II (10 hours)

Electrical and mechanical characteristics of DC motor, starters for shunt motors-three point and four point starter, speed control of DC motors- armature and field control method, losses in DC machines, efficiency and condition for maximum efficiency, Testing of DC machines- Swinburne's test and Regenerative test (Study only).

Text Books:

1. Nagrath and Kothari, "Electric Machines", TMH Publications.
2. B. R, Gupta, "Electrical machines", New Age International.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers.

Reference Books:

1. J. B. Gupta, "Theory & Performance of Electrical Machines", S. K. Kataria & Sons.
2. Ashfaq Hussain, "Electric Machines", Dhanpat Rai Publication.
3. Samarjeet Ghosh, "Electrical Machines", PHI Publications.
4. P. K. Mukherjee and S. Chakravarti "Electric Machines", Dhanpat Rai Publication.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III | **Branch: Electrical Engineering**
Subject: Digital Electronics | **Code: B0324314(024)**
Total Theory Periods: 24 | **Total Tutorial Periods: 12**
Total Marks in End Semester Exam: 100 | **Total Credits: 3**

Course Outcomes:

1. CO1: Understand working of logic gates.
2. CO2: Design and implement Combinational logic circuits.
3. CO3: Design and implement Sequential logic circuits.
4. CO4: Analyze Analog to Digital conversion and Digital to Analog Convertor circuit.
5. CO5: Construct a small memory subsystem.

UNIT I: Fundamentals of Digital Systems and logic families (8 Hours)
Digital signals, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT II: Combinational Digital Circuits (7 Hours)
Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De Multiplexer/ Decoders, Adders, Subtractors, BCD arithmetic, digital comparator, parity checker/ generator, code converters, priority encoders, decoders, Q-M tabulation method of function realization.

UNIT III: Sequential circuits and systems (7 Hours)
SR flip flop, JK flip flop T flip flop and D type flip flops, Applications of flip flops, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops.

UNIT IV: A/D and D/A Converters (7 Hours) Digital to analog converters, weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, analog to digital converters, successive approximation A/D converter, voltage to frequency and voltage to time conversion.

UNIT V: Semiconductor Memories and Programmable Logic Devices. (7 Hours)
Memory organization, memory size, classification and characteristics of memories, Random and sequential access memory, read only memory (ROM), read and write memory(RAM), ROM as a PLD, Programmable logic array, PLA Program Table.

Text Books:

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III
Subject: Numerical Methods
Total Theory Periods: 24
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering Code: B032415(024)
Total Tutorial Periods: 0
Total Credits: 2

Course Outcomes:

1. CO1: Determine roots of polynomials by various methods.
2. CO2: Solve system of equations by numerical methods.
3. CO3: Estimate polynomial values by various numerical methods.
4. CO4: Determine integration and integration from tabulated values of a function.
5. CO5: Solve ordinary differential equations by numerical methods.

UNIT I: Nonlinear Equations (5 Hours): Errors in numerical calculations, Determination of roots of polynomials and transcendental equations by Bisection method, Method of Regula Falsi Position, Newton-Raphson method; convergence analysis, Solution to system of nonlinear equations by Method of iteration & Newton-Raphson Method.

UNIT II: System of Linear Equations (5 Hours): Matrix notation, Triangular matrices, LU Decomposition of a matrix, Eigen values and eigenvectors, Solutions of linear algebraic equations by Gauss Elimination and Gauss-Jordan methods, Iterative methods-Jacobi and Gauss-Seidel methods.

UNIT III: Interpolation and Approximation (5 Hours): Polynomial interpolation, finite differences, Backward, Forward and central difference, divided difference, Detection of errors using difference tables, Lagrange formula and Newton's formula for interpolation, Central difference interpolation formulae, Interpolation with unevenly spaced points by Lagrange's interpolation formula,.

UNIT IV: Numerical Differentiation and Numerical Integration(5 Hours): Introduction, numerical differentiation, differentiation based on Forward differences, Backward differences and Central differences, Maximum and Minimum values of a tabulated function, Numerical Integration, Trapezoidal rule, Simpson's 1/3 & 3/8 rules.

UNIT V: Ordinary Differential Equations(4 Hours): Numerical solution of ordinary differential equations, Taylor series method, Picard's method, Euler and Modified Euler's method, Runge-Kutta methods,

.Text Books:

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private Ltd, Fifth Edition.
2. M. K. Jain, S. R. K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering computation", New Age International.

Reference Books:

1. C. F. Gerald and P. O. Wheatley, "Applied Numerical Analysis", Pearson Education, Sixth edition.
2. W. Cheney and D. Kincaid, "Numerical Mathematics and Computing", Thomson Brooks/Cole, Vikas Publishing House, Fourth edition.
3. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & Matlab", Khanna Publisher.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III
Subject: Electrical Circuit Analysis Laboratory
Total Practical Periods: 24
Total Marks in End Semester Exam: 40

Branch: Electrical Engineering
Code: B024322(024)
Total Credits: 1

Course Outcomes:

1. CO1: Understand the usage of common electrical measuring instruments.
2. CO2: Evaluate the responses by applying network theorems to electrical circuits.
3. CO3: Analyze the transient and steady-state response of electrical circuits.
4. CO4: Analyze two port networks behavior by determining different parameters.
5. CO5: Verify the properties of interconnected two port networks.

List of experiments: (Minimum 10 experiments are to be performed)

1. To study the different functions of a Analog / Digital multimeters.
2. To verify Thevenin's theorem for DC/AC Circuits.
3. To verify Norton's theorem for DC/AC Circuits.
4. Determination of transient response of current in series RL circuit with step voltage input and understand the time constant concept with DC Power Supply.
5. Determination of transient response of current and voltage in series RC circuit with step voltage input and understand the time constant concept with DC Power Supply.
6. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
7. Determination of line and phase voltages in wye and delta connected three phase balanced circuits.
8. Determination of Z parameters for a dc network and computation of Y, Transmission and h parameters.
9. Determination of Y parameters for a dc network and computation of Z, Transmission and h parameters.
10. Determination of transmission parameters for a dc network and computation of Z, Y and h parameters.
11. Determination of h parameters for a dc network and computation of Z, Y and transmission parameters.
12. Determination of driving point and transfer impedances of a two port ladder network and verification with theoretical values.
13. Verification of parameter properties in inter-connected two port series networks.
14. Verification of parameter properties in inter-connected two port parallel networks.

Requirements: Voltmeter, ammeter, wattmeter, power factor meter, Resistors, Inductors, Capacitors, Lamp load, DC supply, Three phase supply, Three-phase autotransformer, Multimeter, Simulation tools like SCILAB, MATLAB, PSIM, MULTISIM

Reference Books:

1. S. K. Bhattacharya, "Experiments in basic electrical engineering", New Age International, 2007.
2. Mehta and Gupta, "Basic shop practical", Dhanpat Rai Publishing Company (P) Ltd-New Delhi, 2003
3. N. K. Jain, "Practical in electrical engineering", Jain Book Depot

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Branch: Electrical Engineering

Semester: B.Tech III
Subject: Electrical Machines Laboratory - I
Code: B024321(024)
Total Practical Periods: 24
Total Marks in End Semester Exam: 40
Total Credits: 1

Course Outcomes:

1. CO1: Perform various tests on single and three phase transformer.
2. CO2: Connect and operate three phase transformer in various configurations.
3. CO3: Perform speed control on DC machine.
4. CO4: Perform various tests on DC machine.

List of experiments: (Minimum 10 experiments are to be performed)

1. To determine the equivalent circuit parameters of a single phase transformer.
2. To determine the voltage regulation of a single phase transformer operating at lagging and upf condition.
3. To determine the efficiency of a single phase transformer under different loading condition
4. To perform the tests required for parallel operation of transformers.
5. To perform parallel operation of two single phase transformer.
6. To study the voltage/current ratios for different types of three phase transformer connection.
7. To perform Back to Back test on two single phase transformer.
8. To perform 3- phase to 2- phase conversion (Scott connection)
9. To study the various routine tests performed on three phase transformers as per IS code.
10. To determine the armature & field winding resistance of D.C machine by voltmeter/ammeter method.
11. To determine the magnetization or Open circuit characteristics of a D.C machine
12. To perform load test on D.C shunt generator.
13. To perform Swinburne's test a D.C machine & calculate its efficiency at full load operating condition.
14. To study three point and four point motor starters and observe its impact on the motor staring current.
15. Speed control of a D.C shunt motor by
    (a) Varying field current with armature voltage kept constant
    (b) Varying armature voltage with field current kept constant.
16. To study the reversal of D.C shunts motor.

Requirements:
Single Phase Transformer, Three Phase Transformer, Three Phase Auto Transformer, DC Shunt Generator Set, DC Shunt Motor, DC series Motor, Ammeters (AC & DC), Voltmeter (AC & DC), Wattmeter, Tachometer

Reference Book:

1. S. G. Tarnekar and P. K. Kharbanda, "Laboratory courses in electrical engineering", S. Chand & Company Ltd.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Branch: Electrical Engineering

Semester: B.Tech III
Subject: Digital Electronics Laboratory
Total Practical Periods: 24
Code: B024323(024)
Total Marks in End Semester Exam: 40

Course Outcomes:

1. CO1: Develop circuits from truth tables using basic gates.
2. CO2: Develop circuits from MSI ICs.
3. CO3: Summarize the truth table of various flip flops.
4. CO4: Design a counter from a sequence diagram.
5. CO5: Examine functioning of A/D converter.

List of experiments: (Minimum 10 experiments are to be performed)

1. To Verify the Properties of NOR & NAND Gates As Universal Building Block.
2. Realization of Boolean Expression Using NAND Or NOR Gates.
3. To Construct X- OR Gate Using Only NAND Or NOR Gates Only.
4. To Construct a Half Adder Circuit. And Logic Gates And Verify its Truth table.
5. To Construct a Full Adder Circuit and Verify its truth table (Using Two X-OR And 3 nand gates).
6. To Construct a Half Subtractor Circuit. by Using Basic Gates and Verify its truth table.
7. To Construct a Full Subtractor Circuit by using Basic Gates and Verify its truth table.
8. To Construct a Circuit of 4 -Bit Parity Checker & Verify its truth table.
9. To construct a BCD Adder using MSI 4 bit parallel adder IC.
10. To Construct a Programmable Inverter Using X-OR Gates & Verify its truth table.
11. To Design a Comparator Circuit & Verify its truth table.
12. To Construct A RS Flip Flop Using Basic & Universal Gates (NOR & NAND)
13. To Construct a J.K. Master Slave Flip Flop & Verify its truth table.
14. To Verify the Operation of a Clocked S-R Flip Flop and J. K. Flip Flop.
15. To Construct a T & D Flip Flop Using J. K. Flip Flop and Verify Its Operations & truth table.
16. To design and verify the Operation of Counters.
17. Study of A/D and D/A converters.

Requirements: Bread boards, Power supplies, Logic Gates, CRO, Function Generator, Counters, and General Purpose Digital Experimental Kits.

Reference Books:

1. William Kleitz, "Lab Experiments--Digital Electronics, a Practical Approach", Prentice Hall, 1990.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III
Branch: Electrical Engineering
Subject: Applications of Numerical Methods in Open Source Software Laboratory
Code: B024324(024)
Total Practical Periods: 24
Total Marks in End Semester Exam: 40
Total Credits: 1

Course Outcomes: Type your text

1. CO1: Develop computer programs for various numerical methods.
2. CO2: Analyze advantages of numerical methods over conventional methods.
3. CO3: Compare various algorithms for a particular method.
4. CO4: Apply numerical methods to engineering applications.

List of experiments: (Minimum 10 experiments are to be performed)

Write a program using SCILAB or C /CPP or any other programming language, ,

1. Bisection method.
2. Regula-Falsi Method.
3. Newton Raphson Method.
4. Multiplication of 2 Matrices.
5. Inversion of a Matrix.
6. Gauss Elimination Method.
7. Factorization Method.
8. Gauss Jordan Method.
9. Gauss Seidal Method.
10. Newton Forward Interpolation.
11. Lagrange's Interpolation.
12. Trapezoidal Rule for Integration.
13. Simpson 1/3 Rule for Integration.
14. Simpson 3/8 Rule for Integration,
15. Euler's Method.
16. Modified Euler's Method,
17. Runge Kutta Method.

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Requirements: Lab equipped by PCs as per AICTE Norms and Open Source Softwares, SCILAB Etc.

Reference Books:

1. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & Matlab", Khanna Publisher.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV | **Branch: Electrical Engineering**
Subject: Electromagnetic Fields | **Code: B024411(024)**
Total Theory Periods: 36 | **Total Tutorial Periods: 12**
Total Marks in End Semester Exam: 100 | **Total Credits: 4**

Course Outcomes: At the end of the course, students will demonstrate the ability to

1. CO1: Compute electric field intensity for various charge distribution.
2. CO2: Compute electric potential, potential difference and energy density in the electrostatic field.
3. CO3: Use the solution of Laplace and Poisson's equations for the calculation of potential and electric field intensity.
4. CO4: Compute magnetic field intensity, magnetic flux density, force and torque for various current carrying elements.
5. CO5: Analyze the time varying electric and magnetic field using Maxwell's equations under time varying conditions.

UNIT I: Basics of Electromagnetic Fields: (6 hours)
Scalars and vectors, vector algebra, Cartesian, Cylindrical and Sphericalcoordinate systems, transformations between coordinate systems, Coulomb's law, Electric field intensity, electricfield due to point charge, line charge, continuous volume charge and surface charge.

UNIT II:Electric Flux and Potential: (6 Hours)
Electric flux and Electric flux density, Gauss's law and its application (symmetricalcharge distribution only),divergence and divergence theorem, Maxwell's first equation, Definition of potentialdifference and potential, potential field of a point charge, potential field between two coaxial cylinders, potentialbetween two conducting spherical shells, conservative property, potential gradient, Energy Density in theElectrostatic field.

UNIT III: Electric current, Poisson& Laplace equations: (6 Hours)
Current and current density, continuity of current, metallicconductors, conductor properties and boundary conditions, the method of images, nature of dielectric materials,boundary conditions for perfect dielectric materials, Poisson and Laplace equation, Uniqueness theorem, examplesof the solution of Laplace equations (one dimension only).

UNIT IV: Magneto staticsand Magnetic Force: (6 Hours)
The steady state magnetic field, BiotSavart Law, Ampere's circuital Law,Curl, Stoke's theorem, Magnetic flux and Magnetic flux density, scalar and vector magnetic potentials, force on amoving charge, force on a differentialcurrent element, force between differential current elements, force and torqueon a closed circuit, magneticmaterials, magnetization andpermeability, Magnetic boundary conditions.

UNIT V: Time Varying Field and Maxwell's Equations:(6 Hours)
Faraday's law of electromagnetic induction, statically anddynamically induced EMFs, displacement current, modification of Maxwell's equations under time varyingconditions (point form and integral form), Poynting Theorem and Poynting vector.

Text Books:

1. William H.Hayt and Jr. John A. Buck , "Engineering Electromagnetics", Tata McGraw-Hill
2. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
3. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

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Reference Books:

1. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
2. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.
3. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
4. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
5. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press,1966.
6. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational publishers, International Edition, 1971.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV
Subject: Power Systems – I (Apparatus and Modeling)
Total Theory Periods: 36
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering
Code: B024412(024)
Total Tutorial Periods: 12
Total Credits: 4

Course Outcomes: Students will be able to:
1. CO1: Describe the concept of national grid and smart grid.
2. CO2: Calculate various line parameters for different configurations of transmission lines.
3. CO3: Perform the analysis of short, medium and long transmission lines.
4. CO4: Solve the problems related to insulation resistance and capacitance calculation in underground cables.
5. CO5: Calculate energy, power, reflection and refraction coefficients for different terminations of transmission lines.

UNIT I: Introduction and modeling (8 hours)
Introduction to Power System: Evolution of power system, Structure of Power System, introduction of bulk Power grid and micro grid, Overview of national grid, Introduction of smart grid
Modeling of Generators and Transformers: Real and reactive capability curve of generators, waveform under balanced 3 phase short circuit at the terminals, Steady state, transient and sub transient equivalent circuits, phase shift in star delta transformer, 3 winding transformers, tap changing transformer.

UNIT II: Overhead Line Components and Parameters (10 hours)
Types of conductors i.e., solid, stranded, ACSR and bundled conductors, calculation of inductance and capacitance of single and three phase lines for single and double circuit configuration, concept of GMR and GMD, Effect of earth on line capacitance, skin effect and proximity effect, types of load, voltage and frequency dependence of loads and per unit system.

UNIT III: Transmission Line Performance Analysis (10 hours)
Classification of transmission lines ie short, medium and long lines, nominal T, nominal π, equivalent T and equivalent π circuits, Calculation of ABCD constants for short, medium and long lines, calculation of efficiency and regulation of short, medium and long lines, Ferranti effect, Surge impedance loading.

UNIT IV: Underground Cables (10 hours)
Classification of underground cables, components of underground cables, insulation resistance and capacitance of underground cables and their calculations, capacitance grading and inter sheath grading, capacitance of three core belted cable, dielectric loss in cable and concept of tan δ.

UNIT V: Travelling Waves in Power System (10 hours)
Wave equation for transients in power systems, characteristic impedance, power and energy in travelling waves, calculation of reflection and refraction coefficients of current and voltage for various types of terminations i.e., open circuit, short circuit, inductive and capacitive terminations and their series and parallel combinations, junction of dissimilar lines, repeated reflections and Bewley lattice diagram, introduction of insulation coordination.

Text Books:
1. Nagarath and Kothari, "Power System Engineering", TMH publisher.
2. B. R. Gupta, "Power System Analysis and Design", S. Chand Publisher.

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Reference Books:
1. Tarun Gonen, "Electric Power Transmission System Engineering and Design", CRC press, Taylor and Francis series.
2. T. K. Nagaskar and M. S. Sukhija, "Power System Analysis", Oxford University Press.
3. Jhon J. Grainger and W. D. Stevenson, "Power System Analysis", Mc Graw Hill Education
4. I. S. Jha, Subir Sen, Rajesh Kumar and D. P. Kothari, "Smart Grid Fundamentals and applications", New Age International Publication.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV
Branch: Electrical Engineering
Subject: Electrical Machines – II
Code: B024413(024)
Total Theory Periods: 36
Total Tutorial Periods: 0
Total Marks in End Semester Exam: 100
Total Credits: 3

Course Outcomes: At the end of this course, students will be able to:

1. CO1: Apply the concepts of AC machine windings.
2. CO2: Analyze the concepts of rotating magnetic fields and operation of three phase Induction Motors.
3. CO3: Understand the working of Single-phase induction motors.
4. CO4: Analyze the performance, and operation of A.C Commutator motor and special motors.
5. CO5: Analyze the performance, characteristics and operation of ac machines.

UNIT I: Fundamentals of AC machine windings (7 hours)
Physical arrangement of windings in stator and cylindrical rotor, slots for windings, single turn coil - active portion and overhang, full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor. Rotating magnetic field.

UNIT II: Three phase Induction Motors (8 hours)
Construction, operation, Types, Torque Slip Characteristics, Starting and Maximum Torque, Equivalent circuit, Phasor Diagram, Losses and Efficiency, Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors.

UNIT III: Single-phase induction motors (6 hours)
Constructional features, Double revolving field theory, Equivalent circuit, Determination of parameters-No load test Blocked rotor test, Cross field theory, starting methods, Characteristics and applications.

UNIT IV: A.C Commutator motor and Special motor (7 hours)
A.C Commutator motor- Construction, principle of operation and application of Single phase series motor, universal motor, Repulsion motor.
Special motor- Construction, principle of operation and application of Variable Reluctance motor, Stepper motor, Linear Induction motor, Permanent Magnet Brushless DC motor, Permanent Magnet Synchronous motor.

UNIT V: Synchronous machines (8 hours)
Synchronous generators- Constructional features, types, Generated EMF, Equivalent circuit, phasor diagram, Operating characteristics, armature reaction, synchronous impedance, voltage regulation (EMF,MMF and zero power factor method), Parallel operation of alternators - synchronization and load division.
Synchronous Motor- Operation, construction, analysis of phasor diagram, two reaction theory, V-curves, power angle characteristics.

Text Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

Reference Books:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. S. Jaganathan, "Special Electrical Machines", Pearson Publication 1st Edition

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV
Subject: Signals and Systems
Total Theory Periods: 24
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering
Code: B024414(024)
Total Tutorial Periods: 12
Total Credits: 3

Course Outcomes:

1. CO1: Understand the concepts of continuous time and discrete time systems.
2. CO2: Analyze the behavior of continuous time and discrete time systems.
3. CO3: Evaluate and analyze the solution of systems using z-Transforms.
4. CO4: Analyze and design systems in complex frequency domain.
5. CO5: Understand sampling theorem and its implications.

UNIT I: Introduction to Signals and Systems (8 hours)
Introduction, Signal properties, Special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. Relation between continuous and discrete time systems, System properties: linearity, additivity and homogeneity, shift-invariance, causality, stability.

UNIT II: Behavior of continuous and discrete-time LTI systems (8 hours)
Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections, Characterization of causality and stability of LTI systems, System representation through differential equations, State-space Representation of systems, Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT III: Discrete linear time system analysis with z- Transforms (6 hours)
The z-Transform for discrete time signals and systems, systems described by difference equations, system functions, poles and zeros of systems and sequences, Solution by z-transform , z-domain analysis.

UNIT IV: Fourier analysis (8 hours)
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response. The Discrete-Time Fourier Transform (DTFT), Parseval's Theorem, Discrete Fourier Transform (DFT), Circular convolution, Linear Filtering Methods Based on the DFT, Overlap-add and save methods.

UNIT V: Sampling and Reconstruction (6 hours)
The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold, Aliasing and its effects. Introduction to the applications of signal and system theory to communication systems, Sinusoidal Amplitude Modulation and demodulation, Pulse-Amplitude Modulation

Text Books:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.

Reference Books:

1. H. P. Hsu, "Signals and systems, Schaums series", McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV
Subject: Analog Electronics
Total Theory Periods: 24
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering
Code: B024415(024)
Total Tutorial Periods: 12
Total Credits: 3

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. CO1: Design and analyze various rectifier circuits and understand the characteristics of transistors.
2. CO2: Design and analyze amplifier circuits.
3. CO3: Understand the functioning of op-amp.
4. CO4: Analyze the linear applications of op-amp.
5. CO5: Design op-amp based circuits for various operations.

UNIT I: Diode circuits and BJT circuits (8 Hours)
Review of half-wave and full-wave rectifiers; zener diodes; clamping and clipping circuits.
BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

UNIT II: MOSFET circuits (7 Hours)
MOSFET structure and I-V characteristics, MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, transconductance, high frequency equivalent circuit.

UNIT III: Differential, multi-stage and operational amplifiers (8 Hours)
Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT IV: Linear applications of op-amp (7 Hours)
Idealized analysis of op-amp circuits, inverting and non-inverting amplifier, differential amplifier, integrator, active filter, voltage regulator, oscillators (Wein bridge and phase shift).

UNIT V: Nonlinear applications of op-amp (6 Hours):
Voltage comparator, zero crossing detector, Schmitt Trigger, waveform generator (square and triangular), precision half wave and full wave rectifiers, peak detector, level detector.

Text Books:

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University, Press, 1998
2. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill.
3. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

Reference Books:

1. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
3. Boylestad and Nashelsky, "Electronic Devices and Circuit Theory", 8th Ed. PHI.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV **Branch: Electrical Engineering**
Subject: Power Systems Laboratory - I **Code: B024422(024)**
Total Practical Periods: 24
Total Marks in End Semester Exam: 40 **Total Credits: 1**

Course Outcomes: Students will be able to

1. Demonstrate various types of insulators used in power system.
2. Demonstrate various types of cables used in power system.
3. Measure ABCD constants of short, medium and long lines.
4. Locate fault in a length of cable.
5. Describe the various equipments/components used in transmission Sub Station.

List of experiments: (Minimum 10 experiments are to be performed)

1. To measure ABCD constants of short transmission lines.
2. To measure ABCD constants of medium transmission line.
3. To measure ABCD constants of long transmission lines.
4. To study the types of cables.
5. To locate fault in cable by Murray loop test.
6. To study the types of insulators ie pin insulator and string insulator.
7. To study Ferranti effect.
8. T measure capacitance between conductor-conductor and conductor-earth.
9. Comparison of GMD and GMR for different groups of conductors.
10. To study the Bus Bar arrangement of college power supply Sub Station.
11. To draw the lay out diagram of college power supply system.
12. To draw the lay out diagram of 132/220/400 KV transmission Sub Station.
13. Technical visit of nearby transmission Sub Station.
14. To study Lightning Arrester and Surge Absorbers.

*** All study experiment must involve physical demonstration/simulation.

Requirements: Transmission line trainer, Power system simulation software like MATLAB/Mi Power or equivalent. Pin type insulator, String insulator, Pieces pf various types of cables, Ammeter, Voltmeter, Multimeter and Wattmeter, Resistors, Inductors, Capacitors and Power supplies.

Reference Books:

1. C. L. Wadhwa, "Electrical Power Systems", New Age International Publishers.
2. Ashfaq Hussain, "Electrical power Systems", CBS Publishers.
3. J. Arrillaga and N. R. Watson, "Computer Modelling of Electrical Power Systems", Wiley International Publisher.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV **Branch: Electrical Engineering**
Subject: Electrical Machines Laboratory - II **Code: B024421(024)**
Total Practical Periods: 24
Total Marks in End Semester Exam: 40 **Total Credits: 1**

Course Outcomes: The students will
1. CO1: Get an exposure to common electrical equipment and their ratings.
2. CO2: Perform various tests on three phase induction motor.
3. CO3: Understand the usage of common electrical measuring instruments.
4. CO4: Perform speed control on induction motor.
5. CO5: Determine the voltage regulation of 3 phase alternator by different methods.

List of experiments: (Minimum 10 experiments are to be performed)

1. To determine the equivalent circuit parameters of 3-phase induction motor by No-Load and Block Rotor test.
2. Measurement of Speed of Induction Motor by Measuring Rotor Frequency.
3. To study the speed control of a three phase slip ring I.M by adding external resistance to the rotor circuit.
4. To Study DOL starter and provide connection to 3- phase Induction motor.
5. Speed reversal of 1-phase induction motor.
6. Characteristics of stepper motor.
7. Measurement of circuit Constant of 1-phase induction motor.
8. To study synchronization of two alternators with each other and effect of change in excitation and speed (frequency) on load sharing.
9. To determine the voltage regulation of 3 phase alternator by EMF method.
10. To plot the V and inverted V- curve of synchronous Motor at No Load, and Full Load.
11. Determination of the Xd & Xq of synchronous machine.
12. Determination of zero sequence reactance by synchronous machine.
13. To Study Star-Delta starter and provide connection to 3-phase Induction motor.
14. To study speed control of Induction motor by Cascade connection.
15. To determine the voltage regulation of 3 phase alternator by direct loading.
16. To determine the voltage regulation of 3 phase alternator by ZPF method.

Requirements:
1. 3-Phase Alternator
2. 1-Phase Induction motor,
3. 3-Phase Induction Motor (Slip-ring & cage)
4. DOL starter
5. Single phase variac
6. Three phase variac
7. Stepper Motor
8. Ammeter, Voltmeter, wattmeter
9. Synchronous Motor
10. Rheostats, resistive Load.

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Reference Books:
1. Yash Pal, "A Reference Book on Experiments with Basic AC/DC Circuits and Electrical Machines", Kindle Edition.
2. D. P. Kothari and B. S. Umre, "Laboratory manual for Electrical machines", J. K. International Publishing House Pvt. Ltd.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech. IV | **Branch: Electrical Engineering**
Subject: Analog Electronics Laboratory | **Code: B024423(024)**
Total Practical Periods: 24
Total Marks in End Semester Exam: 40 | **Total Credits: 1**

Course Outcomes:

Students will be able to:

1. CO1: Design and test rectifiers, clipping circuits, clamping circuits and voltage regulators.
2. CO2: Design, test and evaluate BJT amplifiers in CE configuration.
3. CO3: Compute the parameters from the characteristics of BJT and MOSFET devices.
4. CO4: Evaluate characteristics of the operational amplifiers.
5. CO5: Design various applications of operational amplifiers.

List of experiments: (Minimum 10 experiments are to be performed)

1. Design half wave and full wave rectifiers and determine ripple factor, rectifier efficiency and regulation
2. Design and set up diode clipping and clamping circuits.
3. Determine Zener diode characteristic and determine line and load regulation characteristics using it as a voltage regulator
4. Design and set up the BJT common emitter amplifier with and without feedback and determine the gain-bandwidth product from its frequency response.
5. Design and measure the frequency response of an RC coupled amplifier using BJT.
6. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth
7. Design, setup and plot the frequency response of MOSFET amplifier and obtain the bandwidth.
8. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters - drain resistance, mutual conductance and amplification factor.
9. Evaluate characteristics of the non-ideal operational amplifiers - Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product.
10. Design and realize inverting and non-inverting amplifier using 741 op-amps and obtain their frequency responses.
11. Design and verify the operation of adder and subtractor circuit using op amp 741.
12. Design and verify the operation of a differentiator and integrator circuits using op amp IC 741 and show that they act as a high pass filter and low pass filter respectively.
13. Design and realize a voltage comparator using op amp 741.
14. Design and realize a wein-bridge oscillator using op amp 741.
15. Design and realize a phase shift oscillator using op amp 741.
16. Design and realize a square wave generator using op amp 741.

Requirements:

Circuit components, Breadboard, Hook-up wire, Power supply, Digital multimeter, CRO, DSO, Function generator.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech IV **Branch: Electrical Engineering**
Subject: Virtual Laboratory **Code: B025424(024)**
Total Practical Periods: 24
Total Marks in End Semester Exam: 40 **Total Credits: 1**

Course Outcomes: Students will be able to

1. CO1: Develop the simulation models of electrical machines, power system circuits and networks.
2. CO2: Analyze the tests conducted in the electrical machines.
3. CO3: Evaluate the behavior of magnetic field in the machines.
4. CO4: Design the digital circuit using gates.
5. CO5: Justify the theorems by constructing various circuits and models.

List of experiments: (Minimum 10 experiments are to be performed)

Power System lab- link - http://vp-dei.vlabs.ac.in/Dreamweaver/

1. To study the Ferranti Effect of transmission line/cable. (Available- Video/ Simulation)
2. To determine positive sequence, negative sequence and zero sequence reactance of an alternator.(Available- Video/ Simulation)

Electrical machine lab- link - http://em-coep.vlabs.ac.in/

1. Load Test on Separately Excited DC Motor. (Available – Simulator)
2. Speed Control of Separately Excited DC Motor. (Available – Simulator)
3. No Load Test on Three Phase Induction Motor. (Available – Simulator)
4. Blocked Rotor Test on Three Phase Induction Motor. (Available – Simulator)
5. Open Circuit Test on Three Phase Alternator. (Available – Simulator)
6. Short Circuit Test on Three Phase Alternator. (Available – Simulator)
7. Load Test on Three Phase Alternator. (Available – Simulator)
8. V and Inverted V curves of Synchronous Motor. (Available – Simulator)

Electrical Machine lab – link - http://vem-iitg.vlabs.ac.in/

1. To study the generation of magnetic field in a single coil system due to DC and AC current. (Available – Simulator)
2. To study the behaviour of rotating magnetic field in a two coil system due to AC current. (Available – Simulator)
3. To study the behaviour of rotating magnetic field in a three coil system due to AC current. (Available – Simulator)
4. To measure the DC resistance of stator winding of the induction motor. (Available – Simulator)
5. To start the induction motor by connecting external rheostat to the stator winding. (Available – Simulator)
6. To start the induction motor using 3-phase auto-transformer. (Available – Simulator)
7. To start the induction motor using 3-phase auto-transformer. (Available – Simulator)

Digital Electronics and Logic Design – link - http://vlabs.iitb.ac.in/vlabs-dev/labs/dldgates/labs/index.php

1. Design of Multiplexer circuit using gates. (Available – Simulator)
2. Design of Multiplexer circuit using universal logic gates. (Available – Simulator)
3. Design of Demultiplexer circuit using basic logic gates. (Available – Simulator)
4. Design of Demultiplexer circuit using universal logic gates. (Available – Simulator)
5. Application of Multiplexer. (Available – Simulator)

Circuit and Network Laboratory – link - http://ssl-iitg.vlabs.ac.in/

1. Verification of Reciprocity Theorem. (Available – Simulator)

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2. Verification of Maximum Power Transfer Theorem. (Available – Simulator)
3. Determination of different parameters of Two-port network and verification of their interrelations. (Available – Simulator)

Note- The experiments are to be involved as the virtual lab while updating of the experiments.

Requirements:
1. Virtual Lab – vlab.co.in
2. Adobe Flash Player

Reference Books:

1. S.G. Tarnekar & P.K. Kharbanda, "Laboratory courses in electrical engineering"
2. Ashfaq Hussain, "Electrical power systems", CBS Publications.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers
4. Morris Mano, "Digital Logic and Concept design", PHI Publications
5. A. K. Sawhney, "A Course In Electrical And Electronics Measurement And Instrumentation", Dhanpat Rai Pbs.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Common to All Branches** Semester: **IV**

Subject: **Indian Culture and Constitution of India** Code: B000406(046)

Total Theory Periods: **2/Week** Total Tutorial Periods: **NIL**

Assignments: **Two (Minimum)** Total Marks in ESE: **NIL** Marks in TA: **10**

Objective: The Constitution is the supreme law and it helps to maintain **integrity** in the society and to promote unity among the citizens to build a great nation. The main objective of the Indian Constitution is to promote harmony throughout the nation.

Course Objectives

Upon completion of this course, the student shall be able

- To understand Meaning and concepts of Traditional and Modern of Culture
- To understand Sources of the Study of Indian Culture
- To Enable the student to understand the history and importance of constitution
- To understand philosophy of fundamental rights and duties
- To understand the powers and functions of executive, legislature and judiciary
- To understand the powers and functions of state government
- To understand the recent trends in Indian constitutional and election commission of India.

To understand the central and state relation, financial and administrative.

UNIT-I

Meaning and concepts of Culture: Traditional and Modern concepts of Culture-Notions of Culture in textual tradition, anthropological, archaeological and sociological understanding of the term culture. Elements of Culture, concept of Indianness and value system. Relation between culture and civilization. Historiography and approaches to the study of Indian Culture– Stereotypes, Objectivity and Bias, Imperialist, Nationalist, Marxist and Subaltern. Heritage of India and world's debt to Indian Culture.

UNIT–II

Sources of the Study of Indian Culture: Archaeological: cultural remains, Monuments, Numismatics, Epigraphy; Literary sources and Oral traditions; Foreign Accounts; Archival sources.

UNIT–III

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History of Indian Constitution Constitutional History, Preamble salient features, citizenship, Method of Amendment and Recent Amendments. **Rights and Duties** Fundamental Rights and Directive Principles of State Policy. Fundamental Duties. Difference between Fundamental Rights and Directive Principles of State Policy

Union Government a) President-powers and functions. Vice president powers and functions, Prime Minister and council of ministers powers and functions. b) Parliament- Loksabha, Rajyasabha- composition powers and functions. c) Judiciary (Supreme Court) composition powers and functions Judicial Activism

UNIT–IV

State Government a) Governor: powers and functions b) Chief minister: powers and functions c) State Legislative Assembly and Legislative Council- composition powers and functions. d) High Court : composition powers and functions

UNIT–V

Recent Trends in Indian Constitutional a) Basic structure of Indian Constitution. b) Electoral Reforms c) Panchayati Raj system in India.

Books of Reference

1. **Dr. P. K. Agrawal** Indian Culture, Art and Heritage,
2. **P. Raghunadha Rao** Indian Heritage and Culture
3. M.V.Pylee, An Introduction to the Constitution of India,NewDelhi,Vikas,2005.
4. Subhash C.Kashyap, Our Constitution: An Introduction to India's Constitution and constitutional Law, New Delhi, National Book Trust, 2000.
5. Durga Das Basu, Introduction to the Constitution of India ,NewDelhi,Prentice Hall of India,2001.
6. D.C.Gupta, Indian Government and Politics,VIII Edition,New Delhi, Vikas, 1994.
7. V.D.Mahajan, Constitutional Development and National Movement inIndia, New Delhi, S. Chand and Co., latest edition.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester - B. Tech V | **Branch : Electrical Engineering**
Subject: Control System Engineering | **Code: C024511(024)**
Total Theory Periods : 36 | **Total Tutorial Periods: 12**
Total marks in End semester Exam : 100 | **Total Credits: 4**

Course Outcomes: After completing this course students will be able to:

CO Number	Course Outcomes Statements	Knowledge level
CO1	Classify, model and obtain simplified representation in blocks and signal flow graphs.	3
CO2	Appreciate the role of feedback in the systems	3
CO3	Explain the working of different control devices like Servo Motor, Synchros and Tacho Generator.	2
CO4	Analyze the physical systems in time domain and Construct the root locus plot	3
CO5	Determine the stability of systems using frequency response techniques.	3
CO6	Design different compensators for system.	3

UNIT I: Introduction to Control problem **(10 Hrs)**

Open Loop and closed control systems and their differences; Classification of control systems; Industrial control examples;Mathematical models of Translational and Rotational mechanical systems, thermal systems, liquid level systems, systems with dead time.

Block diagram representation of systems; System representation by Block Diagram and reduction using block diagram algebra; System representation by Signal Flow Graph and gain evaluation using Mason's gain formula.

UNIT II: **(8 Hrs)**

(a) Feedback Characteristics

Effects of feedback onStability, steady state accuracy, transient accuracy, disturbance rejection, insensitivity to parameter variation.

(b) Control Hardware and their Models

Working and Transfer Function of DC Servo motor, AC Servo motor and their comparison; Synchro Transmitter and Receiver working and applications; Tacho Generators working and applications

UNIT III: Time Response Analysis **(10 Hrs)**

Standard test signals; Time response of second order systems; Time domain specifications; Steady state response; Steady state errors and error constants; Effects of proportional derivative and proportional integral controllers, the concept of stability; Routh stability criterion; absolute and relative stability.

Root Locus Technique: The root locus concept; construction of root loci; effects of adding poles and zeros to G(s)H(s) on the root loci

UNIT IV: Analysis in Frequency domain (10 Hrs)

Introduction to frequency response analysis and it's specifications; Polar Plots;Nyquist Plots; Application of Nyquist criterion to find the stability, gain and phase margins.

Bode diagrams concepts and construction methods; Determination of stability, gain margin and phase margin using Bode diagram.

UNIT V: Introduction to design (10 Hrs)

Compensator design (Cascade Lag, Cascade Lead, Cascade Lag-Lead) using root locus plots; Compensator design (Cascade Lag, Cascade Lead, Cascade Lag-Lead) using Bode plots.

Text Books:

1. Control Systems M. Gopal: Tata McGraw-Hill, 1997.
2. Modern Control Engineering K. Ogata, PHI, Fourth edition. 2003

Reference Books:

1. Control Systems Engineering: I.J. Nagrath and M. Gopal; New Age Intenational Publishers, Third edition, 2002.
2. Control system Engineering:. K. Bhattacharya, Pearson, Second edition
3. Control Systems:Dhanesh N. Manik, Cengage Learning.
4. Automatic control systems: Benjamin C. Kuo, Prentice Hall of India, 2002.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Branch: Electrical Engineering **Semester: V**
Subject: Power System Analysis **Code: C024512(024)**
Periods per week (L-T-P):(3-1-0) **Credits: 04**
Number of class Test to be conducted: 2 (Minimum) **No. of assignment to be submitted: 02**
Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

COURSE OUTCOMES: After successful completion of this course, the student will able to:

Unit	CO Statement	Knowledge Level
1	Develop reactance diagram and estimate fault current for three phase short circuit fault on Power System.	3
2	Develop sequence networks of power system using the sequence networks of different components like transformers, transmission line, alternators etc.	3
3	Evaluate the fault currents for different unsymmetrical faults on Power System.	5
4	Apply numerical methods to analyze a power system in steady state	3
5	Apply stability criterion to analyze stabilityof Power Systems	3

UNIT I Symmetrical Faults: Single line diagram, per unit quantities,per unit impedance of three phase transformer, expression for three phase power in p.u. impedance diagram and reactance diagram of power system, computation of voltage and current at various locations of power system using reactance diagram, three phase short circuit on power system, Calculation of different current ratings and interrupting capacity of circuit breaker. **[7 Hrs.]**

UNIT II Symmetrical Components: Expression for positive, negative & zero sequence components, existence of sequence components of current & voltages for three phase circuit, expression for three phase power in terms of symmetrical components, sequence networks of unloaded three phase alternator, three phase transmission line and three phase transformers, development of sequence networks of power system. **[7 Hrs.]**

UNIT III Unsymmetrical Faults: Single line to ground fault, line to line fault, double line to ground fault on unloaded generator, unsymmetrical faults through impedance on unloaded generator, unsymmetrical faults on power system, open conductor faults. **[8 Hrs.]**

UNIT IV Power Flow Analysis: Introduction, bus classification, bus admittance matrix, real and reactive power balance equations at a node, load and generator specifications, application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods (Flow chart and computational procedure) for the solution of the power flow equations, computational issues in large-scale power systems. **[7 Hrs.]**

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UNIT V Power System Stability: The stability problem, steady-state stability, transient stability, swing equations of a synchronous machine connected to an infinite bus, power angle curve, steady-state stability criterion, equal area criterion of stability, application of equal area criterion, critical clearing angle. **[7 Hrs.]**

Text Books:

1. Elements of power system analysis by W.D. Stevenson (4th Ed. Mc Graw Hill)
2. Power System Engg. by I.J. Nagrath& Kothari (Tata McGraw Hill).

Reference Books:

1. Electrical Power System by Ashfaq Hussain (4th Ed. CBS Pub. & Dist.)
2. Power System Analysis and Design by B.R. Gupta (3rd Ed S. Chand)
3. Power System Engg. by A. Chakrabarti, M.L. Soni,P.V.Gupta, V.S.Bhatnager(6th Ed DhanpatRai& Co.)

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CHHATTISGARH SWAMI VIVEKANANDA TECHNICAL UNIVERSITY, BHILAI

Branch: Electrical Engineering **Semester: V**
Subject: Power Electronics **Code: C024513(024)**
Periods per week (L-T-P):(3-1-0) **Credits: 04**
Number of class Test to be conducted: 2 (Minimum) **No. of assignment to be submitted:02**
Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to:

Unit	CO Statement	Knowledge Level
1	Describe and compare the operating characteristics of different power semiconductor switching devices.	2
2	Analyze the operation and performance of different types AC to DC Converters.	4
3	Analyze the operation and performance of different types of DC to DC Converters.	4
4	Analyze the operation and performance of different types DC to AC Converters	4
5	Analyze the operation and performance of different types AC to AC Converters	4

UNIT I: Power Semiconductor Devices : Silicon Controlled Rectifier (SCR): Structure, Operation, V-I Characteristics, Switching Characteristics, triggering methods, protection. Modern Power Electronics Devices: Power MOSFET, IGBT Operation and characteristics.

UNIT II :AC to DC Converters: Single Phase Half wave controlled Full Controlled and Half Controlled Converters with R, RL and RLE Load, with and without freewheeling diode, Effect of source inductance, Dual Converters in circulating and Non-Circulating mode, Three Phase Half wave, half and fully controlled Bridge Converter.

UNIT III : DC to DC Converters: Principle of chopper operation, control strategies, Chopper Configuration, Buck, Boost, Buck-Boost Converter, Working principle of Voltage commutated, Current commuted and Load commuted chopper.

UNIT IV : DC to AC Converters: Single phase Voltage Source Inverter, Single phase Current Source Inverter, Voltage& harmonic control, PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM, PWM with Uni-polar and Bipolar Voltage Switching, three phase voltage source inverters (both120^{o} mode and 180^{o} mode).

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UNIT V: AC to AC Converters: AC Voltage Controller: Phase Control and Integral Cycle Control, Single phase AC voltage controllers, Sequence Control for output voltage regulation, Three phase a c regulator, Cyclo-converter: Basic principle of operation, step-up and step down single-phase to single-phase cyclo-converter.

Text Books:

1. "Power electronics Circuits, Devices and Applications", Muhammad .H. Rashid, PHI pbs.3rd Edition.
2. "Power Electronics", Dr. P.S. Bhimbra, Khanna Publishers, 3rd Edition.

Reference Books:

1. "Power Electronics Converters, applications and Design" Mohan, Undeland, Robbins, John Wiley& Sons, 3rd Edition.
2. "Power Electronic Systems: Theory and Design", JP Agarwal, 1st edition, Pearson Education.
3. "Power Electronics", M.D.Singh and K.B. Khanchandani, Mc Graw Hill India.
4. "Power Electronics, Principles and Applications", Joseph Vithayathil, McGraw Hill Series, 6th Reprint.
5. "Power Electronics: Converters, Applications and Design", Ned Mohan, Tore. M. Undeland, William. P. Robbins, John Wiley and Sons, Third edition.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Branch: Electrical Engineering **Semester: V**
Subject: Electrical Measurements & Measuring Instruments **Code : C024514(024)**
Total Theory Periods: 32[2-1] **Credit: 03**
Total Tutorial Periods: 08 **Assignments: Two (Minimum)**
Class Tests: Two (Minimum)
Course Outcomes: At the end of the course, the students should be able to:

CO	CO STATEMENTS	Knowledge Level
1	Make use of suitable methods for the measurement of resistance.	3
2	Derive the balance equations of an AC bridge and evaluate unknown parameters by balancing the bridge.	5
3	Perform amplitude, frequency, and phase measurements using an oscilloscope and to make use of Lissajous figures for phase and frequency measurements.	3
4	Distinguish between the types of measuring instruments and use them for the measurement of Electrical quantities.	4
5	Test and calibrate ammeter, voltmeter, and wattmeter and energy meter.	6

UNIT- I Measurement of Resistance: [08]
Classification of resistances (low, medium and high), measurement of resistance by volt drop method, loss of charge method, Wheatstone's bridge, Kelvin's double bridge, Megger and ohmmeter, AC Potentiometers and their use for calibration of meters (ammeter, voltmeter and wattmeter).

UNIT-II AC Bridges: [08]
Measurement of inductance (self and mutual) and capacitance by AC bridges: Hay's, Maxwell's, Anderson, Desauty'sbridge, Schering bridge, Oven's bridge and Heaviside bridge and its modification, Wein's bridge for measurement of frequency, Wagner earthing device.

UNIT- III Detectors And Magnetic Measurement: [08]
Construction, theory and operation of D'Arsonval andvibration galvanometer, Oscilloscope – Basic Principle, CRT feature, Block diagram of Oscilloscope, Triggered sources, Measurement of frequency and phase by Lissajous Figures.

UNIT-IV Measuring Instruments: [08]
Classification, operation and working principle of PMMC, MI and dynamometer type instruments, controlling, damping and balancing devices, single-phase and three-phase electrodynamometer power factor meter, frequency meters: electrical resonance type, electrodynamometer, ratio-meter type. Phase sequence meter, maximum demand indicator.

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UNIT-V Power And Energy Measurement: [08]

Construction and principle of dynamometer and induction type wattmeter, measurement of power in a three-phase circuit by using single-phase wattmeters, wattmeter errors, low power factor wattmeter, testing of wattmeter, single and poly-phase energy meters, testing of energy meters.

Text Books:

1. "A Course In Electrical And Electronics Measurement And Instrumentation", Sawhney, DhanpatRaiPbs.
2. Electrical Measurement and Measuring Instruments", Golding, CBS Publication
3. Electronic Instrumentation, H. S. Kalsi, TMH Publications

Reference books:

1. "A Course In Electrical And Electronics Measurement And Instrumentation", J. B. Gupta, KatariaPbs.
2. "Electric Measurements", Harris, Wiley Publication
3. "Electrical Measurements and Instrumentation, Cooper, TMH Publications

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CHHATTISGARH SWAMI VIVEKANANDA TECHNICAL UNIVERSITY, BHILAI

Branch: Electrical Engineering **Semester: V**
Subject: Analog and Digital Communication(Professional-Elective) **Code: C024531(024)**
Periods per week (L-T-P):(3-1-0) **Credits: 04**
Number of class Test to be conducted: 2 (Minimum) **No. of assignment to be submitted:02**
Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

Course Outcomes: After successful completion of this course, the student will be able to:

Course Code	CO Statement	Knowledge Level
1	Explain the modulation process and different types of modulation.	2
2	Analyze the angle modulation and compare different type of angle modulation useful	4
3	Analyze Pulse modulation and multiplexing of signals.	4
4	Explain PCM and Digital modulation, and its mechanism..	2
5	Evaluate the channel capacity and coding efficiency	5

UNIT I Amplitude Modulation: Need of modulation, Amplitude modulation, Single tone and multi tone amplitude modulation, Amplitude Modulation Index, power relation. Generation and detection of AM wave, Suppressed carrier modulation and detection techniques.

UNIT II Angle Modulation: Mathematical equation of frequency modulation (FM), frequency spectrum, phase modulation (PM), relationship between PM and FM, pre-emphasis and de-emphasis, adjacent channel interference, comparison of narrow band and wide band FM, generation of FM.

UNIT III Pulse Modulation System: Sampling theorem, Sampling of Low Pass and band pass signals, Aliasing, Aperture effect, Basic principles of PAM, PWM and PPM, their generation and detection, FDM, TDM, Comparison of TDM and FDM.

UNIT IV PCM and Digital Modulation Techniques: Quantization, PCM, PCM generator, Quantizer, Transmission band width in PCM, PCM receiver, quantization noise/error in PCM, DPCM.

Introduction To Digital Modulation: Types of digital modulation techniques, Fundamentals of binary ASK, PSK and FSK, Generation of BASK, BPSK and BFSK and their coherent detection techniques.

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UNIT V Information Theory: Introduction, Sources of information, Contents in DMS, Contents of a symbol, Information rate, Discrete memory less channel,mutual information, Channel capacity, Source coding, Coding efficiency.

Text Books:

1. Principles of Communication Systems –Taub and Shilling, Tata Mc GrawHill.
2. A Text Book of Analog & Digital Communication –P. Chakrabarti, DhanpatRai&Co.

Reference Books:

1. "Electrical Communication Systems", Kennedy,TMH.
2. "Digital Communications" Sanjay Sharma, S.K. Kataria& Sons, NewDelhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **V**
Subject: **Computer System Architecture (Professional-Elective)** Code: C024532(024)
Periods per week (L-T-P):**(3-1-0)** Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted:
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledge Level
1	Develop micro operation for a given digital circuit.	3
2	Develop micro operations for various computer instructions.	3
3	Program a basic computer	4
4	Develop micro operations for a give microinstruction.	3
5	Analyse the CPU functioning	4

UNIT I Register Transfer and Micro-Operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfer, three state buffers, memory transfer, micro operations, binary adders, binary adder subtractor, binary incrementer circuits. Logic Micro operations, hardware implementation, Shift micro operations, hardware implementation, Arithmetic and Logical Unit.

UNIT II Basic Computer Organization :

Instruction codes, stored program organization, indirect address. Computer registers, common bus system. Computer instructions, instruction set completeness. Timing and control unit, fetch and decode, determining type of instruction, register reference instructions, memory reference instructions. Input-output configuration, input-output instructions, program interrupt, interrupt cycle.

UNIT III Programming the Basic Computer

Introduction, Machine language, assembly language, rules of the language, translation to binary, Program loops, Programming arithmetic and logic operations, Logic operations, Shift operations.

UNIT IV Micro Programmed Control

Control memory, address sequencing, conditional branching, mapping of an instruction, subroutine, micro-program example, microinstruction format, symbolic microinstructions, fetch routine, symbolic micro-program, binary micro-program, Design of control unit, Micro program sequencer.

UNIT V Central Processing Unit

General register organization, control word, Stack organization, Register stack, memory stack, reverse polish notation, Instruction format, 3-2-1-0 address instructions. Addressing modes, Data Transfer and Manipulation, data transfer instructions, data manipulation instructions, arithmetic instructions, logical and bit manipulation instructions, shift instructions. Program control, status bit conditions, conditional branch instructions, subroutine-call-return instructions.

Text Books:

1. Computer System Architecture by M. M. Mano

2. Computer Architecture and Organization, J.P. Hayes Int'l student edition, McGraw – Hill.

Reference books:

1. Structured computer organization 3rd Edn by A. Stannabaum.

2. Computer Organization by V.C.Hamacher et al McGraw.

3. Introduction of Digital computer Design by V. Rajaraman & T.Radhakrishnman.

4. Analog computation and simulation by V. Rajaraman PHI

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engineering **Semester: V**
Subject: Power Plant Engineering (Professional Elective) **Code: C024533(024)**
Periods per week (L-T-P):(2-0-0) **Credits: 02**
Number of class Test to be conducted: 2 (Minimum) **No. of assignment to be submitted:02**
Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledge Level
1	Illustratethe working of Coal Based Thermal Power Plants	2
2	Explain theGas Turbine and Combined Cycle Power Plants	2
3	Explainthe functioning of Nuclear Power Plants	2
4	Distinguish andclassify Renewable Energy sources.	4
5	Evaluate related to plant economics, and propose pollution control techniques	6

COURSE DETAILS:

Unit 1: Coal Based Thermal Power Plants

Layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems

Unit 2: Gas Turbine and Combined Cycle Power Plants

Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

Unit 3: Nuclear Power Plants

Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

Unit 4: Power from Renewable Energy

Hydroelectric power plants, classification, typical layout and components, principles of Wind, Tidal, Solar PV and Solar Thermal, Geothermal, Biogas and Fuel Cell power systems

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Unit 5: Energy, Economic and Environmental Issues of Power Plants

Energy, economic and environmental issues, power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

Text Books:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. Tanmoy Deb, Electrical Power Generation-Conventional and Renewable, Khanna Publication 2017
3. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

Reference Books:

1. B.R. Gupta, Generation of Electrical Energy,7th edn, S. Chand Publishing, 2017
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engineering **Semester: V**
Subject: Electrical Machine Design **Code: C024534(024)**
Periods per week (L-T-P): (2-0-0) **Credits: 02**
Number of class Test to be conducted: 2 (Minimum) **No. of assignment to be submitted: 05**
Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

Course Outcomes: After competition of this course, students will be able to:

Course Code	CO Statement	Knowledge Level
1	Explain mmf calculation and modern trends in design of various types of electrical machines.	2
2	Design core, yoke, windings and cooling systems of transformers.	6
3	Design core and armature for rotating machines.	6
4	Design rotor of rotating machines.	6
5	Design and analyze the computer aided design of electrical machines.	6

UNIT-I

Basic Considerations: Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials. Calculation of total mmf and magnetizing current. **[06 hours]**

UNIT-II

Design of Transformer: Design of distribution and power transformers, Types, Classification and specifications, Design and main dimensions of core, yoke, winding, tank (with or without cooling tubes) and cooling tubes, Numerical examples. **[06 hours]**

UNIT-III:

Design of rotating machines – I: Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, election of frame size, Core and armature design of dc and 3-phase ac machines. **[06 hours]**

Unit-IV:

Design of rotating machines – II: Rotor design of three phase induction motors, Design of field system of DC machine and synchronous machines. Estimation of performance from design data . **[06 hours]**

Unit-V:

Computer Aided Design: Philosophy of computer aided design, advantages and limitations.
Computer aided design approaches analysis, synthesis and hybrid methods. Concept of optimization and its general procedure. Flow charts for the design of transformer, dc machine, three phase induction and synchronous machines. **[06 hours]**

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Text Books:

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay "Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.

Reference Books:

3. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
4. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C. Machines" Pitman & Sons.
5. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.
6. A. Shanmugasundaram, G. Gangadharan, R. Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engineering | **Semester: V**
Subject: Control System Engineering Laboratory | **Code: C024521(024)**
Periods per week (L-T-P): (0-2-0) | **Credits: 01**
Total Lab Periods: 24 | **Batch Size: 30**
Maximum Marks in ESE: 40 | **Minimum Marks in ESE: 20**

List of Experiments: (At least ten experiments are to be performed by each student)

1. To determine the gain of an open loop and closed loop system.
2. To study the effect of disturbance on an open loop and closed loop system.
3. To determine the transfer function of a DC servomotor.
4. Determination of transfer function of an AC servomotor.
5. Characteristics of synchro-transmitter and receiver pair.
6. To study a potentiometer as an error detector.
7. Study of a basic electrically controlled hydraulic system.
8. To Study the time response of a first and second order system.
9. Study of P, PI controller on second order system
10. Study of PID controller on second order system
11. Study of bode plot of a Type 0,Type I and Type II systems
12. To study the lag compensator and lead compensator.
13. To study the lag-lead compensator.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engineering **Semester: V**
Subject: Electrical Measurements & Measuring Instrument Laboratory **Code: C024522(024)**
Periods per week (L-T-P): (0-2-0) **Credits: 01**
Total Lab Periods: 24 **Batch Size: 30**
Maximum Marks in ESE: 40 **Minimum Marks in ESE: 20**

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To determine unknown resistance using Kelvin's Bridge.
2. To determine unknown resistance using Wheatstone Bridge.
3. To determine unknown inductance of a given coil using Maxwell Bridge.
4. To determine the inductance of the given coil using Anderson's Bridge.
5. To determine unknown capacitance of a given capacitor by Desauty's Bridge.
6. To determine capacitance of a given capacitor using Schering Bridge.
7. To determine the inductance using Owen's Bridge.
8. To determine unknown inductance using Hay Bridge.
9. To calibrate a given single phase induction type Energy Meter.
10. To find the phase sequence of the supply by the rotating type phase sequence meter.
11. To find the phase sequence of the supply by the Static type phase sequence meter.
12. To determine the unknown resistance R by Voltmeter-Ammeter Method.
13. To observe the B-H curve and hysteresis loop of agiven transformer core on CRO.
14. Measurement of high resistance by using Meggar.

Equipment/Machines/Instruments/Tools/Software Required:

Bridges, Head Phones, Transformer, Variac, Voltmeter, Ammeter, Multimeters, Resistors, DC Supply, Meggar

Recommended Books:

1. Electrical measurement & measuring instrument by A.K.Sawhney.
2. Electrical measurement & measuring instrument by J.B.Gupta

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engg. **Semester: V**
Subject: Power Electronics Lab **Code: C024523(024)**
Period per week (L-T-P): (0-0-2) / Week **Credit: 01**
Scheme of Examination (Laboratory):Total Marks- 60 [ESE-40, TA- 20]

COURSE OUTCOMES:

CO Statement	Knowledge Level
Determine static characteristics of SCR,MOSFET and IGBT	5
Analyze the operation of various phase controlled rectifiers for different types of load	4
Analyze the operation of step up and step down choppers	4
Analyze the operation of series and parallel inverters	4
Simulate power converter circuits using MATLAB/PSPICE.	3

COURSE DETAILS (At least ten experiments):

1. To study and plot the V-I characteristics of an SCR.
2. To study and plot the drain characteristics of a MOSFET.
3. To study and plot the drain characteristics of a IGBT.
4. To study single-phase half-wave bridge controlled rectifier for R and RL load.
5. To study single-phase full-wave bridge controlled rectifier for R and RL load with and without freewheeling diode.
6. To study of three-phase half-wave controlled rectifier for resistive load.
7. To study of three-phase full-wave controlled rectifier for resistive load.
8. To study step down and step up chopper circuit.
9. To study Voltage commutation chopper circuits.
10. To study current commutation chopper circuits.
11. To study Single Phase series inverter with R and RL loads.
12. To study the bipolar and unipolar switching scheme of a single phase full bridge inverter using MATLAB / PSPICE simulation.
13. To study the three phase VSI for 180/120 mode of conduction using MATLAB / PSPICE simulation.
14. To study single-phase AC voltage control by using TRIAC for R and RL loads.

Apparatus Required:

1. Various Power Electronics Kits.
2. CRO
3. MATLAB/PSPICE

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: **BTech** Semester: **V**
Subject: **Environmental Studies** Code: C000506(020)
Period per week (L-T-P): **(2-0-0) / Week** Non-Credit
Total Contact Hours: **40** No. of assignments to be submitted: **05**

PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:
1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

COURSE DETAILS:

UNIT I: Introduction to environmental studies, ecology and ecosystems (06 hours)

Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II: Biodiversity and conservation (06 hours)

Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III: Natural resources and environment (08 hours)

Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV: Human communities, social issues and environment (08 hours)

Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V: Environmental pollution, policies, legislations, assessment and practices (12 hours)

Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

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On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO):

On completion of the course, students will able to:

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.

TEXT BOOKS:

1. De, A.K., (2006).*Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006).*Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971).*Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005).*Ecology and Environment*. Rastogi Publications.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering**
Subject: **Instrumentation Techniques**
Periods per week (L-T-P): **(3-1-0)**
Number of class Test to be conducted: **2 (Minimum)**

Semester: **VI**
Code: **C024611(024)**
Credits: **4**
No. of assignment to be submitted: **02**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

S.N	CO Statement	Knowledge Level
1	Distinguish between CT, PT and Evaluate error presents in instruments	5
2	Measure of linear displacement, Angular displacement, pressure, force, temperature, strain by Transducers.	5
3	Make use of DAS and about varies Recorders used in industries.	3
4	Explain the architecture and I/O module of PLC.	2
5	Develop and Execute Ladder Programming in PLC.	3

COURSE DETAILS:

UNIT I Errors in Measuring Instruments& CT PT: Errors in measurement, general and statistical analysis of errors, Instrument transformers, errors of CTs and PTs, methods of reduction of errors of instrument transformers, Testing of CTs (Absolute and Silabee's methods), Testing of PTs: Absolute and method using wattmeter. **[8]**

UNIT II Passive and Active Electrical Transducers: Resistive, capacitive, inductive, piezoelectric, selection of transducers, transducers characteristics, frequency generating transducers, pressure inductive transducers, LVDT, differential output transducer, thermistor, strain gauge, Hall effect transducers, measurement of angular and linear velocity using electrical transducers, reluctance pulse pick-ups. **[10]**

UNIT III Data Acquisition System and Recorders: Introduction of DAS, Objective of DAS, Signal conditioning ofinputs, single and multi-channel DAS, Computer based DAS, Sample and hold, Multiplexing, D/A, A/Dconversion general description of Data loggers, Digital transducers, optical encoders, resistive digitalencoders, shaft encoders.Recorders: Introduction, Strip chart recorders, General description of XY recorders, galvanometer type recorders,potentiometric recorders. **[7]**

UNIT IV PLC: Introduction, PLC and Operations, Basic ladder diagram, General PLC Programming Procedure, Devices to which PLC Input and Output Modules are connected. **[5]**

UNIT V Basic PLC Programming and Functions: Programming On-Off inputs to produce On-Off outputs, Relation of Digital Gate Logic to Contact / Coil Logic, Creating Ladder diagrams from process control descriptions.Basic PLC Functions, Register Basics, PLC Time Functions, PLC Counter Functions. **[6]**

Text Books:

1. Electrical and Electronics Measurements and Instrumentation: Purkait, B Biswas, S. Das and C. Koley, McGraw hill
2. Electronic Measurements and Instrumentation: K. Lal Kishore, Pearson.
3. Programmable Logic Controllers, John W.Webb, Ronald A. Reis, Prentice Hall .

Reference Books:

1. Electronic Instrumentation by H. S. Kalsi, McGraw Hill
2. Instrumentation Measurement and Analysis: Nakra and Chaudhry, McGraw Hill.
3. Electronic Instruments and Instrumentation Technology" by M.M.S. Anand, PHI Publications

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engineering **Semester: 6th**
Subject: Switchgear & Protection **Subject Code: C024612(024)**
Periods/Week: (L-T-P) (3-1-2) **Credits: 04**
Minimum number of Class tests to be conducted: 02
Minimum number of Assignments: 02
Scheme of Examination (Theory): Total Marks – 150 [ESE – 100, CT – 20, TA – 30]

COURSE OUTCOMES: After successful completion of this course, the students will be able to:-

S. No.	CO Statement	Knowledge Level
1	Explain working of various protective relays.	2
2	Design suitable Protection Schemes for Alternators.	6
3	Design the required Protection Schemes for various Transformers, Feeders & Transmission Lines according to their usage.	6
4	Design various Comparators for designing various relays.	6
5	Analyze various types of the circuit breakers, the arc quenching phenomena and the protection against over voltages.	4

UNIT-I
RELAY: Terminology, Basic circuit, relay connection with trip circuit and circuit breaker, objectives of protection, types of relay, construction and operation of instantaneous over current relay. I.DM.T. Relay, directional Unit, differential relay, percentage differential relay, Generalized torque expression, logical construction of impedance reactance, MHO and Off-set MHO Relays using generalized torque expression.

UNIT-II
Protection of Alternators and Bus Bars: Differential protection, Protection of stator against phases to ground fault, phase to phase faults, inter turn fault, protection against unbalanced loading, protection of rotor against ground fault, field failure, reverse power, back up protection, field suppression, protection of bus bars, frame leakage protection, differential protection.

UNIT III
Protection of Transformers & Feeders: differential protection of transformers for different winding configurations, difficulties encountered in differential protection and their remedies, Buchholz relay, protection of feeders, protection of ring main and parallel feeders, protection of radial feeders by over current relays, distance relays and carrier current protection scheme.

UNIT IV
Static Relays: directional relay, impedance relay, admittance relay and admittance relay, amplitude comparator, phase comparator, duality between amplitude and phase comparators.

UNIT V
Circuit Breakers and Fuses: Arc formation, arc interruption and re-striking voltage, current chopping, resistance switching, Air blast circuit breakers, minimum and bulk oil circuit breakers, SF6 and Vacuum Circuit breakers, definitions of terms in fuses, HRC fuses.

Text Books:

1. "Power system protection and switchgear", Ravindranath and Chander, TMH
2. "Power system protection", Badri Ram, TMH.
3. "Fundamentals of power system protection", Paithankar and Bhinde, PHI
4. "Switchgear and Protection" by Sunil S. Rao, Khanna Publishers

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Reference books:
1. "Electrical power system", C L Wadhwa, New Age.
2. J and P switchgear handbook

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: **Microprocessor and its applications** Code: **C024613(024)**
Periods per week (L-T-P):**(3-1-0)** Credits: **04**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **2**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

S.N	CO Statement	Knowledge Level
1	Explain the architecture and Software model of Intel's 8085 8-bit Microprocessor.	2
2	Develop and Execute 8085 assembly level programs and manually translate them to Machine Language Programs	3
3	Design interfacing circuit for memory and I/Os using MSI ICs.	6
4	Apply 8085 interrupt system to interface peripheral and IOs in interrupt driven data transfer mode.	3
5	Select various peripheral ICs like 8255, 8155, 8256, 8253, 8254 with 8085 Microprocessor.	3

COURSE DETAILS:

UNIT I Microprocessor Architecture: Brief Introduction to Microprocessors, Architecture of 8085, Pin Configuration and their Functions; internal registers & flag register, memory-stack organization, Generation of Control Signals, demultiplexing of address / data bus, Machine cycle, status and Control Signals.

UNIT II Instruction Set and Programming with 8085: Instruction for Data Transfer, Arithmetic, Logical Operations and Branching Operation. Stacks, Subroutine and Related Instructions. Addressing Modes, Instructions Format. Simple Programs using Instruction Set of 8085.

UNIT III Data Transfer and Device Selection: Format of Data Transfer, Modes of Data Transfer, Type of I/O Addressing, Condition of Data Transfer: Microprocessor Controlled Data Transfer/ Peripheral Controlled Data Transfer, Absolute and Linear Select Decoding, Memory and I/O Interfacing, Use of Decoders Selection.

UNIT IV Interrupts: Restart Instruction; Hardware Implementation, Interrupt Processing; Multiple Interrupts and Priority Concepts, Interrupt Structure of 8085, Instructions related to interrupts, Pending Interrupts, Application of Interrupts and simple illustrative Programs.

UNIT V Architecture of Peripheral Interfacing Devices: Architecture, Pin Diagram and functioning of 8155/8156, 8255 (PPI). Simple programs like Initialization and I/O operations of the ports using simple I/O mode, Timer operation of 8155. Architecture, Pin diagram & description of USART (8251). Block Diagram, Pin Configuration of Programmable Interval Timer 8253/8254:.

Name of Text Books:

1. Microprocessor Architecture, Programming and Application by R. S. Gaonkar, Wiley Eastern
2. Digital Systems – From Gates to Microprocessors by Sanjay K. Bose, New Age International Publishers.
3. Introduction to Microprocessors by Aditya P Mathur, 3rd Edition, Tata Mc Graw Hill

Name of Reference Books:

1. 8085 Microprocessor Programming & Interfacing – N.K. Srinath, PHI
2. Digital Computer Electronics – Malvino, TMH
3. Microprocessors: Theory and Applications – Intel and Motorolla, Rafiquuzzaman, PHI.
4. 0000 to 8085: Introduction to Microprocessor for Engineers and Scientists, Ghosh & Sridhar, PHI

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: **Instrumentation Techniques Laboratory** Code: **C024621(024)**

List of Experiments: (Minimum 10 experiments to be done from the list given below)

1. Measurement of % ratio error and phase angle error of CT.
2. Measurement of current, voltage and power using CT & PT.
3. Measurement of displacement using LVDT.
4. Measurement of force using strain gauge.
5. To Study Piezo-electric transducer.
6. Measurement of displacement using capacitive pickup.
7. To demonstrate the operation of D/A converter.
8. To demonstrate the operation of A/D converter.
9. Measurement of intensity of light.
10. Measurement of angular displacement using capacitor transducer.
11. Industrial automation demonstration through PLC.
12. Measurement of current / voltage using Hall.
13. Measurement of liquid level using capacitive pick-up.
14. Speed control of DC motor using PLC.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Electrical Engg. **Semester: 6TH**
Subject: Switchgear & Protection Lab **Subject Code: C024622(024)**
Total practical periods: 30 **Credis: 01**
Scheme of Examination (Theory): Total Marks – 60 [ESE – 40, TA – 20]

List of experiments: (To be performed minimum 10 experiments)

COURSE OUTCOMES: After successful completion of this course, the students will be able to:-

S. No.	CO Statement	Knowledge Level
1	Understand the working of various relays like IDMT relay, Instantaneous Over-current relay, etc.	2
2	Design a suitable protection scheme according to the requirement.	6
3	Design a Percentage-Biased Differential Protection Schemes for Alternators & Transformers according to its needs.	6
4	Understand the working of most important relay for Transformer i.e. Buchholz Relay.	2
5	Analyze the various protection schemes for various types of faults.	4

1. To study Over-Current Relay static type & draw characteristics.
2. To study under voltage relay electromechanical type & draw characteristics.
3. To study over voltage relay electromechanical type & draw characteristics.
4. To study IDMT Over current relay Electromechanical Type & draw current verses time characteristics.
5. To study IDMT earth fault relay electromechanical type draw current verses time characteristics.
6. To study operating characteristics of percentage-biased differential relays to plot the characteristics of percentage biased differential relay for 30%, 40%, & 20%.
7. To determine the characteristics of instantaneous relays.
8. To study Buchholz Relays.
9. To study Solid State O.C.R.
10. To study Merz Price Protection of transformer (Simulation Model).

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: **Microprocessors Lab** Code: **C024623(024)**
Periods per week (L-T-P):**(0-0-2)** Credits: **01**
Scheme of Examination (Theory): **Total Marks-60 [ESE-40, TA-20]**

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledge Level
1	Develop and execute various programs on 8085 Microprocessor kit/ 8085 Simulator.	3

List of experiments: (Minimum 10 experiments are to be performed)

1. To Transfer data into specified register.
2. To add content of two register and store result in another register.
3. To add content of two memory locations and store result in another memory locations.
4. To find 2's complement of 8 bit number stored in a memory location.
5. To mask upper nibble of the 8 bit numberstored in a memory location.
6. To transfer block of 10 data bytes from one memory location to another.
7. To transfer block of 10 data bytes from one memory location to another in reverse order.
8. To multiply two 8 bit numbers.
9. To add contents of a block of 10 data bytes.
10. To find largest among the 10 given data bytes.
11. To find number of even and odd values from a given block of data bytes.
12. Sorting given data bytes in ascending order.
13. Two 16 bit numbers are residing at some memory location, Write a program two add them up and store the result at some other memory location.
14. To count the how many number of times even and odd PARITY bytes are appearing in 256 consecutive memory locations.
15. To convert a binary number in to its equivalent BCD.

Apparatus Required:

1. Microprocessor 8085 Kit or 8085 Simulator Software

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: Programming and Simulation **Lab** Code:
Periods per week (L-T-P):**(0-0-2)** Credits: **01**
Scheme of Examination (Theory): **Total Marks-60 [ESE-40, TA-20]**

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

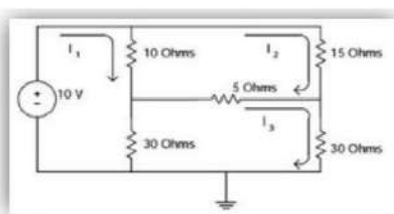
Course Code	CO Statement	Knowledge Level
1	Develop and execute various programs on MATLAB/Scilab or any other suitable Simulation software	3

CourseOutcomes:

On successful completion of the Course, the student will be able to:

1. Understand the main features and importance of the MATLAB/ SCI LAB mathematical programming environment.
2. Apply working knowledge of MATLAB/ SCI LAB package to simulate and solve Electrical, Electronic circuits and Applications.
3. Solve, Simulate and Analyse various DC circuits.
4. Solve, Simulate and Analyse various AC circuits.
5. Solve, Simulate and Analyse various Analog and Digital Electronics circuits.
6. Solve, Simulate and Analyse simple Transformer and DC Generator circuits.

List of experiments: (Minimum 10 experiments are to be performed)

Sl. No.	**Topic/Exercises**
1	Ohm's law - If R = 10 Ohms and the current is increased from 0 to 10 A with increments of 2A.Write a program/ simulate to generate a table of current, voltage and power dissipation.
2	Resistances combination- Write a program/ simulate to solve the equivalent resistance of series and parallel combinations up to three resistances R1, R2 and R3.
3	KVL- Using Mesh/ loop analysis solve and simulate the given circuit to find the loop currents I_1, I_2 and I_3. 

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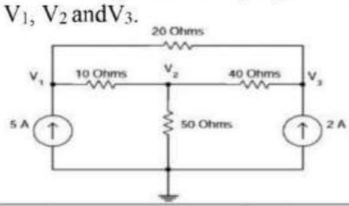
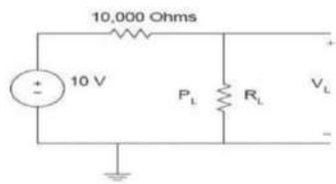
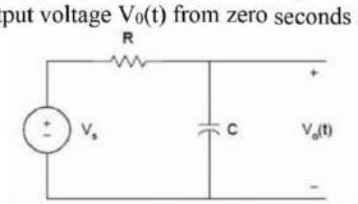
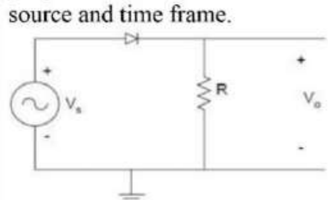
4	KCL- Using Nodal analysis, solve and simulate the given circuit to find the nodal voltages V_1, V_2 and V_3. 
5	Maximum Power Transfer theorem- In figure the R_L varies from 0 to 50 k Ω, Write a program and simulate to plot the power dissipated by the load. Verify that the maximum power dissipation by the load occurs when R_L is 10 kΩ. 
6	Impedance and Admittance- Consider impedance Z for any R-L-C circuit and express it both in rectangular and polar form. Also compute Admittance Y.
7	RL ac circuit- For an series R-L circuit, the voltage $v(t)$ and current $i(t)$ are given as; $v(t) = 10\cos(377t)$ $i(t) = 5\cos(377t + 60^0)$ Simulate the above condition and plot a sketch of $v(t)$ and $i(t)$ for $t = 0$ to 20 milli seconds.
8	RC circuit- For the figure shown, the input voltage is a rectangular pulse with an amplitude of 5 Volts and a width of 0.5 sec. $C = 10$ μF and $R = 1000$ kΩ. Write a program and simulate to plot the output voltage $V_0(t)$ from zero seconds and end at 1.5 seconds. 
9	Half Wave Rectifier- A half-wave rectifier circuit is shown in figure. It consistsofanalternatingcurrent(ac)source,adiodeandaresistor.Writea program and simulate to obtain the input and output plots. Assume suitable values for the ac source and time frame. 
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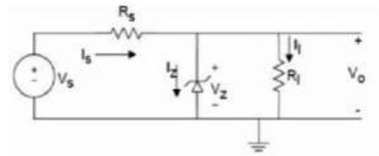
Zener Voltage Regulator- A zener voltage regulator circuit of figure has the following data:



Write a program to obtain the Breakdown characteristics and calculate the output voltage Vs = 30 Volts and Vs = 35 Volts.

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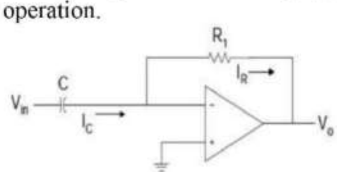
<tr><td>11</td><td>

OPAMP Differentiator- For the figure given assume suitable values for Input voltage and circuit components. Write a program and simulate to show a plot for OPAMP differentiator operation.



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Number System- Write a program and obtain code conversion for the following.
a) $(99)_{10} = (?)_2$ b). $(10011100)_2 = (?)_{10}$ c). $(6F9)_{16} = (?)_2$ and $(?)_{10}$

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Logic gates- Write a program/ script file that produces a truth tables for the NOT, AND, OR, NAND, NOR, and EXOR operations. Take a and b inputs as 4 bits.

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De-Morgan's Theorems- Write a program/ M-file to obtain the Truth Table to Prove De-Morgan's Theorems.

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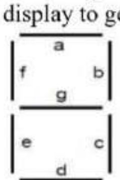
Seven segment Display- Write a program to solve the 7 Boolean expressions of Seven segment display to get the results in table form to indicate ‘Display digit and segment LEDs on’.



[To display the digit with 7 LEDs (light emitting diode) arranged as shown in Fig, the input D should be converted to 4-bit digit code and assigned to 7 Boolean functions to determine the on or off state of each diode in the 7- segment LED display]

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Transformers- Write a program to compute voltages of primary and secondary, primary current and secondary current.
The inputs are kVA = 100, E1 = 230 kV, transformation ratio K = 0.6. Missing data may be assumedsuitably. $30 \le V_S \le 35V$; $R_L = 10K$, $R_S = 2K$

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DC Generators- Write a program to compute Emf generated in dc shunt generator with the given parameters like I_a= 10 A, I_L = 9 A, R_a = 0.5 Ω, Rsh= 120 Ω, and R_L= 6 Ω. Missing data may be assumed suitably.

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To develop a computer program to form the bus admittance matrix, Y bus of a given power system.

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Reference Books:

For Programming:

1. Getting started with MATLAB by RudraPratap, Oxford University Press,2005.
2. MATLAB and its Applications in Engineering by Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813,2009.
3. SCILAB(a Free Software to Matlab),Er. Hema Ramachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011.

For Electrical Engg. Basics:

4. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
5. A Text Book of Practicals in Electrical Engineering by Dr. N. K. Jain, DhanpatRai Publishing Company,2009.

For Electronics Engg. Basics:

6. Electronics Laboratory Primer by S. Poornachandra and B. Sasikala, S. Chand Publishers and Co,2010.
7. Laboratory Experiments and PSPICE Simulations in Analog Electronics by L.K.Maheshwari and M.M.S.Anand Publishers – PHI Learning Pvt.Ltd.
8. *Digital Electronics*: Principles and Applications by R. L. Tokheim, Tata McGraw- Hill Education,2013.

Freely Available e-Resources/e-Books:

1. http://in.mathworks.com/
2. https://www.scilab.org/resources/documentation/tutorials
3. Introduction to Programming with Matlab by J. Michael Fitzpatrick and John D. Crocetti, Department of Electrical Engineering and Computer Science, School of Engineering, Vanderbilt University, Nashville, TN,2000-2011.
4. Introduction to Matlab: Application to Electrical Engineering by HoussemRafik El Hana Bouchekara, Umm El Qura University, Februray2011.
5. A Matlab Tutorial by Dr. L. Doyle and Dr. A. Kokaram, Department of Electronic and Electrical Engineering, University of Dublin Trinity College,2000.
6. Electronics and circuit analysis using MATLAB by John. O. Attia, Department of Electrical Engineering, Prairie View A&M University, Boca Raton London, New York, Washington D.C., CRC Press,1999.
7. MATLAB for Electrical and Computer Engineering, Students and Professionals *with* Simulinkby Roland Priemer, University of Illinois at Chicago, Scitechpub.com, Edison, NJ,2013.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Program / Semester: **B.Tech (VI)**	Branch: **Humanities**
Subject: **Technical Communication & Soft Skills**	Course Code: **C000601(046)**
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication&writing CVs, Cover Letters for correspondence.Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting.On Saying “Please”, How to say “NO”.

UNIT-5Positive Pschycology: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger, Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman& Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three “As” of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: **Fiber Optics (Professional Elective-II)** Code: **C024631(024)**
Periods per week (L-T-P):**(3-1-0)** Credits: **04**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: 2
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledge Level
1	Illustrate the components materials used for preparation of optical fibre.	2
2	Analyze various characteristics of a signal or a system	4
3	Analyze a given optical fibre with different characteristics.	4
4	Design an economical Optical fibre for communication system.	5
5	Explain Optical fibre for various communication system.	2

COURSE DETAILS:

UNIT I Introduction to optical communication, principle of light transmission, optical fiber modes and configuration, mode theory for circular wave guides, single mode fibers, multimode fibers, numerical aperture, mode field diameter, fiber material, fiber fabrication techniques.

UNIT II Optical sources, LEDs, LASER diodes, Modal reflection noise, Power launching and coupling, Population inversion, Fiber splicing, Optical connectors, Photo detectors, PIN, Avalanche detectors, Response time, Avalanche multiplication noise.

UNIT III Signal degradation in optical fibers, attenuation losses, Signal distortion in optical wave guides, material dispersion, Wave guide dispersion, Chromatic dispersion, Intermodal distortion, Pulse broadening in graded index fiber, mode coupling, fiber design.

UNIT IV Coherent optical fiber communication, Modulation techniques for homodyne and heterodyne systems, Optical fiber link design, Rise time budget and link power budget, Long haul systems, Bit error rate, Line coding, NRZ,RZ, Block codes, Eye pattern.

UNIT V Advanced system techniques, Wavelength division multiplexing, Optical amplification, Semiconductoramplifier, EDFA comparison between semiconductor and optical amplifier, Gain bandwidth,Photonic switching ,Optical networks ,Optical fiberbus, Ring topology, Star architecture, FDDI and SONET standards.

Text Books:
1. Optical Fiber Communication, Gerd Keiser, Mc Graw Hill InternationalEd
2. Optical Fiber Communication, A.K. Ghatak&K.Tyagarajan.
3. OpticalFibre Communication: Principals and Techniques", John M. Senior, PHI NewDelhi

Reference Books:
1. Fibre Optics: Principles and Applications, N.S. Kapany, Academic Press, NewYork.
2. FibreOptics System Network Applications, Terry Edwards, John Wiley &Sons
3. Fibre Optics Test & Measurements, Dennis Drickson, Prentice Hall PTR, NJUSA.
4. Fibre Optic Communication Technology, D. Jafar, K. Mynbaev& Lowell L. Schenier, Pearson Education, Asia.it'sApplications, S.C. Gupta, PHIIndia

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch**: Electrical Engineering** Semester**: VI**
Subject: **Microcontroller and Embedded System(Professional Elective-II)** Code: **C024632(024)**
Periods per week (L-T-P):**(2-1-0)** Credits**: 03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: 02(Minimum)
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledge Level
1	Compare elements of Microcontroller family, and understand pin configuration of 8051	2
2	Interpret the architecture, various instructions and their application in programming of microcontroller 8051	2
3	Apply the knowledge of counters and interrupts to make programs for external interrupts	3
4	Illustrate different Protocols of serial communication in microcontroller 8051	2
5	Explain different categories, requirements and applications of embedded system	2

COURSE DETAILS:

UNIT I Introduction to Microcontroller: A brief History of Microcontrollers, Harvard Vs Von-Neumann Architecture, RISC Vs CISC, Classification of MCS-51family based on their features (8051, 8052, 8031, 8751, AT89C51), Pin configuration of 8051

UNIT II 8051 Processor Architecture and Instruction Set: Internal block diagram, Registers of 8051, Inbuilt RAM, Register banks, stack, on-chip and external program code memory ROM, power reset and clocking circuits, I/O port structure, Addressing modes, Instruction set and simple programming

UNIT IIICounter/Timer and Interrupts of 8051: Introduction, Registers of timer/counter, Different modes of timer/counter, Timer/counter programming, Interrupt Vs Polling, Types of interrupts and vector addresses, register used for interrupts initialization, programming of external interrupts, Timer interrupts.

UNIT IV Asynchronous Serial Communication: Introduction to serial communication, Types,RS232 standard, RS422 Standard, 1488 and 1489 standard, GPIB, Max 232/233Driver

UNIT V Overview of Embedded System: Embedded System, Categories of Embedded System, Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices.

Name of Text Books:

1. The 8051 Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi& McKinlay,2nd Ed.,PHI.
2. The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Name of Reference Books:

1. Microcontrollers: Architecture, Programming, Interfacing and System Design, Rajkamal, Pearson Education
2. Programming for Embedded Systems- Dreamtech Software Team, Wiley Dreamtech
3. Programming and Customizing the 8051 Microcontroller, Predko; TMH

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: **Hybrid Electric Vehicles (Professional Elective-II)** Code: **C024633(024)**
Periods per week (L-T-P) :**(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

CO	Statement	Knowledge Level
CO-1	Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources	1
CO-2	Illustrate andexplain basic schemes of electric vehicles and hybrid electric vehicles.	2
CO-3	Choose proper energy storage systems for vehicle applications	3
CO-4	Classify various communication protocols and technologies used in vehicle networks.	4
CO-5	Interpretation of different energy storage system.	5

UNIT-I Introduction to Hybrid Electric Vehicles:
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics.

UNIT-II : Electric and Hybrid traction:
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis .

UNIT-III Electric Drive-trains:
Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis .

UNIT-IV: Electric Propulsion System
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives

UNIT-V: Energy Storage and Sizing the drive system:
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics.

Text Books :
1.Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

Reference Books :

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VI**
Subject: **Digital Control Systems (Professional Elective - II)** Code: **C024634(024)**
Periods per week (L-T-P):**(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: 02
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledge Level
1	Apply z transform to convert analog filter into digital filter.	3
2	Analyze the performance of filters.	3
3	Apply sampling techniques used in the communication.	3
4	Design digital filters and control their performance.	6
5	the optimization problem in control system	2

COURSE DETAILS:

Unit 1 Z transform: Z transform, Relationship between the s-plane and the z-plane, Inverse z-transform, Properties of Z transform, applications of z-transform, Delayed z-transform, Modified z-transform, Design of digital control systems using Z transform, Characteristic equation of closed loop systems

Unit 2 State-space analysis: Analysis of sampled data systems, State equations of discrete data systems, Eigen values, Eigenvectors, State transition matrix, State diagram of discrete-data systems with zero order hold; Controllability, Observability.

Unit 3 Sampling Techniques: Sampling: Types of sampling, instantaneous sampling, natural sampling, flat top sampling, Sample and hold circuits, Reconstruction of signals, Sampling rate, Nyquist criteria for sampling, Aperture effect, Applications.

Unit 4 Control System Design: Design using state-space techniques, Stability tests using Bilinear transformation, Jury's stability test, Second method of Lyapunov, Root loci for digital control systems, design of discrete PID, PD and PI controllers, Effect of adding poles and zeros, Pole placement design techniques.

Unit 5 Optimum control system: Parametric optimization problem using second method of Lyapunov, Quardric optimal control problem, Performance indices, Linear Quadratic Regulator design.

Text Books:

1. D. C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition, 2007.
2. K. Ogota, Discrete Time Control Systems, Prentice Hall, 2/e, 1995.
3. Madan Gopal, Digital Control and State Variable Methods.

Reference Books:

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1. "Modern control engineering", Roy Choudhary, PHI.
2. "Control System Analysis and Design",K K Agarwal.
3. "Control Engineering Theory and Practice",M N Bandhopadhyay, PHI.
4. "Introduction to Control Engg. Model, Analysis and Design", Ajit K Mandal, New Age International Publishers.
5. I J Nagrath and M Gopal; New Age international Publishers, Forth Edition

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering**
Subject: **Electric Drives**
Periods per week (L-T-P):**(3-1-0)**
Number of class Test to be conducted: **2 (Minimum)**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Semester: **VII**
Code: **D024711(024)**
Credits: **04**
No. of assignment to be submitted: **05**

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Illustrate the structure of Electric Drive systems and their role in various applications.	2
Design ratings on the basis of heating and cooling and Categorize torque, speed and position controller of motor drives.	4
Explain the drive motor characteristics.	5
ClassifySpeed control of DC and AC machines using Power Electronics.	4
Explainoperation of tractions	5

COURSE DETAILS:

UNIT I: INTRODUCTION TO ELECTRIC DRIVES
Basic concept of electric drives – Types of Electric Drives – factors influencing the choice of electrical drives – multi quadrant operation - component of load torque, nature and classification of load torques - transient operation, steady state stability and load equalization.

UNIT II: CONTROL AND RATING OF ELECTRIC DRIVES
Drive parameters - Modes of operation of electric drives - heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors - Closed loop control of drives, closed loop control of multi motordrives.

UNIT III: DRIVE MOTOR CHARACTERISTICS
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Types of Motor starters (DC & AC) - Braking of Electrical motors – DC motors: Shunt, series and compound – single phase and three phase induction motors.

UNIT IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. & AC DRIVES
DC Drives: Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system – Using controlled rectifiers and DC choppers –applications.
AC Drives: Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

UNIT V: TRACTION DRIVES
Electric Traction system, Nature of traction load, calculation of Traction drive rating and energy consumption, Important feature of traction drives, Motors employed in traction, Conventional method for AC and DC traction drives control, Semiconductor converter controlled drives employing DC motors, AC motors for 25 KV AC traction.

TEXT BOOKS:
1. Fundamentals of electrical drives, G K Dubey, 2ndedition, NarosaPb
2. Electric Drives. Vedam Subramanyam, TMH Pbs.

REFERENCE BOOKS:
1. Electric Motor Drives, R. Krishnan, PHI Pb
2. Modern Power Electronics and A C Drives, B K Bose, Pearson Education
3. Pillai.S.K "A First Course on Electric Drives", Wiley Eastern Limited, 2012
3. Electrical Machines, Drives and Power Systems, Theodore Wildi, Pearson Sixth Edition

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech VII** Branch: Electrical Engg.
Subject: **Power Apparatus System** Subject Code: **D024712(024)**
Total Theory Periods – 32 Total Tutorial Periods: 8
Class Tests: Two (Minimum) Assignments: Two (Minimum)
Total marks in End Semester Exam: 100

Course Outcomes:

After successful completion of this course, student will be able to:

CO	CO STATEMENT	BLOOM'S TAXONOMY LEVEL
1.	Acquire knowledge of overhead line insulator, string efficiency and sag and tension calculation of transmission line.	2
2.	Describe different types of Distribution system.	4
3.	Explain about various types of grounding system.	5
4.	Explain insulation coordination and surge protection.	4
5.	Correlate basic concept of reliability with Reliability of transmission and Distribution System.	5

UNIT – I Mechanical Design of Transmission Lines: Types of Insulator , Conductors, Towers , Span, Conductor Configuration, Spacing, Clearance , Sag and Tension Calculation, Potential distribution over a string of suspension insulators, string efficiency, methods for equalizing the potential, Selection of Conductor Size, Number of Circuit , Ground Wire, Surge Impedance Loading.

UNIT-II Distribution System: Types of Distribution System, Various types of AC & DC Distributors, Voltage Drop Calculation, Selection of Distribution Voltage, Size of Conductor, Kelvin's Law.

UNIT-III Power System Grounding: Different Methods of grounding : Neutral Grounding, Solid Grounding, Resistance Grounding, Reactance Grounding, Arc Suppression Coil Grounding,ZigZag Transformer Grounding, Effect of Grounding on System Over Voltages. Merits & Demerits of Various Grounding Systems.

UNIT-IV Surge Protection & Insulation coordination : External & Internal Overvoltage Mechanism of Lightening Discharge , Wave Shapes of Stroke Current, Line Design on Direct Stroke Over Voltage Protection , Earth Wire, Rod Gap , TRF , Expulsion Tube , Surge Diverter Selection of BIL , International Recommendation , Selection of Arrestor Rating, Coordination of Protector Devices With Apparatus Insulation.

UNIT-V Reliability of Transmission and distribution System: Definitions : Outage , Bath Tub Curve , Causes of Failures, Two State Model, Failure & Repair Rate, Probability Density Function, Reliability of Series / Parallel System , Reliability Planning , Preparation of Reliability Models. Numerical problems related to Reliability of Transmission and distribution system.

Text Books:

1. Power System Analysis & Design, B.R. Gupta S.Chand Publications.

2.A Course in Electrical Power,Soni, Gupta and Batnagar,DhanpatRai and Sons.

3. An Introduction to Reliability and Maintainability Engineering, Ebeling; Tata McGraw Hill.

4.Electrical Power Systems C. L.Wadhwa, New Age International Publisher

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Reference Books:

1. Transmission & Distribution, Westinghouse
2. Electrical Power System Design, M. V. Deshpande(TMH)

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VII**
Subject: **High Voltage Engineering** Code: **D024713(024)**
Periods per week (L-T-P):**(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Illustrate the various breakdown theories for gaseous, liquid and solid dielectric.	4
Describe the generating methods for high DC, AC, and impulse voltages	1
Summarize the measuring methods for high DC, AC and impulse Voltages	2
Summarize the fundamentals of High Voltage Test Techniques.	4
Analyze the dynamic response of high voltage measurement systems.	4

COURSE DETAILS:

UNIT I : **Breakdown in Gases**;- Levels of high voltages, necessity of EHV and its limitations, Electrical insulation and dielectrics, Electrical fields – Uniform and non-uniform fields (weekly and extremely), Electric field, intensity/stress, degree of non-uniformity, Breakdown in Electronegative Gases Types of insulation – gas, liquid, and solids, Types of ionizations – impact, thermal and photo-ionization, Collision Process, Electron avalanche in uniform field, Townsend's first and second Criterion for breakdown, Streamer theory of breakdown, Paschen's law, Discharge in Weakly non-uniform field, Discharge in extremely non-uniform field, Corona loss in transmission lines, Methods of reducing corona loss.

UNIT – II :**Breakdown in Solids & Liquid Dielectrics:-** Types of liquid dielectrics, pure and commercial liquids, Conduction & breakdown in commercial liquids-suspended particle theory, Cavitation and the bubble theory, determination of breakdown strength of transformer oil, Factors affecting dielectric strength of liquids. Breakdown in Solid Dielectrics: Breakdown mechanism, Intrinsic breakdown, Electromechanical breakdown, thermal breakdown, breakdown of solid dielectric in practice, Breakdown due to treeing & tracking, breakdown due to the internal discharges.

UNIT III: **Generation of high voltages**:-Generation of high D.C. voltages, half wave & full wave rectifier circuits, voltage multipliers,Van De Graff generators, Electro static Generators, Generation of high alternating voltages, cascade transformers, Generation of impulse voltages, Multistage Impulse generator, Marx circuit, Tripping & control of Impulse generators

UNIT IV: **Measurement of high Voltages**: -Measurement of high D.C. voltage, Measurement of high A.C.& impulse voltages, series Impedance voltmeter, series capacitance voltmeter capacitance potential dividers & capacitance voltage transformers, Resistance potential dividers, Electrostatic voltmeter, Spark gap for measurement of high D.C., A.C. & impulse voltages ,High current shunts- Digital techniques in high voltage measurement .Potential divider for impulse voltage measurements, CRO for impulse voltage measurements.

UNIT V: **High Voltage Testing of Electrical Apparatus:** - Test on insulators, Dry & wet flash Over tests & withstand tests, Impulse flash over & withstand voltage test, High voltage tests on cables Impulse testing of transformers. Non-Destructive Testing: Measurement of dielectric constant & loss factor, High voltage Schering Bridge, Partial Discharge Measurements, isolators and transformers- Insulation Coordination.

Text Books:

1. High Voltage Engg , C.L. Wadhwa, New Age International Ltd. , 2nd Ed
2. High Voltage Engg., M.S. Naidu & V. Kamraju, Tata McGraw Hill, 3rd Ed
3. An Introduction to High Voltage Engineering, Subir Ray, PHI.

Reference Books:

1. High voltage Insulation Engineering, Ravindra Arora, New Age International.
2. High voltage Engineering, D. V. Razevig and Chaurasia, Khanna Publication.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering**
Subject: **Electric Drives Laboratory**
Periods per week (L-T-P):**(0-0-1)**
Number of class Test to be conducted: **2 (Minimum)**

Semester: **VII**
Code: **D024721(024)**
Credits: **01**

<u>List of experiments:</u> (Minimum 10 experiments to be performed)

1. To study the heating time constant for a Continuous Duty Motor
2. To Study the heating time constant of a Short time Duty Motor
3. To Study the cooling time constant of a Short time Duty Motor
4. To Study the heating time constant of a Short Time Duty Motor
5. To Study the cooling time constant for an Intermittent Duty Motor
6. Performance and speed control of D.C drive using 3-phase full converter
7. Performance and operation of a four quadrant chopper on D.C drive
8. Study and performance of electrical Dynamic braking and Plugging of D.C shunt motor
9. Study of V/F control operation of 3-ϕ Induction motor
10. Simulation of PWM VSI/CSI fed 3-ϕ Induction motor control using MATLAB/PSPICE/PSIM software
11. Study of solid state stator voltage control of 3-ϕ Induction motor (using AC voltageregulator)
12. Performance and speed control of 3-ϕ Induction motor using 3-ϕ voltage source inverter
13. To study frequency control Synchronous motor drive
14. Study of AC motors for 25KV Ac traction
15. Study of Resistance wielding and Arc welding

Apparatus Required

1. AC motor speed control trainer
2. DC motor speed control trainer
3. Heating cooling time constant unit
4. V/f control of Induction motor

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering**
Subject: **High Voltage Engineering Laboratory**
Periods per week (L-T-P):**(0-0-1)**
Number of class Test to be conducted: **2 (Minimum)**

Semester: **VII**
Code: **D024722(024)**
Credits: **01**

List of Experiments: (To be performed minimum 10 experiments)

1. Study of 100 kV (or higher) high voltage testing transformer and its control panel.
2. To plot breakdown voltage versus distance curve for sphere- sphere gap.
3. Determine the break down voltage of transformer oil.
4. Measurement of unknown high voltage using Sphere-Sphere gap.
5. Comparison of breakdown voltage for Plane-Plane, Needle-Plane, and Needle-Needle gaps.
6. To observe the effect of polarity in Sharply Non Uniform Field.
7. To determine the break down voltage for two parallel conductors for various spacing
8. Determination of string efficiency with guard ring.
9. Determination of string efficiency without guard rings
10. To determine dry and wet flash over voltage of Pin / Suspension type insulator.
11. To determine flash point and Fire Point of oil using Pensky Marten's apparatus.
12. Measurement of high voltage using Schering Bridge.
13. Measurement of relative permittivity of the given material.
14. Measurement of RMS voltage by transformer ratio test.
15. High Voltage DC testing of cables.

Apparatus Required:

1. HV testing Transformer with control panel and rectifier unit.
2. Sphere (and other gaps) arrangement.
3. Schering bridge kit
4. Insulator string with Guard Ring provision
5. Oil testing kit
6. Pensky Marten's apparatus

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Reference Books;

1. HV Engg. By, Naidu & kamaraju.

2. Electrical instrument & Measurement A.K.Sawhney

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VII**
Subject: **Energy Auditing and Management** Code: **D024731(024)**
Periods per week (L-T-P):**(2-1-0)** Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES
1. Students may decide about energy management in more effective way.
2. Students may analyze about various energy related aspect of electrical system and its auditing methods.
3. Students can carry out financial management.

Unit I - Basic principles of Energy audit **CO1[10 Hrs]**
Energy Scenario: Primary and Secondary Energy, Conventional and non-conventional energy, Energy Security, Energy Conservation and its importance, Concept and methods of energy conservation, Energy needs of growing economy, Introduction to DSM. Concept of DSM. Benefits from DSM. DSM techniques.

Unit II - Basic principles of Energy audit **CO2[8 Hrs]**
Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution.

Unit III - Energy efficient Motors **CO2[10 Hrs]**
Energy efficient motors, Factors affecting efficiency, Loss distribution , Constructional details, Characteristics ,Variable speed , Variable duty cycle systems, RMS Hp, Voltage Variation, Voltage unbalance, Over motoring, Motor energy audit.

Unit IV - Power Factor Improvement, Lighting and energy instruments **CO2[8 Hrs]**
Power factor-Methods of improvement , Location of capacitors , Pf with non linear loads, Effect of harmonics on PF, PF motor controllers, Good lighting system design and practice , Lighting control, Lighting energy audit, Energy Instruments-Watt meter, Data loggers , Thermocouples, Pyrometers, Lux meters , Tongue testers ,Application of PLC.s

Unit V - Economic aspects and analysis **CO3[8 Hrs]**
Economics Analysis-Depreciation Methods , Time value of money , Rate of return , Present worth method , Replacement analysis , Life cycle costing analysis ,Energy efficient motors- Calculation of simple payback method , Net present worth method, Power factor correction, Lighting - Applications of life cycle costing analysis, Return on investment .

Text Books:
1. Energy Demand: Analysis, Management and Conservation, Ashok.V.Desai(ED), Wiley Eastern Ltd.,New Delhi.
2. Energy technology, S. Rao, Parulekar, Khanna Pbs.
3. Energy management, Paul o. Callaghan , Mc-Graw Hill Book company.

Reference Books:
1. Demand Side Management, Jyothi Prakash, Tata McGraw-Hill
2. Energy efficient electric motors, John C. Andreas, Marcel Dekker Inc
3. Renewable Energy Sources and Conservation Technology , N.K. Bansal, Kleeman Millin , Tata McGraw-Hill Publishers
4. Energy management and good lighting practice: Energy management hand book, W. C. Turner, John Wiley and sons.
5. Energy management, W.R. Murphy & G. Mckay Butter worth, Heinemann publications.

COURSE OUTCOMES
After learning the course the Students should be able to:
CO1: Brief list of topics to be covered for Energy m management and audit and required instruments.
CO3: Material and Energy balance.
CO4: Perform financial management.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester**: VII**
Subject: **System Software** Code: **D024732(024)**
Periods per week (L-T-P):**(1-1-0)** Credits**: 02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Explain the machine structure of IBM 360	2
Categorize assembler based on its operation	4
Explain the functions of macros	5
Classify Loaders	4
Explain various text editors.	5

COURSE DETAILS:

UNIT-I
Machine structure: - memory, registers, Data & instruction Formats C Languages Vs Assembly Languages, Addressing Modes, Data Transfer operations, Arithmetic Instructions, Compare & Branch Instructions, Logical & shift Operations, Subroutines in Assembly Languages.

Unit-II
Assemblers: Introduction to Translators: Interpreters vs. Compliers, Definition of an assembler, Symbol Tables, Table Processing-Search & sort Techniques, Design of an Assembler, Single pass & multi pass Translators, Intermediate Code Forms, and List Generation & Error Indication

Unit-III
Macros & Conditional Assembly: Macro Definition, Feature of Macro facility, Macroinstruction arguments, conditional Macro Expansion, Label in macros, Macro calls within macros, Use of macros, Implementation of Macros in assemblers.

Unit-IV
Loaders Features & Linker Editors: Automatic Library Search, Loader Design Options, Load Address & Address Origin, Loading Libraries, Program Forms & self Relocation. Linkage Editors, Dynamic Linking, Bootstrap Loaders.

Unit- V
Software Tools: Text Editors: Word Processors, MS DOS EDLIN editor, Binary File Editors MS DOS DEBUG Editor, Debug command line Arguments, Loading & manipulating of addresses & data.

Textbooks:
1. System software by D.M.Dhamdhere (TMH)
2. System Programming by J.J.Donovan (TMH)
3. Microcomputer System: 8086/8088 & Family-Architecture & Design by Liu & Gibson, PHI

Reference Books:
1. Advanced Dos by Michael Hyman & Ray Duncan (MS-press).
2. MS-DOS User's manual (MS-Press)
3. Structured programming in Assembly Languages for IBM-PC by William C.Runnion.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester**: VII**
Subject: **Modeling and Simulation** Code: **D024733(024)**
Periods per week (L-T-P):**(1-1-0)** Credits**: 02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Objectives:

1. To acquire the knowledge to understand the numerical models of dynamical systems and virtual reality modeling.
2. To cover both analytical methods and simulation of queueing systems in MATLAB and will cover the programming languages of discrete stochastic system (GPSS, SIMSCRIPT).
3. To develop the ability to process of translating real-world problems into simulation models, and the model building techniques involved.

Course Outcomes:

The students will be able to :

1. Understand the basic concepts of simulation and its utility in solving real-world problems.
2. Apply statistical knowledge and modeling techniques required to construct and validate simulation models for real-world systems.
3. Analyze and interpret simulation outputs.
4. Communicate effectively in a well-structured manner and build up an open-minded attitude.

UNIT-I System Models & Role of simulation:

Basic concept & nomenclature, Types of system-Determination, Stochastic, Continuous & Discrete Systems, System Simulation-Uses of simulation & its limitation, Steps in simulation studies- Statistical Tool: Generation & Testing of pseudorandom numbers, Random variate generation for Uniform, Exponential Normal & passion distributions, Sampling & Estimation, Maximum Likelihood estimation, Confidence interval estimation.

UNIT –II Discrete Event Simulation:

Representation of time, Approach to discrete event simulation Queuing Models-Single & multi- server queues, Steady state behavior of queues, Network of queues, Inventory System simulation, Programming languages for discrete system simulation-GPSS, SIMSCRIPT (Brief overview)

UNIT-III Modeling & performance Evaluation of computer Systems:

Behavioral, Data flow & structural modeling, Overview of hardware, Modeling & Simulation, Simulation for behavioral model, Evaluation of multiprocessor systems, workload characterization & Benchmarks.

UNIT-IV Continuous System Simulation:

Continuous System Models-Open & closed loop systems, Model described by differential equations, Systems dynamics, Growth & decay models, Systems dynamics diagram, Simulation of aircraft models,Biologial & sociological systems simulation, Simulation Languages Overview- CSMP.

UNIT-V Virtual Reality Modeling:

Overview of Virtual Reality Modeling Language VRML 20,creating dynamic worlds, integrating JavaScript's either VRML Verification & Validation of Simulation Models: Goals of Model Verification & validation, Input data Analysis, Output Analysis, Sensitivuity analysis, Hypothsis testing, Performance measures & their estimation

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Text Books:

1. Discrete System Simulation, J.E.Banks, Prentice Hall
2. System Simulation, G.Gordon, PHI
3. System Simulation and Modeling, Sankar Sengupta, Pearson

Reference Books:

1. A VHDL Primer, J.Bhastav, Prentice Hall
2. Computer Systems Performance Evaluation, D.Ferrari, Prentice Hall

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester**: VII**
Subject: **Advanced Microprocessor** Code: **D024734(024)**
Periods per week (L-T-P):**(1-1-0)** Credits**: 02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Objectives:

1. To develop understanding of the architectures of advanced microprocessors
2. To get knowledge of microprocessor based systems
3. To acquire the skills in the programming and applications of these processors
4. To understand various interfacing concepts
5. To understand various interfacing circuits necessary for various application

Course Outcomes:

By the end of this course students will learn to:

1. Describe the features and use of advanced microprocessors
2. Compare and contrast the features of different members of a microprocessor family
3. Design memory, I/O, and interrupt interfaces to the microprocessor.
4. Develop software to control an application.

UNIT I: Architecture and Instruction set for 8086:
Architecture and pin configuration of 8086, instruction format, addressing modes, data transfer instruction, arithmetic instructions, Branching & Looping Instructions, NOP and Halt, Flag Manipulation Instructions, Logical, shift and Rotate Instruction, Byte and String Manipulation: string Instructions; REP Prefix, Table Translation, Number Format conversions. Assembler Directives and Operators; Assembly Process; Translation of assembler Instructions, Programming of Microprocessor 8086.

UNIT – 2: System Bus Structure:
Basic 8086/8088 system bus architecture, Minimum mode Configuration, Maximum mode Configuration; memory interfacing with 8086/8088 in minimum and maximum mode; system Bus standards. Interrupts of Microprocessor 8086.

UNIT – 3: Advanced Microprocessor architecture:
CPU 80386 Architecture and functional pin diagram, Function of Bus Interface unit, Execution unit, control unit, Instruction decoder Unit, Segmentation unit & page unit, General purpose Registers, Flag Register, Test & Debug Register, and Pipelining. Addressing mode and Instruction set of microprocessor 80386.

UNIT – 4: Task and Modes of Operation:
Real mode, Virtual Mode, Protected Mode, Page based Virtual Memory, Single level tasks: Segment Register, segment descriptors, Local descriptor table, Global Descriptor Register, Interrupt Descriptor Register, Multilevel tasks: Gate Descriptor, Task state segment, Task switch; Task gate descriptors, Related Instructions, Page descriptors, addressing technique. Address Calculation, Segment and Page Protection, Scaling; Bit Addressing, Programmer invisible register, Cache Memory, Virtual memory, Types of cache.

UNIT – 5: Multiprocessor Configuration & Interfacing
Numeric data Processor 8087; I/O Processor 8089, Communication between CPU and IOP, Related Instruction; Interfacing and programming of programmable peripheral interface 8255 and programmable interrupt controller 8259 with microprocessor 8086.

Text Books:

1. Microcomputer Systems: 8086/8088 Family – Architecture, Programming, and Design; Y.Liu and G.A. Gibson; PHI.
2. Advanced Microprocessors and Peripherals, K. M. Bhurchandi and A. K. Ray, McGraw Hill, India.
3. The X86 Microprocessors: Architecture And Programming (8086 To Pentium), Lyla B. Das, Pearson

Reference Books:

1. 80386 Microprocessor Handbook: C.H.Pappas and W.H. Murray: Osborne McGraw Hill
2. The Intel Microprocessors, Barry B. Brey, Pearson

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester**: VII**
Subject: **Embedded System Software in C** Code: **D024735(024)**
Periods per week (L-T-P):**(1-1-0)** Credits**: 02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Objectives

1. Learn the basic components and structure of a C program, learn to define variables, and use operators and operands to create C expressions and statements
2. Develop the students to write their own programs using standard language infrastructure regardless of the hardware or software platform.
3. Introduce the student with embedded software concepts used in embedded system
4. Develop an understanding of the technologies behind the embedded computing systems

Course Outcomes

Upon successful completion of this course, the students should be able to:

1. Be the familiar with basic concepts of computer programming
2. Write their programs efficiently using the C programming language.
3. Introduce the student with embedded software concepts used in embedded system
4. Get educated and trained with practical job oriented knowledge.
5. Develop practical skills to cater to the industry requirements

UNIT-I Introduction to C language

The C language and its advantages, Structure of a C program –preprocessor directives, declaration and definition, Writing C programs, Building an executable version of C program, Debugging and executing C program.

C Language Fundamentals

Identifiers and keywords, Data types, Arithmetic, unary, logical, bit-wise, assignment and conditional operators, Declarations, Expressions, Statements and symbolic constants, Input/Output management, Decision making and Branching, Decision making and looping

UNIT – II Functions, Arrays, Pointers and Structures

Defining and accessing functions, Passing arguments to functions, The C standard library functions, Defining and processing arrays, Passing arrays to a function, 2-dimensional arrays, String Manipulation, Pointer Arithmetic, Types of functions(parameterized and non-parameterized), Control structures.

UNIT – III Programming Techniques of Embedded C

Introduction to embedded system, Choice of - processor, programming language and operating system, Development of embedded software

Introducing the AVR Family (Elementary treatment)

Introduction, The external interface of the Standard ATMEGA16(only), Reset requirements, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Parallel interface, internal PWM, ADC.

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UNIT – IV Reading and writing I/O Pins

Introduction, Basic techniques for reading from port pins, Reading and writing bytes, Reading and writing bits (simple version), Reading and writing bits (generic version), The need for pull-up resistors, Dealing with key de-bounce, Reading switch inputs and Counting, Creating 'hardware delays' using Timer 0 and Timer 1, 'timeout' mechanisms, Creating and testing loop timeouts and hardware timeouts, interrupts and its examples.

UNIT – V Hardware Interfacing

LED interfacing, LCD interfacing, motor interfacing (DC motor, PWM servo, stepper), 4X4 matrix interfacing, sensor interfacing (analog and digital).

Text Books:

1. Schaums outline of Theory and Problems of programming with C : B. S. Gottfried, Tata McGraw-Hill
2. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008
3. Embedded C programming and Atmel AVR, 2nd edition, Richard Barntt, Sarah Cox and Larry O' Cull , Delmar Cengage Learning.

Reference Books:

1. Let us C: Yashwant Kanetker, BPB Publications
2. C – programming: E.Balagurusamy Tata McGraw Hill
3. The 'C' programming language: B.W.Kernighan and D.M.Ritchie, PHI
4. Embedded Software Development with C: Qian, Haring and Cao, Springer

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester**: VII**
Subject: **Micro Controller & Embedded System** Code: **D024736(024)**
Periods per week (L-T-P):**(1-1-0)** Credits**: 02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course objectives:

1. To understand basic concepts of microcontroller 8051
2. To understand architecture and features of typical Microcontroller
3. To understand need of microcontrollers in embedded system
4. To understand the programming of microcontrollers and embedded systems with a focus on real- time application.
5. To learn interfacing of real world input and output devices
6. To study various hardware and software tools for developing applications

Course Outcomes:

Upon completion of the course the student will be able to:

1. Program, build and test a microcontroller system.
2. Interface a microcontroller system to user controls and other electronic systems.
3. Describe the internal architecture of microcontroller systems, including counters, timers, ports, and memory.
4. Understand principles of embedded systems design

Unit –I: Introduction

Introduction to 8051 family, introductions to general-purpose microprocessor, Micro controller for embedded system. A brief history of 8051, 8052, 8751, AT8951, pin configuration of 8051, 89C52RD2.

Unit-II: Instruction set of 8051

Instruction set, 8051 assembly language programming, Internal Structure of 8051, power resetting, Built up RAM & ROM, I/O programming and addressing modes.

Unit-III: Counter and Timer programming

Counter and Timer details, Counter and Timer programming using 8051, interrupt programming, Types of Interrupt.

Unit-IV: Serial Communication Programming

Asynchronous serial communication, Data programming, RS232 standard, RS422 standard, 1488 &1489 standard, GPIB, MAX232 Driver, serial communication programming.

Unit-V: Interfacing

ADC & DAC interfacing, stepper motor interfacing, Keyboard interfacing Memory interfacing, embedded design concept, embedded design card, 8096 Architecture.

Textbooks:

1. 8051 programming, interfacing and Application K J Ayala, Penram; TMH
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C (English) 2nd Edition, Muhammed Ail Mazidi, Janice Gillispie Mazidi, Rolin D./ McKinlay, Pearson
3. Micro controller & Embedded System Manual.

Reference Books:

1. 8051 Microcontroller: Internals, Instructions, Programming & Interfacing
2. Programming and customizing the 8051 micro controller, Predko: TMH
3. Embedded System Design: An introduction to processes, Tool And Techniques, Arnold. S.Berger

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester**: VII**
Subject: **Digital Image Processing** Code: **D024737(024)**
Periods per week (L-T-P):**(1-1-0)** Credits**: 02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Illustrate the basics and fundamentals of digital image processing	2
Change images using the techniques of smoothing, sharpening and enhancement	3
Relate restoration concepts and filtering techniques	4
Relate basics of segmentation, features extraction, compression and recognition methods for color models	4

COURSE DETAILS:

UNIT I: DIGITAL IMAGE FUNDAMENTALS
Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries.

UNIT II: IMAGE ENHANCEMENT
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Homomorphic filtering, Color image enhancement.

UNIT III: IMAGE RESTORATION
Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV: IMAGE SEGMENTATION
Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Watershed segmentation algorithm.

UNIT V: IMAGE COMPRESSION AND RECOGNITION
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

TEXT BOOKS:

1. Digital Image Processing Pearson, Rafael C. Gonzalez, Richard E. Woods, Third Edition.
2. Fundamentals of Digital Image Processing, Anil K. Jain, Pearson.

REFERENCE BOOKS:

1. Digital Image Processing, Kenneth R. Castleman, Pearson.
2. Digital Image Processing using MATLAB, Gonzalez, Richard E. Woods, Steven Eddins, Pearson Education, Inc.
3. Multidimensional Digital Signal Processing, D.E. Dudgeon and RM. Mersereau, Prentice Hall Professional Technical Reference.
4. Digital Image Processing, William K. Pratt, John Wiley, New York.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical Engineering** Semester: **VII**
Subject: **Power System Operation and Control** Code: **D024738(024)**
Periods per week (L-T-P):**(1-1-0)** Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Explore the concept of automatic generation control	2
Apply the modes of excitation systems and exercises voltage control	3
Employ incremental cost curve and penalty factor for economic generation	3
Plan unit commitment for optimal operation	5
Evaluate power system security and methods of improvement, apply mathematical and engineering fundamentals required to control and operation of power system	3,5

COURSE DETAILS:

UNIT I: Economic dispatch of Thermal units
Economic dispatch problem with and without losses, solution methods lambda iteration technique, gradient search and Newton's method, optimal power flow method

UNIT II: Unit commitment
Unit commitment problem, startup and shutdown cost, Thermal unit constraints, hydro constraints and other constraints, solution methods priority list and dynamic programming.

UNIT III: Hydro Thermal coordination
Long term and short term hydro thermal scheduling problem, solution by gradient method, pumped storage hydro plant scheduling pumped storage hydro plant scheduling.

UNIT IV: Power System Security
Security analysis, Contingency analysis method, contingency selection

UNIT V: Load frequency and Excitation Control
Generator model, load model, prime mover model, governor model, tie-line model, automatic generation control of single area, inter connected areas, steady state and dynamic analysis, two area load frequency control, types of excitation control, Reactive power control, and voltage collapse

Text Books:
1. Allen. J. wood and Bruce F. Woolenberg, "Power generation, operation and Control", John Wiley & sons, Inc., 2003.

Reference Books:
1. P Kundur, "Power system stability and control" MC Craw Hill Publisher, USA, 1994
2. Olle. IElgerd, "Electric Energy System Theory and Introduction" Tata McGraw Hill publishing Company Ltd. New Delhi, Second edition 2003

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program: Bachelor of Technology
Semester: B. Tech – 7th **Branch: Electrical Engg.**
Subject: Universal Human values 2 **Course Code: D000701(046)**
Total Marks in End Semester Exam: **L: T: P: 2 Credits: 0**

Course Objective(s):

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I Introduction- Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
- Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in 'I'.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.
- Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life.
- Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
- Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
- Holistic perception of harmony at all levels of existence.
- Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  - At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  - At the level of society: as mutually enriching institutions and organizations
- Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
3. Small is Beautiful - E. F Schumacher.

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Course Outcome:

After completion of course, student should be able to

- To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** Branch: **Electrical Engineering**
Subject: **Installation Maintenance & Testing of Electrical Equipments** Course Code: **D024811(024)**
Periods per week (L-T-P): **(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

COURSE OBJECTIVES:
After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Categorize and describe the site management activities	2
Categorize various transformer maintenance activities	3
Categorize various Switchgear and Circuit Breaker maintenance activities	3
Categorize various electrical rotating machines maintenance activities	3
Illustratehotline maintenance and electrical fire safety	4

COURSE DETAILS:

UNIT – I: OVERVIEW OF SITE MANAGEMENT, ELECTRICAL SAFETY
Introduction to Site activities; Civil works, Erection, Testing & Commissioning, Operation and Maintenance, Type and Scope of Maintenance, Safety management, Electrical shocks, treatment of shock, Recommended safety precautions against electrical shocks in LV and HV installations, Earth lead and its size, permissible earth resistance for different installations, improvement of earth resistance, Safety procedure during commissioning phase and Operation & maintenance phase.

UNIT – II: TRANSFORMER
Important steps in maintenance of power transformer, maintenance schedule for attended and unattended transformer, causes of troubles and failure of power transformer, Dispatch and shipping, inspection, storage, procedure of filling oil in transformer tank, drying out, various commissioning tests on a power transformer, typical maintenance schedule for transformer up to 1000 KVA and above 1000KVA, transformer oil filtration.

UNIT – III: SWITCHGEAR, CIRCUIT BREAKER
Introduction to switchgears and equipments in substation and their functions, Type tests, routine test and commissioning tests, high/low voltage ac circuit breakers (Air, Oil, Vacuum, SF6) possible troubles, causes and remedial actions for outdoor circuit breakers, maintenance of CB (Air, Oil, Vacuum, SF6), Trouble shooting of substation equipment

UNIT – IV: ROTATING MACHINES
Standard designation for cooling and degree of protection, Installation and commissioning of introduction motor and rotating machines, drying out of electrical rotating machines, installation resistance measurements, Mechanical maintenance of rotating machines, Care, servicing and maintenance of motor, Mechanical fixture and alignment, Troubles, causes, remedies and protective devices during respective abnormal condition in low voltage induction motor, Testing of induction motors.

UNIT – V: HOTLINE MAINTENANCE AND SAFETY AGAINST ELECTRIC FIRE
Meaning and advantages of hot-line maintenance. Special type non conducting materials used for preparing tools for Hot line maintenance, Tools, Various types of Hot- line operations, safety during Hot line maintenance.
Introduction to Electrical Fire Safety, Electrical accidents, Safety regulations, Fire Fighting to extinguish Electrical Fire using Dry Powder type Fire extinguisher.

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TEXT BOOKS:
1. Testing, commissioning, operation and maintenance of Electrical equipments, S. Rao, 6th Edn. Khanna Publishers.

REFERENCE BOOKS:
1. Installation maintenance and testing of Electrical Equipments, S. Tarlok, S. K. Kataria& Sons
2. Fundamentals of maintenance of Electrical Equipment by Bhatia Khanna Pub.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** Branch: **Electrical Engineering**
Subject: **EHV AC DC Transmission (Elective)** Course Code: **D024831(024)**
Periods per week (L-T-P): **(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Describe fundamentals of EHV AC and DC Transmission system.	2
Describe the series / shunt Compensation of line by applying FACTS devices.	2
Illustrate the conditions of over voltages transmission system.	5
Explain the components of EHV DC system.	5
Explain Control of EHV DC system.	2

UNIT – I: Fundamentals of EHV AC & DC transmission and Converter Constitution of EHV AC and DC Links, Kind of DC Links, Limitations and advantages of AC and DC Transmission, Principal application of AC and DC Transmission, trends EHV AC and DC Transmission, Power-handling capacity, Converter analysis Graetz circuit, Firing control, overlapping.

UNIT – II: Line Compensation and FACTS Devices Extra-long distance lines, Voltage profile of loaded and unloaded line along the line, Compensation of lines, series and shunt compensation, Shunt reactors, Tuned power lines, Problems of extra-long compensated lines, FACTS concept and application.

UNIT – III: Traveling waves and Over voltages in transmission system Travelling waves on transmission systems, their shape, attenuation and distortion, effect of junction and termination on propagation of travelling waves, Over voltages in transmission system, Lightning, switching and temporary over voltage: Control of lighting and switching over voltages.

UNIT – IV: Components and working of EHV dc system Components of EHV dc system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, adverse effects, Classification, Remedial measures to suppress, filters, Ground return, Converter faults & protection harmonics mis-operation, Commutation failure, Multi-terminal D.C. lines.

UNIT – V: Control of EHV DC system Control of EHV dc system desired features of control, control characteristics, constants current control, Constant extinction angle control, Ignition angle control, parallel operation of HVAC & DC system, Problems and advantages.

Textbooks:
1. EHV AC Transmission, Begamudre, New Age International.
2. EHV AC & DC Transmission, Manoj Nair, Balaji publication
3. HVDC Transmission, Padiyar, New Age Pbs.

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Reference Books:
1. EHV-AC and HVDC Transmission Engineering and Practice: Theory, Practice and Solved Problems, Sunil S. Rao, Khanna Publisher.
2. Direct current transmission, Edward Wilson Kimbark, Wiley-Interscience.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)**
Branch: **Electrical Engineering**
Subject: **Flexible AC Transmission System (Elective)**
Subject Code: **D024832(024)**
Total Theory Periods - **32**
Total Tutorial Periods: **8**
Class Tests: **Two (Minimum)**
Assignments: **Two (Minimum)**
Total marks in End Semester Exam: **100**

Course Outcomes:
After successful completion of this course, student will be able to:

CO Statement	Blooms Level
Gain the basic knowledge of FACTS controller and its types.	
Explain the operation of Voltage and Current Source Convertors.	
Describe the operation of Static Shunt , Static Series and Combined Compensators.	

UNIT–I: Introduction of FACTS Controllers
Problems of AC power transmission, Power Flow in parallel and meshed path, Overview of stability consideration, loading capabilities, Power flow control in AC transmission system, Reactive power compensation, Basic types of FACTS Controllers, Advantages of FACTS technology.
UNIT–II: Voltage Source Converters (VSCs) and Current Source Converters (CSCs)
Basic concepts of VSC, single-phase full wave bridge converter operation, single phase-legoperation, three-phase full wave bridge converter and its operation, transformer connections for 12-pulse,24-pulse and 48-pulse operation. Basic concepts, three-phase CSCs, three-phase full wave rectifier, comparison of VSCandCSC.
UNIT–III: Static Shunt Compensators:
Basic concepts, method of controllable VAR generation, Static VAR compensator (SVC), application of SVC in power systems, working of STATCOM, V-I and V-Q characteristics, transient stability enhancement and exchange of real power using STATCOM, comparison of SVC and STATCOM, Merits of hybrid compensators.
UNIT–IV: Static Series Compensators
Objectives of series compensation, variable impedance type series compensation, GTOthyristorcontrolled series capacitors (GCSC), thyristor controlled series capacitor (TCSC), basicconceptsof GCSC and TCSC.
UNIT–V: Combined Compensators
UPFC: Unified Power Flow Controller (UPFC), basic operating principles,conventional transmission control capabilities, Comparison of UPFC to series compensators,Applications of UPFC.
IPFC: Interline Power Flow Controller (IPFC), basic operating principles and characteristics, Applications of IPFC.

Text Books:
1. N. G. Hingorani and L. Gyugyi, "Understanding FACTS: Concepts and Technology of FACTS Systems", Wiley-IEEE Press, 1999.
2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
3. T. J. E. Miller, "Reactive Power Control in Electric Systems", John Wiley and Sons, New York, 1983.

Reference Books:
1.Yong Hua Song, Allan T Johns, Flexible AC Transmission Systems FACTS, 1999.
2. Xiao Ping Zhang,ChristianRehtanz, Bikash Pal, Flexible AC Transmission Systems 2006.
3. R. Mohan & R. M. Mathur, Thyristor-based FACTS Controllers for Electrical Transmission Systems, John Wiley,2002.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** Branch: **Electrical Engineering**
Subject: **Biomedical Instrumentation (Elective)** Course Code: **D024833(024)**
Periods per week (L-T-P): **(2-1-0)** Credits: **03**
Number of class Test to be conducted: 2 (Minimum) No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Explain an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration.	2
Understand the various sensing and measurement devices of electrical origin.	2
Illustrate the latest ideas on devices of non-electrical devices.	5
Describes the important and modern methods of imaging techniques.	2
Describes latest knowledge of medical assistance / techniques and therapeutic equipment.	2

UNIT-I: Human Physiology and Basics:
Brief introduction to human physiology, Basic components of bio-medical instruments, bioelectric signals, action potentials, Bio-electrodes.

UNIT-II: Transducers
Biomedical Transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.

UNIT-III: Electro-Physiological Measurements
Analysis of EEG, ECG, EMG, EOG & Bio-Potential Amplifiers for ECG, EMG, EEG, etc.

UNIT-IV: Electrical Parameter Measurements
Cardiovascular measurement-blood pressure, blood flow, stroke volume, Impedance Plethysmography, Cardiac output, heart sound etc. Instrumentation for respiratory & nervous systems.

UNIT-V: Monitoring, Assisting, Therapeutic Equipment and Safety
Patient care & monitoring system, Remote monitoring through telephone, Internet, Satellite link, Safety aspects associated with Biomedical Instrumentation. Recent advances in Bio-Medical Instrumentation, Microprocessor based systems, Laser & optical Fiber systems.

Text Books:

1. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Prentice-Hall,
2. Handbook of Biomedical Instrumentation, R. S. Khandpur, McGraw Hill

Reference Books:

1. Biomedical Instrumentation, M. Arumugam, Anuradha Agencies.
2. Introduction to Biomedical Engineering, Domach, Pearson Education.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** Branch: **Electrical Engineering**
Subject: **VLSI Design (Elective)** Course Code: **D024834(024)**
Periods per week (L-T-P): **(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Apply his/ her knowledge in basic design techniques for IC fabrication.	4
Understand layout design rules and logic design.	5
Help in VLSI Fabrication Industries.	2
Illustrate the Design of CMOS.	2
Explain the ideas and concepts of Subsystem designing.	5

Unit-I: Overview of VLSI Design Methodology
VLSI design process-Architectural Design-Logical , Design-Physical, Design-Layout Styles-Full custom-semi custom approaches. Basic Electrical properties of MOS & CMOS circuits: NMOS enhancement transistor-PMOS enhancement transistor-threshold voltage-threshold voltage equations-MOS devices equations-Basic DC equations-Second order effects-MOS modules-small signal AC characteristics –NMOS inverter-Steered input to an NMOS modules-Depletion mode & enhancement mode pull ups-CMOS inverter-DC characteristics-Inverter delay-pass transistor transmission gate.

Unit-II: VLSI Fabrication Techniques
An overview of wafer fabrication –wafer Processing-Oxidation-Patterning- Diffusion –Ion implantation-Deposition-Silicon gate NMOS process-CMOS processes-Nwell-Pwell-Wintub Silicon on insulator- CMOS process enhancement-Interconnect-Circuit elements.

Unit-III: Layout Design Rules
Need for design rules-Mead Conway design rule for the silicon gate NMOS process-CMOS Nwell/ Pwell design rules-Simple layout examples-sheet resistance-area Capacitance-Wiring Capacitance-drive large capacitive loads.

Unit-IV: Logic Design
Switch logic-pass transistor & transmission gate-Gate logic-Inverter-two point, NAND gate-NOR gate-other forms of CMOS logic-Dynamic CMOS logic-clocked CMOS logic-Precharged domino CMOS logic-structured design-simple combinational logic design examples-Parity generator Multiplexes-clocked sequential circuits-two phase clocking-charge storage-dynamic register element-NMOS &CMOS- dynamic shift register-semi static register-JK flip flop circuit.

Unit-V: Subsystem Design Process
Design of a 4 bit shifter-General arrangement of a 4 bit arithmetic processor-Design of a ALU subsystem-Implementing ALU functions with an adder-Carry look ahead adders-Multipliers-serial parallel multipliers-Pipelined multiplier array-Modified Booth's Algorithm

Text Books:

1. Basic VLSI Design, Douglas A.Pucknell& Kamran Eshranghian, Prentice Hall of India, New Delhi, 3rd edition 1994.

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2. CMOS VLSI Design : A Circuits and Systems Perspective, Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson, 3rd Edition
3. Introduction to NMOS & CMOS VLSI system design, Amar Mukherjee, Prentice Hall, USA, 1986

Reference Books:

1. Introduction to VLSI system, Caver Mead & Lynn Conway, Addison Wesley.
2. Introduction to VLSI design, Eugene D.Fabricus, McGraw Hill International edition, 1990.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** **Branch: Electrical Engineering**
Subject: **Robotics and Automation (Elective)** Course Code: **D024835(024)**
Periods per week (L-T-P): **(2-1-0)** Credits: **03**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Create matrix algebra and Lie algebra for computing the kinematics of robots.	2
Calculate the forward kinematics and inverse kinematics of serial and parallel robots.	3
Calculate the Jacobian for serial and parallel robot.	3
Apply the path planning for a robotic system.	4
proficient in the use of Maple or Matlab for the simulation of robots.	5

UNIT-I: Fundamental Concepts of robotics
History, present status & future trends-Robotics & automation-Laws of Robotics-Robot definitions Robotics systems & robot anatomy-Specification of Robots-resolution, Repeatability & accuracy of a manipulator. Robot Drives & Power Transmission Systems & Control: Robot drive mechanisms, hydraulic-electric-pneumatic drives, mechanical transmission method-Rotary-to /Rotary motion conversion, Rotary –to linear motion conversion-End effectors-Types- in piping problem-Remote centered compliance devices-control of actuators in robotics mechanisms.

UNIT-II: Sensors & Intelligent Robots
Sensory devices-non-optical-position sensors-optical position sensors-Velocity Sensors-Proximity sensors-contact & non-contact type-touch &slip sensors-Force & torque sensors-Al & Robotics.

UNIT-III: Computer Vision for Robotics Systems
Robot vision systems-Imaging components-image representation-Hardware aspects-Picture coding Object recognition & categorization-Visual Inspection-Software Considerations Application, Commercial robotic vision systems

UNIT-IV: Transformations & Kinematics
Homogenous coordinates-coordinates references frames-Homogenous transformation for the manipulator-The forward & inverse problem of manipulator kinematics-Motion generation, Manipulator dynamics- Jacobian in terms of D-H Matrices-Controller architecture.

UNIT-V: Robot Cell Design & Control
Specification of commercial robots-Robots design & process specification-Motor selection in the design of a robotic joint-Robot cell layouts-Economic & social aspect of robotics. Application of Robots: Capabilities of Robots-Robotics Applications-Obstacle Avoidance-Robotics in India-The future of robotics Factor Automation-Hierarchical computer control.

Text books:

1. Robotics Engg-An Integrated Approach, Richard D.Klafter, Thomas A.Chmielewski Michael Negin, Eastern Economy Edition, Prentice Hall of India P.Ltd.1989.
2. Robotics Technology & Flexible Automation, S. R. Deb and S. Deb, McGraw Hill 2ndedition.

Reference Book:

1. Robotics: Control, Sensing, Vision& Intelligence, K.S.Fu, R.C. Gomalez, C.S.G. Lee,tat McGraw Hill.
2. Industrial Robots-Technology, Programming & application, Mikell P.Groover et.al, McGraw Hill, 2nd edition.
3. Handbook of Industrial Robotics, Shiman Y.Nof, John Willey & Sons, New York, 1985

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** **Branch: Electrical Engineering**
Subject: **Energy Management System and SCADA (Elective)** Course Code: **D024836(024)**
Periods per week (L-T-P): **(2-0-0)** Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **02**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Objective: At the end of the course, the student will be able to:

	Course Objectives:	Blooms Taxonomy Level
1.	Understand the fundamentals of energy management functions.	2
2.	Understand the economic analysis and system energy management for electrical system and equipment.	2
3.	Enhance the knowledge in lighting and cogeneration.	3
4.	Expose to the concept of supervisory control and data acquisition.	2
5.	Familiarize the application of SCADA in power systems	3

UNIT–I: ENERGY MANAGEMENT FUNCTIONS
Need for energy management– energy management program, Energy accounting–Energy monitoring, Targeting and Reporting, Energy audit process, Energy Management Centers and their Functions, Architectures of Centers and their Functions, Energy performance assessment of HVAC system.

UNIT–II: ECONOMIC ANALYSIS AND SYSTEM ENERGY MANAGEMENT
Important concepts in an economic analysis, Electricity tariff, Electrical Load Management and Maximum Demand Control, Systems and equipment, Electric motors, Transformers, Capacitors-power factor and effect to harmonicon power quality, Energy efficiency analysis on electrical power system, motor and Transformer.

UNIT–III: LIGHTING AND CO GENERATION
Concept of lighting systems– the task and the working space, Light sources–ballasts–luminaries, Lighting controls, Optimizing lighting energy, lighting and energy standards, Forms of cogeneration–Feasibility of cogeneration, Energy performance analysis of lighting and cogeneration.

UNIT–IV: SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)
SCADA-Functional requirements and Components, General features, Functions and Applications, Benefits, Various SCAD Architectures, SCADA Communication: various industrial communication technologies.

UNIT–V: SCADA APPLICATIONS
SCADA Applications: Utility Applications, Transmission and distribution sector-Operations, Monitoring, Analysis and improvement, Substation automation structure. Introduction to wide area protection.

Text Books:
1. SCADA and Energy Management System By Tanuj Kumar Bisht, S.K. Kataria& Sons.
2. Energy Management and Conservation, P. Venkataseshaiah K.V. Sharma ,Wiley Publications

References:
1. Wayne C.Turner, Steve Doty "*Energy Management Hand book*", The Fairmont Press, 6th Edition, 2007.
2. K.Tyagi, "*Hand book on Energy Audits and Management*", Tata Energy Research Institute, 2nd reprint, 2003.
3. Stuart A. Boyer: "*SCADA- Supervisory Control and Data Acquisition*", Instrument Society of America Publications, USA, The Instrumentation system and Automation Society, 4th Edition, 2010.
4. Gordon Clarke, Deon Reynders" *Practical Modern SCADA Protocols:DNP3,60870.5 and Related Systems"*, Newnes Anim print of Elsevier Publications, 1st Edition, 2004.
5. www.energy manager training.comwww.bee-india.nic.in.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** | **Branch: Electrical Engineering**
Subject: **Smart Grid (Elective)** | Course Code: **D024837(024)**
Periods per week (L-T-P): **(2-0-0)** | Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** | No. of assignment to be submitted: **02**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Objectives: After completion of this course students will be able to:

	Course Objectives:	Blooms Taxonomy Level
1.	To interpret knowledge on the development of the smart grid, components, and architectures.	2
2.	Illustrate various aspects of smart grid technologies, smart meters, and advanced metering infrastructure.	2
3.	Apply classical and modern load flow study techniques in analysis of Smart Grid systems.	4
4.	Analyze smart grid performance using various computing tools.	3
5.	Design and develop independently innovative products and services in the field of Smart Grid Technologies.	4

UNIT–I: Introduction to Smart Grid
Definition of the Smart Grid, early smart grid initiatives, Overview of the technologies required for the smart grid, Representative Architecture, Functions of Smart Grid Components, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT–II: Smart Grid Technologies
Communication and Measurement Technologies, Monitoring, PMU, Smart Meters, and Measurements Technologies, GIS and Google Mapping Tools, Multi-agent Systems (MAS) Technology, Micro grid and Smart Grid Comparison.

UNIT–III: Performance Analysis Tools for Smart Grid Design
Introduction to Load Flow Studies, Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods, Load Flow State of the Art: Classical, Extended Formulations, and Algorithms, Load Flow for Smart Grid Design, DSOPF Application to the Smart Grid, Static Security Assessment (SSA), Contingencies and their Classification.

UNIT–IV: Computational Tools for Smart Grid Design
Introduction to Computational Tools, Decision Support Tools, Optimization Techniques, Classical Optimization Method, Heuristic Optimization, Evolutionary Computational Techniques, Adaptive Dynamic Programming Techniques, Hybridizing Optimization Techniques and Applications to the Smart Grid, Computational Challenges.

UNIT–V: Pathway for Designing Smart Grid
Introduction to Smart Grid Design, Barriers and Solutions to Smart Grid Development, Advanced Optimization and Control Techniques for Selection Functions, Automation of the Smart Grid at Transmission Level and Distribution System, Automation Requirement of the Power Grid, End User/Appliance Level of the Smart Grid, Applications for Adaptive Control and Optimization.

Text Books:

1. Smart Grid: Fundamentals of Design and Analysis, James Momoh (Wiley-IEEE Press).
2. Smart Grid: Technology and Applications, JanakaEkanayake (Wiley).

Reference Books:

1. Power System Protection in Smart Grid Environment, Ramesh Bansal (CRC Press, Taylor & Francis Group).
2. Smart Grids: Fundamentals and Technologies in Electric Power systems of the future, Bernd M. Buchholz, Zbigniew A. Styczynski (Springer, Second edition) Energy Processing and Smart Grid, James A. Momoh (Wiley).

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech (VIII Sem)** Branch: **Electrical Engineering**
Subject: **Electrical Estimation and Costing (Elective)** Course Code: **D024838(024)**
Periods per week (L-T-P): **(2-0-0)** Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **02**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course objectives:
After successful completion of this course, the student will be able to-

CO Statement	Blooms Level
Explain general principles of estimation & residential building electrification	1
Plan detailed estimates and costing of residential and commercial installation	5
Design and estimate of overhead transmission & distribution lines, Substations	6

UNIT-I: Principle of Estimation and Residential Building Electrification
Introduction to estimation and costing, Electrical Schedule. Determination of cost material and labor Contingencies. Overhead charges. General Rules, guidelines for wiring of residential installation and positioning of equipments, Principles of circuit design in lighting and power circuits. Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram.

UNIT-II: Electrification of Commercial Installation
Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation.

UNIT-III: Service Connection, Power Circuits, Inspection and Testing of Installation
Inspection of internal wiring installations, Inspection of new installations, testing of installations, testing of wiring installations, Important considerations regarding motor installation wiring, Determination of rating of cables Determination of rating of fuse, Determination of size of Conduit, distribution Board main switch and starter.

UNIT-IV: Design of Overhead Transmission and Distribution Lines
Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, accessories, Erection of supports, setting of stays, Fixing of cross arms, Fixing of insulators, Conductor erection, Repairing and jointing of conductor, Dead end clamps, Positioning of conductors and attachment to insulators Jumpers, Tee-offs, Earthing of transmission lines, Guarding of overhead lines, Clearance of conductor from ground.

UNIT-V: Design and Estimation of Substation
Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation, Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram.

Text Books:
1. Electrical Installation Estimating & Costing, J.B.Gupta,VIII Edition S.K.Katria & Sons New Delhi.
2. Electrical Design Estimating and Costing, K.B.Raina S.K.Bhattacharya, New Age.

Reference Books:
1. Electrical Wiring Estimating and Costing, S.L. Uppal, G.C Garg, Khanna Publishers.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech. (VIII Sem)** Branch: **Electrical Engineering**
Subject: **Installation Maintenance & Testing of Electrical Equipments (Lab)**
Total Periods: **36** Course Code: **D024821(024)**
Total Marks in End Semester Exam: **40** TA: **20**

CO Number	CO Statement	Knowledge Level
CO1	Students will be able to calibrate various instruments	3
CO2	Students will be able to perform testing of Instrument Transformers	3
CO3	Students will be able to measure the earth resistance and Insulation Resistance	3
CO4	Students will be able to demonstrate the Fire Extinguisher	4
CO5	Students will be able to demonstrate the Artificial Respiration Techniques	4

List of Experiments: (To be performed minimum10 experiments)

1. Calibration of Ammeter and voltmeter
2. Calibration of Wattmeter
3. Calibration of Energy meter.
4. Testing of wiring installation using Megger.
5. Current Transformer Testing.
6. Potential Transformer Testing
7. To study the Installation of Plate and Pipe Earthing
8. Measurement of Earth Resistance using Earth Tester.
9. To study the installation and routine test required for commissioning of 3phase Induction motor
10. Study of Installation of Pole Mount Substation and preparation of it's estimate.
11. Installation, Maintenance and Testing of HPMV/Sodium Vapour/Metal Halide Lamp fitting.
12. Live Demonstration of Fire Fighting to extinguish Electrical Fireusing Dry Powder type Fire extinguisher. (Mock Demotoentire group/classatatime; No batch size limitation)
13. Live Demonstration of Artificial Respiration Techniques, Preferably by a Doctor with the help of Dummy Model. (Mock Demotoentire group/classatatime; No batch size limitation)
14. To study and prepare the standard operating procedure required while taking electrical shutdown.
15. To carryout general preventive maintenance of electrical machines, panels, experimental kits of different Electrical labs of your Institute and prepare its maintenance report.

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Apparatus Required:

1. CT, PT
2. Energy meters
3. Ammeter, Voltmeter
4. Induction Motor
5. Megger
6. Cable Tester
7. Fire extinguisher

Reference Books:

1. A course in electrical and electronic measurement and instrumentation, A.K. Sawhney.
2. Testing, commissioning, operation and maintenance of Electrical Equipments, S. Rao, 6th Edn. Khanna Publishers.
3. Installation maintenance and testing of Electrical Equipments, S. Tarlok, S. K. Kataria & Sons.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.Tech. (VIII Sem)**
Subject: **Simulation with MATLAB**
Total Periods: **36**
Total Marks in End Semester Exam: **40**

Branch: **Electrical Engineering**
Course Code: **D024822(024)**
TA: **20**

CO Number	CO Statement	Knowledge Level
CO1	Students will be able to design and simulate various types of controllers	4
CO2	Students will be able to analyze the effect of pole/zero addition to any system	4
CO3	Students will be able to design and simulate various types rectifiers/filters/choppers etc.	4
CO4	Students will be able to write programs in MATLAB and analyze for calculation of Transmission Line Parameters	4
CO5	Students will be able to write programs in MATLAB and analyze for various Load Flow Study Techniques	4

List of Experiments:(Tobeperformedminimum10experiments)

1. Simulation of different types of controllers (PID, PLL, PI)
2. Simulation for the addition of poles and zeros in a given transfer function.
3. Simulation of different types of filters.
4. Simulation of the performance of a full wave bridge rectifier for RL load and RLE load.
5. Simulation of step up and step down choppers.
6. Simulation of Chopper controlled DC motor.
7. Simulation and modeling of synchronous machine. (X_d,X_d' etc calculation)
8. Write a MATLAB program for Computation of Real, Reactive power and line loss.
9. Write a MATLAB program to Plot V and inverted V curve.
10. Write a MATLAB program for Transformer parameter calculation.
11. Write a MATLAB program for Transmission line parameter calculation (Z,Y,A,B,C,D).
12. Write a MATLAB program for Load flow solution by GaussSeidal method.
13. Write a MATLAB program for Load flow solution Load flow solution by Newton Raphson Method.
14. Write a MATLAB program for Economic load dispatch calculation.
15. Write a MATLAB program for load frequency control.

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Requirements for the Simulation Lab:
MATLAB6.1/MATLAB6.5 any higher MATLAB version.

Reference books:

1. Power system analysis, HaddiSadat.
2. Introduction to MATLAB, Palm.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology Branch:All Branches | **Semester: III**
Subject: Mathematics – III | **Code: B000311(014)**
Total Theory Periods: 03 | **Total Tutorial Periods: 01**
Class Tests: Two (Minimum) | **Assignments: Two (Minimum)**
ESE Duration: Three Hours | **Maximum Marks: 100** | **Minimum Marks: 35**

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

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Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering**
Subject: **Mechanical Measurement and Metrology**
Total Theory Periods: **02**
Class Tests: **Two (Minimum)**
Assignments: **Two (Minimum)**

Semester: **III**
Code: B037312(037)
Total Tutorial Periods: 01
Maximum Marks: 100
Minimum Marks:35
ESE Duration: **Three Hours**

Course Objectives:

1. To provide an understanding of measurement system and its functional elements.
2. To impart knowledge of measurement of pressure and measurement of strain.
3. To impart knowledge of flow measurement, vibration measurement and data acquisition system.
4. To study about linear and angular measurement devices, measurement of geometrical forms, optical projectors, tool maker microscope and autocollimators.
5. To study about interferometer, comparators, screw thread and gear measurement and coordinate measuring machine.

UNIT I: Generalized Measurement System: Introduction - Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, static and dynamic performance characteristics of measurement devices, Calibration, Error- concept and sources, statistical analysis of errors, Sensors and Transducers– Types of sensors, type of transducers and theircharacteristics.

UNIT II: Measurement of pressure: Pressure standard, Bourdon tubes, Diaphragm and bellows, Measurement of very low pressure- Mcleod gauge and Pirani gauge.
Measurement of Strain: Type of strain gauges and their working, temperature compensation. Strain rosettes. Measurement of temperature by thermometers, bimetallic, thermocouples, thermistors and pyrometers-total radiation and optical pyrometry.

UNIT III: Measurement of flow: Variable head meters, hot wire and magnetic meters, ultrasonic flow meters. **Vibration measurement:** Seismic instruments, vibration pickups. **Data acquisition system:** Introduction to data acquisition systems, single and multi- channel systems, Input – output devices signal transmission and Processing.

UNIT IV: Metrology: Standards of measurement; Limits, Fits and Tolerances; Linear and angular measurement devices and systems limit gauges, gauge blocks. Measurement of geometric forms like straightness, flatness, roundness and circularity, surface texture measurement, principles and application of optical projectors, tool makers microscope, autocollimators etc.

UNIT V: Metrology: Principle and use of interferometry, Comparators, Screw Threads Measurement, Measurement of Gears tooth. Coordinate measuring machine (CMM): need, construction, types and application.

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Tutorial from above units covering practical applications.

Text Books:

1. Mechanical Measurements – G. Beckwith Thomas G. – Pearson Education.
2. Mechanical Measurements and Control – D.S. Kumar – S.K. Kataria & Sons.

Reference Books:

1. Metrology and quality control- A.M. Badadhe -Technical Publication.
2. Measurement Systems, Application Design – E.O. Deoblein - McGraw Hill.
3. Engineering Metrology – K.J. Hume - MacDonald and Company.
4. Engineering Metrology – I.C. Gupta - Dhanpat Rai & Sons.
5. Mechanical & Industrial Measurements – R.K. Jain – Khanna Publishers.

Course Outcomes

On successful completion of the course, the student will be able to:

1. Describe the functional elements of measurement system and its performance characteristics.
2. Describe measurement of pressure, strain and temperature.
3. Describe flow measurement, vibration measurement and data acquisition system.
4. Describe linear and angular measurement devices, measurement of geometrical forms, optical projectors, tool maker microscope and autocollimators.
5. Describe interferometer, comparators, screw thread and gear measurement and coordinate measuring machine.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering**
Subject: **Engineering Mechanics**
Total Theory Periods: **02**
Class Tests: **Two (Minimum)**
Assignments: **Two (Minimum)**

Semester: **III**
Code: B037313(037)
Total Tutorial Periods: 01
Maximum Marks: 100
Minimum Marks:35
ESE Duration: **Three Hours**

Course Objectives:

1. To provide an understanding of basic concepts and laws of engineering mechanics
2. To impart concepts related to friction and virtual work for solving applied problems.
3. To provide an understanding of centroid, area moment of inertia, product of inertia, centre of gravity and mass moment of inertia.
4. To impart concepts related to kinematics of a particle and rigid body.
5. To impart concepts related kinetics of rigid bodies.

UNIT–I:

Introduction to Engineering Mechanics- Rigid body, Force and force systems, Principles of mechanics, composition and resolution of forces, Resultant, types of supports and support reactions, free body diagrams, equilibrium of concurrent forces in a plane, Moment of Force and its Application- Varignon's Theorem, Parallel forces in a plane, General cases of forces in a plane. Forces in space-Resultant of system of force in space, equilibrium of spatial system of forces.

UNIT–II:

Friction-Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Angle of friction, Angle of Repose, Motion of Bodies, wedge friction, ladder friction, rolling friction.

Belt and rope friction- length of belt in open and closed belt drives, ratio of tensions, initial tension in belt, power transmitted, condition for maximum power, stress in belt material, V-belt. Screw jack & differential screw jack

Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium, Applications of energy method for equilibrium.

UNIT–III:

Centroid- Centroid of simple figures from first principle, centroid of composite sections.

Area moment of inertia- Definition, Area moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections;

Product of inertia: Definition, Product of inertia of plane sections from first principles Displacement of axes, Rotation of axes, Principle axes, Principal moment of inertia.

Centre of Gravity & Mass moment inertia - Plate, Cylinder, Cone, Sphere and Composite bodies

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UNIT–IV: Kinematics

Rectilinear motion of Particle: Displacement, velocity and acceleration

Curvilinear motion of Particle: Rectangular components of velocity, Rectangular components of acceleration, component of motion: Radial and transverse components

Kinematics of rigid body: Translation, Rotation, Linear and angular velocity, Linear and angular acceleration in rotation General plane motion: absolute and relative velocity in plane motion, instantaneous centre of rotation in plane motion

UNIT-V: Kinetics

D'Alembert's principle and its applications in plane motion of connected bodies; **Work-energy principle** and its application in plane motion of connected bodies;
Principle of impulse and momentum and its application in plane motion of connected bodies;
Impact of Elastic bodies Coefficient of restitution, direct central impact, oblique impact.

Tutorial from above units covering practical applications.

Text Books:

1. Engineering Mechanics – A. K. Tayal - Umesh Publications.
2. Engineering Mechanics- S. Timoshenko and D.H. Young- TMH.
3. Vector Mechanics for Engineers - F. P. Beer and E. R. Johnston - Tata McGraw Hill.

Reference books:

1. Engineering Mechanics: Principles of Statics and Dynamics - R.C. Hibbeler - Pearson Press.
2. Engineering Mechanics -Irving H. Shames- PrenticeHall.
3. Introduction to Statics and Dynamics - Andy Ruina and Rudra Pratap - Oxford Univ Press.
4. Engineering Mechanics - Shanes and Rao - Pearson Education.
5. Engineering Mechanics (Statics, Dynamics) - Hibler and Gupta - Pearson Education.
6. Singer's Engineering Mechanics - Reddy Vijaykumar K. and K. Suresh Kumar.
7. A Text Book of Engineering Mechanics – R. K. Bansal - Laxmi Publications.
8. Engineering Mechanics – R. S. Khurmi - S. Chand.

Course Outcomes

On successful completion of the course, the student will be able to:

1. Apply basic concepts and laws of mechanics to determine resultant and analyze the systems of forces.
2. Analyze static system by applying law of friction/ principle of virtual work.
3. Determine the centroid, second moment of area and product of inertia of simple and composite plane figures and centre of gravity and mass moment of inertia of simple and composite bodies.
4. Analyze problem related to kinematics of a particle and rigid bodies.
5. Analyze problem related to kinetics of rigid bodies.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **III**
Branch: **Mechanical Engineering**	Code: B037314(037)
Subject: **Engineering Thermodynamics**	Assignments: **Two (Minimum)**
Total Theory Periods: **02**	**Maximum Marks: 100**
Total Tutorial Periods: **01**	**Minimum Marks:35**
Class Tests: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

1. To introduce students to basic concepts and first laws of thermodynamics.
2. To impart knowledge of concepts of second law of thermodynamics and entropy.
3. To introduce students to exergy and related concepts.
4. To study about properties of real gases and mixture of ideal non-reactive gases.
5. To provide an understanding of properties of pure substances

UNIT I: (a) Introduction to Engineering Thermodynamics-Macroscopic vs microscopic view point, Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, concept of continuum. Exact & Inexact differentials. Work- electrical, magnetic, gravitational, spring and shaft work, Displacement work, flow work , free expansion, work done in various quasistatic process, work as a path function. Heat transfer-sensible heat, latent heat, heat as a path function.
(b) **First Law of thermodynamics**-Joule's experiment, internal energy as property of system, first law applied to various quasistatic process, PMMI , Limitations of the First Law, control volume, Steady flow energy equation, Applications of SFEE.

UNIT II: (a) Second law of thermodynamics: Thermal Reservoir, Heat Engine, cyclic Heat engine, Kelvin-Planck statement and Clausius Statements and their Equivalence, Refrigerator and Heat pump, COP, PMMII, ,reversibility and irreversibility, causes of irreversibility, Carnot cycle, reversed heat engine, Carnot theorem, corollaries of Carnot theorem, Absolute thermodynamic temperature scale.
(b) Entropy: Clausius theorem, the property of entropy, the inequality of Clausius,
Entropy
principle and its applications, Entropy change during different thermodynamic processes, entropygeneration in closed system and open system, first and second law combined.

UNIT III: Exergy: Available energy, availability and availability function of a closed system, availability and availability function of an open system , dead state, Helmholtz function , Gibbs functions, Irreversibility and Gouy-Stodola Theorem, Second law efficiency.

UNIT IV: (a) Properties of gases: Equation of state of a gas, Ideal gas, gas compression, deviation of Real gas from ideal gas, Vander Waal's equation of state, correction for the intermolecular attractions, correction for finite size of molecules, evaluation of constants a and b, virial expansions, limitations of the van der Wall's equation, Reduced coordinates, compressibility factor, the law of corresponding States.
(b) Properties of mixture of gases: Mass Fraction, Mole fraction, Dalton's Law of partial pressure, Amagat-Leduc's law of additive Volumes, Properties of mixture of ideal non- reactive gases –gas constant, molecular weight, specific heat, internal energy, enthalpy and entropy.

UNIT V: Properties of Pure substances: Thermodynamic properties of pure substances in solid, liquid and vapor phases, Phase Transformations, dryness fraction, Triple point, critical state, p-v, p-T, T-s, h-s diagrams, p-v-T surfaces, Properties and Processes in ideal vapor, use of steam tables and Mollier diagram in determination of steam properties, energy interaction and Entropy calculations, measurement of steam quality.

Tutorial from above units covering practical applications.

Text Books:

1. Thermodynamics- An Engineering Approach – Cengal & Boles – McGraw Hill.
2. Engineering Thermodynamics – P.K. Nag – TMH.

Reference Books:

1. Fundamental of engineering thermodynamics- R. Yadav-CPH.
2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria .
3. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag- Wiley.
4. An Introduction to Thermodynamics-Y.V.C. Rao- University Press.
5. Engineering Thermodynamics-M. Achuthan- PHI.
6. Thermodynamics & Thermal Engineering – J. Selwin Rajadurai – New Age.
7. Thermodynamics – C.P. Arora – TMH.
8. Thermodynamics – S.C. Gupta – Pearson.

Course Outcomes

On successful completion of the course, the student will be able to:

1. Apply basic concepts and first laws of thermodynamics to analyze thermodynamics system.
2. Apply the concepts of second law of thermodynamics and entropy to analyze thermodynamics system.
3. Apply the concepts of exergy to solve related problems.
4. Explain the equations of state and thermodynamic properties of real gases and calculate properties of mixture of ideal non- reactive gases.
5. Analyze processes involving pure substances.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering**
Subject: **Material Science**
Total Theory Periods: **02**
Class Tests: **Two (Minimum)**
ESE Duration: **Three Hours**

Semester: **III**
Code: B037315(037)
Total Tutorial Periods: 01
Assignments: Two
Maximum Marks: 100

Course Objectives:
1. To impart an understanding of crystal structure and crystal Imperfection.
2. To impart knowledge of mechanical properties of materials & theories of deformation.
3. To impart an understanding of theories of solidification & phase equilibrium.
4. To impart knowledge of heat treatment and surface treatment.
5. To study about various engineering materials.

UNIT I:
Structure of Materials: Crystalline and noncrystalline solid, Concept of unit cell and space lattice, Crystal structure of metal, Miller indices.
Crystal Imperfection: Point defects – Interstitial defect, Frankel defect and Schottky defect; Line defects- Edge dislocations, Screw dislocation; Surface defects- Grain boundary, Tilt boundary, Twin boundary and Volume defects- Stacking fault.

UNIT II:
Mechanical Properties of Materials: Stress-strain diagrams for engineering materials, Young's modulus, Yield strength, Tensile strength, Elasticity, Plasticity, Ductility, Malleability, Brittleness, Toughness, Stiffness, Hardness, Hardenability, Fatigue and Creep.
Deformation of Metals: Elastic deformation: Elastic after effect, Plastic deformation: deformation by slip (shear deformation)-Critical resolved shear stress, Deformation by twinning, Differences between slip and twinning. Dislocation theory - edge dislocation, screw dislocation. Strain hardening, Seasons cracking, Bauschinger effect, Yield point phenomena and related effects, Cold and hot working processes, Effect of cold work, recovery, recrystallization, grain growth on properties of crystalline materials.

UNIT III:
Solidification of Metals and Alloys: Mechanism of solidification, Nucleus formation and crystal growth, Homogeneous and heterogeneous nucleation, Metal ingot structure- Dendritic and columnar grains, Grain boundaries, Grain growth, solidification process, Effect of grain size on properties of metals.
Phase and Phase Equilibrium Diagram: Phase & types of phase, Hume-Rothery's rule, Cooling curve of pure metals and alloys, Gibb's phase rule, Types of phase equilibrium diagrams: Isomorphous- Lever rule, Monotectic, Eutectic-Hyper, Hypoeutectic, Eutectoid -Hyper, Hypoeutectoid, Peritectic and Peritectoid system. Allotropy of Iron, Iron-Iron carbide phase diagram.

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UNIT IV:

Heat Treatment: Introduction, Purpose and advantages of heat treatment, T-T-T curve and Micro constituents in steel, Heat treatment processes: Annealing-Stress relief, Spheroidising, Process and full annealing, Normalising, Hardening, Tempering, Austempering, Martempering. **Surface Hardening**-Flame, Induction and Case hardening: Carbuising- Pack and Gas carburizing, Nitriding, Cyaniding, Carbo-nitriding, Vacuum and Plasma hardening.

UNIT V:

Engineering Materials: Classifications of engineering materials, Composition, Properties and application of the following engineering materials:-**Ferrous: Cast Iron**- Grey cast iron, White cast iron, Malleable cast iron, and Spheroidal cast irons. **Steel**- Unalloyed or plain carbon steels-Low, Medium, High carbon steels **Alloy steel**- Stainless steel, Tool steel, Maraging steels, Spring steel. **Non-ferrous:** Copper alloys: Brasses – Muntz metal, Cartridge brass, Naval brass, Admiralty brass, Bronzes – Gun metal, Phospher bronze, Aluminium bronze, Copper-nickels alloys. Aluminium alloys : Duralumin, Cast aluminium alloys, Aluminium silicon alloys. Sintered carbide. Al-Cu-Mg alloy, Nickel base superalloy, Titanium alloy. **Composite materials.**

Tutorial from above units covering practical applications. Text

Books:

1. Material Science & Engineering A First Course- V. Raghavan- PHI.
2. Material Science- O.P. Khanna- Dhanpat Rai.

Reference Books:

1. Elements of Material Science & Engg. – Van Vlack- Pearson.
2. Physical Metallurgy – Clark & Varney- CBS Publishers & Distributors
3. Engineering Physical Metallurgy – Lakhtin- CBS Publishers & Distributors
4. Physical Metallurgy Principles – Robert E Reed Hill- Cengage Learning
5. Materials Science – Narang- CBS Publishers & Distributors
6. Engineering Materials – WoulfSeries.

Course Outcomes

On successful completion of the course, the student will be able to:

1. Explain crystal structure and Imperfection in crystal structure.
2. Define basic mechanical properties of materials & explain the theories of deformation.
3. Explain solidification phenomenon of pure metal, alloys and interpret phase diagrams.
4. Explain how microstructure and mechanical properties of carbon and alloy steels are controlled by various heat treatment/surface treatment processes.
5. Compare characteristics of various ferrous, nonferrous and composite materials.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering**
Computer Aided Machine Drawing Lab
Total Lab Periods: **48**
Maximum Marks: 40

Semester: **III** Subject:
Code: B037321(037)
Batch Size - **30**
Minimum Marks: 20

Course Objectives:

1. To impart an understanding of "Code of practice for general engineering drawings".
2. To impart an understanding of Limit, Fits, Tolerance and representation of dimensional and geometrical tolerance.
3. To impart practical experience in handling drafting software systems.
4. To prepare orthographic views and orthographic sectional view of machine components using standard CAD packages.
5. To prepare assembly drawings with its bill of material using standard CAD packages.

List of Exercises: (At least ten exercises including first five compulsorily)

1. Code of practice for general engineering drawings (BIS) – Conventional representation of lines, Letter, standard machine components, surface roughness, direction of lay of machining and welded joints.
2. Limits, Fits, Tolerances and representation of dimensional and geometrical tolerance in engineering drawing.
3. Conversion of pictorial view of solids to its orthographic views.
4. Sectional view: type of sectional views-full section, half section, partial or broken section and sectioning conventions-spokes, web, rib, shaft, pipes, different types of holes, hatching or section lines, conventions of sections of different metals and materials.
5. Conversion of pictorial view of solids to orthographic sectional view.
6. Assembly drawing of Screwed Fasteners.
7. Assembly drawing of Riveted Joint.
8. Assembly drawing of Cotter joint- Sleeve & Cotter Joint, Spigot and Cotter joint.
9. Assembly drawing of Pin Joint or Knuckle joint.
10. Assembly drawing of Bearing-Bushed bearing, Plummer block.
11. Assembly drawing of Coupling-Flange coupling, Flexible coupling.
12. Assembly drawing of Pulley-Fast and loose pulley.
13. Assembly drawing of Valves-Steam stop valve, Blow-off cock, Lever safety valve.

Note: Students are required to submit a mini project on assembly drawing of one important mechanical engineering assembly with its part drawing and bill of materials at the time of final assessment.

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Software/ System/ Books Required:

1. Intel® Core 2 Duo or greater, 3.0 GHz or greater. Microsoft® 64-bit Windows® 7 or greater. RAM: 2 GB or greater recommended, Free Disk Space: 250 GB or greater recommended.
2. Software Required – DraftingSoftware.
3. N. D. Bhatt and V.M. Panchal, "Machine Drawing", Charotar Publishers
4. Gopalakrishna K.R., "Machine Drawing", Subhas Stores Books Corner, Bangalore
5. Junnarkar, N.D., "Machine Drawing", Pearson Education.

Course Outcome:

On successful completion of the course, the student will be able to:

1. Demonstrate an understanding of Indian standards on drawing practices, conventional symbol of surface roughness, lay of machining, welded joints and standard components.
2. Demonstrate an understanding of Limit, Fits, Tolerances and representation of dimensional and geometrical tolerance in mechanical engineering drawing.
3. Convert pictorial view of machine components into orthographic views and orthographic sectional view with sectioning conventions
4. Draw assembled orthographic views of screwed fasteners and riveted joints.
5. Draw assembly drawing from disassembled views of important mechanical engineering assembly e.g. cotter joint, pin joint, bearing, coupling, pulley and valves.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering**
Mechanical Measurement and Metrology Lab
Total Lab Periods: **24**
Maximum Marks: 40

Semester: **III** Subject:
Code: B037322(037)
Batch Size - **30**
Minimum Marks: 20

Course Objectives

1. To expose students to real world measurement equipment.
2. To learn operation of various measurement equipment.
3. To expose students to real world metrology equipment.
4. To learn operation of various measurement equipment.
5. To provide students with the necessary skills for calibration and testing of different gauges and instruments.

List of Experiments: (At least Ten experiments are to be performed by each student)

(Minimum Seven experiments to be performed from the following group)

1. Measurement of Pressure Using Bourdon Pressure Gauge.
2. Calibration of Pressure Gauge Using Dead Weight Pressure Gauge Tester.
3. Measurement of Displacement Using LVDT.
4. Measurement of Temperature Using Thermister.
5. Measurement of Flow Rate Using Rotameter.
6. Measurement of Angle Using Angular Sensor.
7. Measurement of Torque Using Torque Transducer.
8. Measurement of Pressure Using Pressure Transducer.
9. Measurement of Strain Using Strain Cantilever Beam.
10. Measurement of Temperature Using RTD.
11. Measurement of Temperature Using Thermo Couple.
12. Measurement of Temperature by Themocouple.
13. Experimentation using Data Acquisition System.

(Minimum Three experiments to be performed from the following group)

1. Measurement of length, height, diameter by Vernier Calipers, Vernier Height Gauge, Micrometers.
2. Measurement of various angles using Bevel Protractor, Sine Bar & Combination Set.
3. Determination of the accuracy of Electrical and Optical Comparator.
4. Determination of the Surface Flatness and Contour using Interferometer.
5. Determination of the Effective Diameter of screw threads by using Two wire & Three wire methods.
6. Measurement of Gear Elements using Profile Projector and image analyzer.
7. Measurement of Tool Angles of a Single Point Cutting Tool by using Tool Makers Microscope.
8. Calibration of Vernier Calipers, Micrometer, Height Gauge, Depth Micrometer using Slip Gauges.

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Note: Students are required to submit a mini project at the time of final assessment. List of

Equipment and Machine Required

Measurement	Metrology
1. Data Acquisition System 2. Software compatible with DAS 3. Displacement Measurement Tutor Using (LVDT) 4. Pressure Measurement Tutor Using Pressure Transducer 5. Strain Measurement Tutor Using Strain Cantilever Beam 6. Torque Measurement Tutor Using Torque Transducer 7. Temperature Measurement Tutor Using RTD Sensor 8. Temperature Measurement Tutor Using Thermistor 9. Temperature Measurement Tutor Using Thermistor 10. Angular Measurement Tutor Using Angular Sensor 11. Rotameter Trainer Module 12. Dead Weight Pressure Gauge Tester 13. Bourdon Gauge Trainer 14. Image Analyzer	1. Vernier Calipers 2. Vernier Height Gauge 3. Depth Micrometers 4. Set of Slip Gauges 5. Interferometer 6. Tool Makers Microscope 7. Profile Projector 8. Bevel Protector 9. Sine Bar 10. Combination Set 11. Optical & Electrical Comparator 12. Optical Flats 13. Surface Plates 14. Dial Indicators 15. Snap and Ring Gauges (Go and No-Go Type)

Course Outcomes

On successful completion of the course, the student will be able to:

1. Identify different mechanical measurement and metrological instruments.
2. Describe the working of different mechanical measurement and metrological instruments.
3. Conduct experiments, observe, interpret data and report results of pressure, displacement, temperature, flow rate, angle, torque and strain measurement instruments.
4. Conduct experiments, observe, interpret data and report results of heights, lengths, diameter, various angles, accuracies in electrical and optical comparator, surface flatness and contour etc using various types of metrological instruments.
5. Calibrate vernier calipers, micrometer, height gauge, depth micrometer using slip gauge.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering** Semester: **III**
Subject: **Engineering Thermodynamics Lab** **Code: B037323(037)**
Total Lab Periods: **24** Batch Size - **30**
Maximum Marks: 40 **Minimum Marks: 20**

Course Objective:

1. To physically engage students to real world thermal equipments through active experimentation to develop deeper understanding of theoretical concepts.
2. To impart an understanding of boiler classification, boiler mountings, accessories, boiler performance parameters and draught.
3. To study about of steam engine, steam turbines.
4. To study about surface and jet condenser.
5. To study about reciprocating air compressor.

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To study the rise in temperature of liquid due to external work.
2. Effect of reduction in temperature in a steam pressure vessel.
3. To study the expansion process using throttling devices.
4. To study the effect of mixing of two/three fluid streams having different flow rates and temperatures.
5. To study the different thermodynamic working fluid e.g. air, steam.
6. To study boiler, boiler classification and performance parameters of boiler.
7. To study draught, classification of draught and related parameters.
8. To study the Cochran boiler and its accessories and mountings.
9. To study the Lancashire boiler and its accessories and mountings.
10. To study the Babcock Wilcox boiler and its accessories and mountings.
11. To study a simple steam engine.
12. To study a compound steam engine.
13. Performance and testing of surface steam condenser.
14. Performance and testing of steam jet condenser.
15. Study of steam turbines.
16. Study of reciprocating air compressor.

Note: Students are required to submit a mini project at the time of final assessment.

Equipment/Machines/Instruments/Tools/Software Required:

- Insulated agitated vessel.
- Steam pressure vessel with arrangement for external cooling.
- Compressed air tank with expansion device.

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- Arrangement of mixing of two/three fluid streams.
- Boiler mountings
- Boiler accessories
- Cochran boiler
- Lancashire boiler
- Babcock and Wilcox boiler
- Simple Steam engine
- Compound steam engine
- Steam Turbines
- Surface steam condenser
- Jet steam condenser
- Reciprocating air compressor

Course Outcomes

On successful completion of the course, the student will be able to:

1. Demonstrate an ability to explain basic knowledge of laws of thermodynamics and its verification through experimentation.
2. Describe construction and working of various types of boilers, boiler mountings, accessories, performance parameters and draught.
3. Describe various types of steam engine, steam turbines.
4. Describe surface and jet condenser.
5. Describe reciprocating air compressor.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Mechanical Engineering** Semester: **III**
Subject: **Software Lab** Code: **B037324(037)**
Total Lab Periods: **24** Batch Size - **30**
Maximum Marks: 40 **Minimum Marks: 20**

Course Objective:

1. To impart an understanding of basics of surface and solid modeling concepts.
2. To impart practical experience related to surface/solid modeling with use of advance features of current CAD models.
3. To impart practical experience related to surface modeling by using dedicated surface modeling commands.
4. To prepare assembly from part modeling using standard CAD packages.
5. To impart an understanding of sheet metal modeling.

List of Exercises: (At least ten exercises)

Part A: Surface and solid modeling

1. Introduction to surface modeling, surface representation method and classification of surface entity.
2. Introduction to solid modeling, solid representation and classification of solid entity.
3. Introduction to sketcher module of modeling software and practice drawing.
4. Surface/solid modeling using extrude, sweep features.
5. Surface/solid modeling using revolve features.
6. Editing of surface/solid model using editing tools such as pattern, holes, fillet and chamfer features.
7. Practice engineering drawing use of various surface commands.
8. Create assembly using Bottom-up Assembly Modeling Catalogs & CAD Data Formats.

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Part B: Working with sheet metal module

1. Introduction to sheet metal process in CAD software and its applications in engineering.
2. Sheet metal modeling using different flange, wall and wall on edge features.
3. Design of sheet metal using bend features.
4. Design of sheet metal using extrusion features.
5. Design of sheet metal using cut-out, tear drop features.

Note: Students are required to submit a mini project on assembly modeling of equipment of practical application at the time of final assessment.

Software and System Requirement:

• Software: 3D Modeling Software
The following operating systems are recommended:
• Microsoft Windows 7 or Windows 10 (64-bit)
• Multi-core, 64-bit processor (ex. Intel Dual Core, Intel i3, i5 etc.)
• Dedicated graphics card recommended (not integrated on motherboard such as Intel Integrated graphics)
• 4GB of RAM - 8GB or more is highly recommended
• Minimum 10GB Free Hard Disk space
• Microsoft Office 2013 or newer for report generation

Course Outcome:

On successful completion of the course, the student will be able to:

1. Demonstrate various concepts of surface/solid modeling and sheet metal design.
2. Demonstrate an understanding of different features used in surface/solid modeling and sheet metal in engineering practice.
3. Design a part or assembly of parts using Computer-Aided Design software.
4. Apply top-down design principles to model a design.
5. Make appropriate selection of CAD functionality to use as tools in the design process and communicate effectively the geometry and intent of design features

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037411(037)
Subject: **Applied Thermodynamics**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
The objective of this course is to develop student's ability to apply principles of thermodynamics to analyze the basic energy conversion systems of power generation, compression, condensation and system with compressible flow.

UNIT- I	**Gas power cycles:** An overview of reciprocating engine, Air standard cycle, Otto cycle, Diesel cycle, Dual cycle-Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures, comparison of cycles. An overview (only p-v and T-s diagram) of Sterling, Ericson, Atkinson, Lenoir cycle.
UNIT-II	**Reciprocating Air Compressors:** Classification of air compressors, working of single acting single cylinder reciprocating compressor, single acting reciprocating compressor without clearance, single acting reciprocating compressor with clearance-equation of work, volumetric efficiency. Multistage reciprocating air compressors, advantage of multistage compression, two stage air compressor-minimum work, Indicator diagram, mean effective pressure and indicated power, compressor power , efficiencies, shaft power of the compressor, advantages and limitations of reciprocating compressors.
UNIT- III	**Vapor Power Cycle:** Simple steam power cycle, Rankine cycle; p-v, T-s and h-s diagrams, efficiency, steam rate, heat rate, comparison of Rankine and Carnot cycles, mean temperature of heat addition, reheat cycle, ideal regenerative cycle, practical regenerative cycle, Feed Water Heaters (FWH)- open and closed FWH, characteristics of ideal working fluids, binary vapor cycle.
UNIT- IV	**Steam Condensers:** The function of condenser, Element of a water cooled condensing unit, types of condenser, advantages and disadvantages of various types of condenser, condenser vacuum, mass of circulating water required, source of air its effects and removal, vacuum efficiency, condenser efficiency **Cooling ponds and cooling tower:** Cooling pond, cooling towers, classification and working principles.
UNIT-V	**Thermodynamics of Compressible Fluids:** Velocity of pressure waves in a fluid, Mach number, isentropic stagnation state, stagnation enthalpy, temperature, pressure, density, one dimensional steady isentropic flow, area velocity relationship, critical properties-choking in isentropic flow, dimensionless velocity, Effect of back pressure on the performance of nozzle flow. Flow of steam through nozzle, throat area for maximum discharge, supersaturated Flow in nozzle.

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Text Books:	
1.	Thermodynamics- An Engineering Approach – Cen gal & Boles – McGraw Hill, Delhi
2.	Engineering Thermodynamics – P.K. Nag – TMH Publishers

Reference Books:	
1.	Fundamental of engineering thermodynamics- R.Yadav, CPH, Allahabad
2.	Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons
3.	Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag, Wiley, Delhi
4.	An Introduction to Thermodynamics-Y.V.C.Rao, UniversityPress, Hyderabad
5.	Thermodynamics & Thermal Engineering – J. Selwin Rajadurai – New Age International Publishers
6.	Thermodynamics – C.P. Arora – TMH, Delhi
7.	Thermodynamics – S.C. Gupta – Pearson Education, Delhi

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze and evaluate gas power cycles.
2.	Analyze reciprocating air compressors.
3.	Analyze vapour power cycle.
4.	Analyze steam condenser and discuss working principle of cooling pond and cooling towers.
5.	Analyze thermodynamic system with compressible fluid.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037412(037)
Subject: **Fluid Mechanics**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
The objective of the course is to develop an understanding of the behavior of fluids at rest or in motion and the subsequent effects of the fluids on the boundaries as the mechanical engineers has to deal with fluids in various applications. This enables students to apply the analytical tools to solve different types of problems related to fluid & fluid flow.

UNIT- I	**Properties of fluid:** Fluid, ideal and real fluid, properties of fluid : mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus. Newtonian and non-Newtonian fluids **Fluid Statics:** Pressure, Pascal's law, Hydrostatic law, Manometry, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation.
UNIT-II	**Fluid Kinematics:** Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, streak line, stream line, stream tube. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, circulation, stream and potential function, flow net ,its characteristics and utilities. Liquid in relative equilibrium.
UNIT- III	**Fluid Dynamics:** Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle, Pitot tube.Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and Momentum correction factor, Vortex motion, Radial flow.
UNIT- IV	**Laminar Flow:** Reynold's experiment, flow of viscous fluids in circular pipe, shear stress and pressure gradient relationship, Velocity distribution, Hagen-Poiseuille Equation, flow of viscous fluids between two parallel plates (Coutte flow) shear stress and pressure Gradient relationship, Velocity distribution, Drop of pressure head. **Turbulent flow:** Effect of turbulence, Expression for loss of head due to friction in pipes (Darcy-Weisbach equation), Expression for co-efficient of friction in terms of shear stress. **Flow through pipe:** Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe power transmission through pipe, water hammer in pipes.
UNIT-V	**Dimensional Analysis:** Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, Limitations. **Model analysis:** Dimensionless number and their significance, model laws, Reynolod's model law, Fraude's model law, Euler's model law, Weber's model law, Mach's model law, Type of models, scale effect in model, limitation of hydraulic similitude.

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Text Books:	
1.	Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria & Sons – New Delhi
2.	A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi

Reference Books:	
1.	Fluid Mechanics & Hydraulics Machines-R.K.Bansal-Laxmi Publications.,Delhi
2.	Engineering Fluid Mechanics –K.L. Kumar, Eurasia Publication House, Delhi
3.	Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
4.	Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH,Delhi
5.	Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas- TMH ,Delhi
6.	Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi,& SM Seth-Standard, Delhi
7.	Theory and Application of Fluid Mechanics- K.Subramanya-TMH Delhi

Course Outcomes	
1.	Explain fluid properties and basic principles of fluid statics and analyze the problem related to manometry, forces on submerge plane, buoyancy and flotation.
2.	Explain basic principles of fluid kinematics and analyze related practical problem.
3.	Explain basic principles of fluid dynamics and analyze related practical problem.
4.	Derive relationships for various flow characteristics of laminar flow, turbulent flow and energy losses in pipe flow and apply to analyze related practical problems.
5.	Apply dimensional analysis to derive a relationship among connected variables and apply model laws to predict the behavior of the prototype in given circumstances.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037413(037)
Subject: **Strength of Materials**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
This course is designed to understand the basic concepts of stress, strain and their variations under different types of loading. It includes analysis of beam, shaft and spring for bending moment, shear force, shear stress, slope and deflection under different loading and support conditions.

UNIT- I	**(a) Simple stress & strain**: elasticity, Hooke's law, factor of safety, stress-strain diagram for ductile and brittle materials, Analysis-bar of varying sections, tapered bar, composite sections, bar of uniform strength, elongation of bar due to self-weight. Thermal stresses-composite bars. **(b) Elastic constants**: Longitudinal strain, lateral strain, Poisson's ratio, volumetric strain, bulk modulus, relation between Young's modulus and bulk modulus, complementary shear stress, relation between modulus of elasticity and modulus of rigidity, stresses in the components subjected to multi-axial forces.
UNIT-II	**(a) S.F. and B.M. diagrams of beams**: Types of load, types of beams, SF and BM diagram for cantilever, simply supported and overhanging beams, Point of contra-flexure, relation between load, SF and BM. **(b) Bending stresses in beams:** Pure bending, neutral axis, moment of resistance, bending stresses in symmetric sections, section modulus, bending equation, bending stress distribution, problems. **(c) Shear stress in beams:** shear stress at a section, shear stress distribution for rectangular, circular, I and T sections.
UNIT- III	**Deflection of transversally loaded beams:** Relation between slope, deflection and radius of curvature, determination of slope and deflection by Double integration method, Macaulay's method, Moment Area Method in simply supported, cantilever and overhanging beams.
UNIT- IV	**(a) Torsion of shafts:** Shear stress in circular shaft due to torsion, torque and power transmitted by solid, hollow & stepped circular shaft, polar modulus, strength of shafts and torsional rigidity, composite shaft, shafts in series, shafts in parallel, deflection of shafts fixed at both ends, combined bending and torsion. **(b) Springs:** Types of spring, Closed Coil Helical Springs subjected to Axial Load, springs in series & parallel.
UNIT-V	**(A) Principal stresses and strain:** Transformation of plane stresses, Principal stresses, Maximum shear stresses, Mohr's circle for plane stresses, Plain strain and its Mohr's circle representation, Principal strains, Maximum shear strain. **(B) Combined Loading:** Components subjected to bending, torsion & axial loads.

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Text Books:	
1.	Elements of Strength of Material – Timoshenko & Young- EWP press
2.	Strength of Materials – Dr. Sadhu Singh – Khanna publication
3.	Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications

Reference Books:	
1.	Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons
2.	Mechanics of Material-Gere and Timoshenko CBS Publications
3.	Strength of Materials- R. Subramanian, Oxford University Press
4.	Strength of material – Ryder–ELBS
5.	Introduction to Solid Mechanics – I.H.Shames–PHI
6.	Engineering Mechanics of Solids – E.P. Popov – PHI

Course Outcomes:	
1.	Apply the concept of stress and strain to analyze various types of structures.
2.	Determine the distribution of shear force, bending moment and transverse shear stress along the loaded beam.
3.	Determine the deflections and slope of loaded flexural members. .
4.	Analyze shaft and springs under torsional load.
5.	Analyze various structural elements subjected to combined stresses/combined loads.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037414(037)
Subject: **Manufacturing Process**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
This course is designed to provide students with an overview of a wide variety of manufacturing processes for processing of engineering materials. Student will learn principles, operations and capabilities of various moulding, metal casting, metal joining and metal cutting processes.

UNIT- I	**Introduction to Manufacturing Processes:** Importance of Manufacturing Processes, classification, technological definitions. **Metal Casting (Foundry): Introduction:** Basic Principle, Advantages and Limitations, Applications. **Pattern Making**: Pattern materials, allowances, types of pattern, color code scheme **Mould Making**: Green and dry sand casting process, types of sand, molding sand and its properties, molding sand composition and applications. **Elements of mould**: Cores; Use, core material, types of cores, advantages and limitations, core prints, chaplets, Gating and Risering System, Sand casting defects: appearance, causes & remedies. **Special Molding Processes**: Carbon dioxide molding process, investment casting process, Die casting process, shell molding process, continuous casting process, centrifugal casting processes.
UNIT-II	**Welding – I: Introduction:** Principle, classification based on application of filler material & without filler material, source of energy, fusing and pressure welding processes, application of welding processes. **Arc welding**: Principle, power source and equipments, welding electrodes- types' composition & specification, Metal Arc welding (MAW), flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes. (AHW). **Gas Welding**: Principle, Oxy-Acetylene welding, Reaction in Gas welding, Flame characteristics, Gas torch construction & working, forward and backward welding.
UNIT- III	**Welding – II: Resistance Welding:** General, principle of heat generation in resistance welding, application of resistance welding processes. Process details and working principle of spot, seam and projection welding, electrode materials, shapes of electrodes, electrode cooling, selection of welding currents, voltages. **Special type of welding**: Friction welding, Explosive welding, Thermit welding, Laser welding, Electron beam welding, Electroslag welding, Ultrasonic welding; principle, equipments, operations. **Soldering, Brazing & Braze welding, Welding Defects**
UNIT- IV	**Machine Tools: Lathe:** Principle of operation, basic parts of a lathe, types – speed lathe, engine, bench, tool room, capstan, turret, automatic, specification, construction, operations-facing, turning, knurling, taper turning, thread cutting, drilling, boring, reaming, work holding devices & tools, mechanism and attachments for various operations. **Shaper**: Principle of operation, parts, types horizontal, vertical, universal, Operations – horizontal cutting, vertical cutting, angular cutting, irregular cutting, specification, Quick return Mechanisms. Table feed mechanism, work holding devices. **Planner:** Principle of operation, parts, types – double housing, open side, pit type, plate type, divided table. Specification, types of drives.
UNIT-V	**Milling:** Principle of operation, parts, specification, types- horizontal, vertical, universal, milling operations – plain, face, slotting, gear cutting mechanisms and attachments for milling, indexing-simple, compound and differential. **Broaching:** Principle of operation, parts, types of broaches- horizontal, vertical, pull, surface-internal and external broaching machines, nomenclature, of broach.

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	Drilling: Principle of operation, parts, drill nomenclature, types of drilling machines, other operations like counter boring, counter sinking, spot facing etc. **Reaming**: Principle of operation, parts, description of reamers, and type of reaming operations. **Boring:** Principle of operation, parts, types of boring machines, boring operations, boring tools

Text Books:	
1.	Manufacturing Technology (Vol. – I & II) – P.N. Rao – Tata McGraw Hill Pub. Company, New Delhi.
2.	A Text Book of Production Technology (Manufacturing Processes) – P.C. Sharma – S. Chand and Company Ltd., New Delhi.

Reference Books:	
1.	Manufacturing Science – A. Ghosh & A.K. Mallik – East West Press Pvt. Ltd., New Delhi
2.	Manufacturing Engineering and Technology – S. Kalpakjian & S.R. Schmid – Addision Wesley Longman, New Delhi
3.	Production Technology – R. K. Jain – Khanna Publishers, New Delhi
4.	A Text Book of Production Technology (Vol. I & II) – O.P. Khanna – Dhanpat Rai & Sons, New Delhi.

Course Outcomes:	
1.	Describe various metal casting and allied processes.
2.	Describe various arc and gas welding processes.
3.	Describe resistance welding, other special type of welding , soldering, brazing and braze welding
4.	Describe construction, working and various machining operations of lathe, shaper and planer
5.	Describe construction, working and various machining operations of milling, broaching, drilling rimming and boring machine

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037415(037)
Subject: **Kinematics of Machine**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
Study of kinematics is concerned with understanding of relationships between the geometry and the motions of the parts of a machine. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to give desired motions. This course includes graphical and analytical analysis of position, velocity and acceleration, drawing the profile of cams and its analysis, gear kinematics with gear train calculations, theory of friction, belt drive, brakes & dynamometer.

UNIT- I	**Relative velocity:** Elements, pairs, Mechanism, Four bar chain and its inversion, Velocity diagrams, Relative velocity method, Instantaneous centre method.
UNIT-II	**Relative Acceleration:** Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroillis component of acceleration.
UNIT- III	**Cams:** Classification of cams and followers, Nomenclature of a radial cam, Description of follower movement, Displacement diagrams, Uniform and modified uniform motion, Simple harmonic motion, Uniform acceleration motion and its modifications, Cycloidal motion, Synthesis of cam profile by graphical approach, Considerations of pressure angle. Cams with specified contours: Circular arc cam & tangent cam.
UNIT- IV	**Gear:** Types of gears, Gear terminology, Law of gearing, Gear tooth forms, Involute and Cycloid tooth profile, Interference and Undercutting of Involutes teeth, Minimum number of teeth on pinion to avoid interference. **Gear trains:** Simple, Compound, Reverted, and Epicyclical gear trains, computation of velocity ratio in gear trains by different methods.
UNIT-V	**(a) Friction:** Applications of friction, Pivot and collar friction, Thrust bearing. **(b) Belt-Drives**: Ratio of tensions for flat belt & V-belt, Centrifugal tension, condition for maximum power transmission. **(c) Brakes and dynamometer:** Simple block and shoe brake, Band brake, Band and block brake, and internal expanding shoe brake, Absorption dynamometer, Transmission dynamometer.

Text Books:	
1.	Theory of Machine – S. S. Ratan-Tata McGraw Hill.
2.	The Theory of Machine – Thomas Beven – CBS Publishers.

Reference Books:	
1.	Theory of mechanism and machine – A. Ghosh, A.K. Mallik –EWP Press.
2.	Theory of Machine – Shigley, JE- Oxford University Press
3.	Theory of Machine- Jagdish Lal- Metropolitan Book Co. Pvt. Ltd.
4.	Theory of machine – J.E. Singh – McGraw Hill.

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Course Outcomes:	
1.	Describe the concepts of machines, mechanisms and related terminologies and analyze planar mechanism for displacement and velocity.
2.	Analyze planar mechanism for acceleration.
3.	Analyze cam-follower mechanism.
4.	Analyze gears and gear train.
5.	Analyze bearings, belt-drive, brakes and dynamometer.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Fluid Mechanics Lab**	Code: B037421(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives:
The Fluid mechanics lab runs closely with the lectures in such a way that experiments support the text covered in the class room. The objective of this course is to compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows.

List of Experiments: *(At least Ten experiments are to be performed by each student)*	
1.	To determine the meta-centric height of a ship model.
2.	To verify Bernoulli's Theorem.
3.	To verify Impulse Momentum Principle.
4.	To calibrate a Venturimeter and study the variation of coefficient of discharge.
5.	To calibrate an orifice-meter.
6.	Experimental determination of critical velocity in pipe.
7.	To determine of head loss in various pipe fittings.
8.	Flow measurement using Pitot tube.
9.	To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
10.	To determine the hydraulic coefficients (Cc, Cd and Cv) of an orifice.
11.	To determine the coefficient of discharge of a mouth piece.
12.	To obtain the surface profile and the total head distribution of a forced vortex.
13.	To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
14.	To study the variation of friction factor for pipe flow.
15.	To determine the roughness coefficient of an open channel.

List of Equipment/Instruments/Machines/Software Required:	
•	Apparatus for determination of metacentric height
•	Bernoulli's apparatus
•	Impact of jet apparatus
•	Venturimeter
•	Orifice meter
•	Pipe friction apparatus
•	Orifice apparatus
•	Mouth Piece apparatus with the provision for determination of hydraulic coefficient Cc, Cd & Cv
•	Vortex flow apparatus
•	Apparatus of head loss in various pipe fittings.
•	Reynold's apparatus
•	Complete setup for flow measurement using Pitot tube

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate practical understanding of principles of buoyancy and flotation and determine meta-centric height.
2.	Verify impulse momentum principle
3.	Demonstrate practical understanding of the various terms in Bernoulli's equation and verify Bernoulli's theorem.
4.	Calibrate flow measurement devices
5.	Demonstrate practical understanding of Major and Minor Losses in pipe flow.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Material Testing Lab**	Code: B037422(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives:
This course provides students opportunities to become familiar with standard mechanical testing methods and fundamental properties of engineering materials, and to develop report writing proficiency.

List of Experiments: *(At least Ten experiments are to be performed by each student)*	
1.	To study the Universal Testing Machine.
2.	To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve.
3.	To determine strength of wood on U.T.M (i) Along the Grain (ii) Across the Grain.
4.	To determine shear strength of Mild Steel on U.T.M.
5.	To observe Flexural Behavior of Timber specimen and to determine it's strength under transverse loading on U.T.M.
6.	To study the Impact Testing Machine and test specimen of Izod and Charpy.
7.	To determine Izod and Charpy Value of the given mild steel specimen.
8.	To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material.
9.	To study the Spring Testing Machine.
10.	To determine modulus of rigidity for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring testing machine.
11.	To study the Torsion Testing Machine.
12.	To determine ultimate shear stress and modulus of rigidity under Torsion.
13.	To study the Cupping Test Machine and to determine Erichsen value of Mild Steel sheet.
14.	To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given material.
15.	To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
16.	To study the Vickers Hardness Machine and to conduct a hardness test on the machine.
17.	To study Column testing machine and to conduct Buckling Test of column.

Equipment/Machines/Instruments/Tools/Software Required:	
• Universal Testing Machine	• Cupping Testing Machine
• Impact Testing Machine	• Rockwell Hardness Testing Machine
• Fatigue Testing Machine	• Brinell Hardness Machine
• Spring Testing Machine	• Vickers Hardness Machine
• Torsion Testing Machine	• Column Testing Machine

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze mechanical properties of various engineering materials under a specific types of load in universal testing machine.
2.	Analyze mechanical properties of engineering materials under impact loading.
3.	Analyze mechanical properties of specimen under torsion (Torsion Testing Machine, Spring Testing Machine)
4.	Determine hardness of given material.
5.	Analyze mechanical properties of specimen under fatigue, deep drawing and buckling load.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Manufacturing Science Lab**	Code: B037423(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives: Manufacturing is the backbone of any industrialized nation. The objective of the course is to provide an overview of the different manufacturing processes which are commonly employed in the industry to fabricate component using different materials.

List of Experiments: *(At least Ten experiments are to be performed by each student)*	
Foundry	
1.	Moulding of a multi-piece pattern by green sand moulding.
2.	Making a mould (with core) and casting.
Machine Tool	
3.	Taper turning in a Lathe
4.	Thread cutting in Lathe
5.	Slot cutting in Shaper
6.	Gear cutting in milling machine using indexing head.
7.	Alignment testing of Lathe
8.	Drilling, boring and reaming of a hole.
Cutting Tool	
9.	Study of turning tool of Lathe (Tool signature)
10.	Study of twist drill
Welding	
11.	Joining MS plates by arc welding (SMAW,MIG)
12.	Joining metal sheet by resistance welding
13.	Joining metal by soldering/brazing
Inspection and Testing	
14.	Inspection of casting defect and welding defects
15.	Non destructive testing of casting and welding defects

Equipment/Machines/Instruments/Tools/Software Required:	
1.	Moulding equipment
2.	Melting facility
3.	Lathe
4.	Shaper
5.	Drilling Machine
6.	Milling Machine
7.	Reamers
8.	Arc welding equipments
9.	Soldering /Brazing equipments
10.	Non destructive testing equipments

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate the use of green sand molding process for casting.
2.	Demonstrate the use of various machine tools for important machining operations.
3.	Explain the tool geometry of single point cutting tool and twist drill.
4.	Explain the practicability of various metal joining processes like arc welding, resistance welding, soldering and brazing.
5.	Obtain practical skills in inspection and testing of casting and welding defects.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Virtual Lab**	Code: B037424(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course objective:
The objective of this course is to inculcate a habit of self learning in our students through virtual lab. Virtual Labs is a project initiated by the Ministry of Human Resource Development, Government of India, under the National Mission on Education through Information and Communication Technology. Virtual lab provides remote experimentation which furnishes basic leaning skill, and built advanced concepts as well. It provide complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.

List of Experiments

Sl.	Name of Virtual Lab	Website link	
A.	**Strength of materials Lab**	http://sm-nitk.vlabs.ac.in/	**(Any 03)**
	1. To study the mechanical properties of Mild Steel and Cast iron specimen under tension load and compression load. 2. To study the mechanical properties of mild steel under torsion and bending. 3. To determine experimentally, the ultimate shear strength of timber. 4. To find the Rockwell and Brinell hardness number of mild steel, cast iron, brass, aluminum and spring steel. 5. To find the impact resistance of mild steel and cast iron using Izod and Charpy test.		
B.	**Mechanics of Machine lab/ Mechanisms Lab**	http://mm-nitk.vlabs.ac.in/ http://vlabs.iitkgp.ernet.in/mr/	**(Any 03)**
	1. To study Kinematic analysis of Slider cranks mechanism. 2. To study Kinematic analysis of Elliptical Trammel. 3. To study Kinematic analysis of Crank and Slotted Mechanism 4. To study Oldham Coupling Mechanism. 5. To study quick return mechanism.		
C.	**Virtual laboratory Experience in Fluid and Thermal Sciences**	https://mfts-iitg.vlabs.ac.in/	**(Any 03)**
	1. To perform conduction analysis of Single Material Slab and cylinder. 2. To perform conduction analysis of Double Material Slab. 3. To perform conduction analysis of cylinder. 4. To determine the overall heat transfer coefficient (U) in the parallel flow heat exchanger. 5. To determine the overall heat transfer coefficient (U) in the counter flow heat exchanger.		
D.	**Micromachining laboratory**	http://mm-coep.vlabs.ac.in/	**(Any 02)**
	1. To study the Wire Electrical Discharge Machining process. 2. To study the Laser Hardening process. 3. To study the electrochemical machining Process.		

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E.	**Fabrication Laboratory (FAB LAB)**	http://fab-coep.vlabs.ac.in/Introduction.html	**(Any 01)**
	1. Study of Molding and Casting of complex shapes using Polyurethane rubber mold compounds. 2. To understand the process parameters of 3D scanning to generate digitized data from physical model.		

Equipment/Machines/Instruments/Tools/Software Required:	
1.	Computer system with good connectivity to Internet, any specific software is not required.

Note:	
1.	Refer Virtual Labs website which is an initiative of ministry of education under the national mission on education through ICT to conduct virtual lab. Link: https://www.vlab.co.in/
2.	It is advised to visit https://www.vlab.co.in/broad-area-mechanical-engineering frequently for any update and new experiments on the listed subjects.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Perform experiments of material testing laboratory through virtual simulator.
2.	Analyze different type of mechanism through virtual simulator.
3.	Analyze various heat transfer parameter in virtual laboratory
4.	Describe EDM, Laser cutting, ECM after learning the process through micromachining laboratory
5.	Describe casting/ 3D scanning after learning the process through fabrication laboratory.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Common to All Branches** Semester: **IV**

Subject: **Indian Culture and Constitution of India** Code: B000406(046)

Total Theory Periods: **2/Week** Total Tutorial Periods: **NIL**

Assignments: **Two (Minimum)** Total Marks in ESE: **NIL** Marks in TA: **10**

Objective: The Constitution is the supreme law and it helps to maintain **integrity** in the society and to promote unity among the citizens to build a great nation. The main objective of the Indian Constitution is to promote harmony throughout the nation.

Course Objectives

Upon completion of this course, the student shall be able

- To understand Meaning and concepts of Traditional and Modern of Culture
- To understand Sources of the Study of Indian Culture
- To Enable the student to understand the history and importance of constitution
- To understand philosophy of fundamental rights and duties
- To understand the powers and functions of executive, legislature and judiciary
- To understand the powers and functions of state government
- To understand the recent trends in Indian constitutional and election commission of India.

To understand the central and state relation, financial and administrative.

UNIT-I

Meaning and concepts of Culture: Traditional and Modern concepts of Culture-Notions of Culture in textual tradition, anthropological, archaeological and sociological understanding of the term culture. Elements of Culture, concept of Indianness and value system. Relation between culture and civilization. Historiography and approaches to the study of Indian Culture– Stereotypes, Objectivity and Bias, Imperialist, Nationalist, Marxist and Subaltern. Heritage of India and world's debt to Indian Culture.

UNIT–II

Sources of the Study of Indian Culture: Archaeological: cultural remains, Monuments, Numismatics, Epigraphy; Literary sources and Oral traditions; Foreign Accounts; Archival sources.

UNIT–III

History of Indian Constitution Constitutional History, Preamble salient features, citizenship, Method of Amendment and Recent Amendments. **Rights and Duties** Fundamental Rights and Directive Principles of State Policy. Fundamental Duties. Difference between Fundamental Rights and Directive Principles of State Policy

Union Government a) President-powers and functions. Vice president powers and functions, Prime Minister and council of ministers powers and functions. b) Parliament- Loksabha, Rajyasabha- composition powers and functions.

c) Judiciary (Supreme Court) composition powers and functions Judicial Activism

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UNIT–IV

State Government a) Governor: powers and functions b) Chief minister: powers and functions c) State Legislative Assembly and Legislative Council- composition powers and functions. d) High Court : composition powers and functions

UNIT–V

Recent Trends in Indian Constitutional a) Basic structure of Indian Constitution. b) Electoral Reforms c) Panchayati Raj system in India.

Books of Reference

1. Dr. P. K. Agrawal Indian Culture, Art and Heritage,

2. P. Raghunadha Rao Indian Heritage and Culture

3. M.V.Pylee, An Introduction to the Constitution of India,NewDelhi,Vikas,2005.

4. Subhash C.Kashyap, Our Constitution: An Introduction to India's Constitution and constitutional Law, New Delhi, National Book Trust, 2000.

5. Durga Das Basu, Introduction to the Constitution of India ,NewDelhi,Prentice Hall of India,2001.

6. D.C.Gupta, Indian Government and Politics,VIII Edition,New Delhi, Vikas, 1994.

7. V.D.Mahajan, Constitutional Development and National Movement inIndia, New Delhi, S. Chand and Co., latest edition.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **V**
Branch: **Mechanical Engineering**	Code: **C037511(037)**
Subject: **Internal Combustion Engine**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

The main objective of the course to impart an understanding of construction, working and performance of reciprocating internal combustion engines The focus is on explaining its thermodynamic cycle, combustion process, fuel supply system, various auxiliary systems and engine performance.

UNIT- I	**a) Introduction:** Internal and external combustion engine and their comparison, four stroke cycle S.I. and C.I. engine, two strokeengine, comparison of four stroke and two stroke engines, comparison of S.I. and C.I. engine, classification of I.C. Engine onvariousbasisValvetimingdiagramforS.I.andC.I.engines. Effectofvalve timingandenginespeedonvolumetricefficiency. **b) Fuel-air cyclesandactual cycle:** Reasons fordeviationof actualcyclefromair standardcycles,fuelair cyclesand theiranalysis, actualcyclesandtheir analysis.Reasons ofignition advanceandinjectionadvance.
UNIT-II	**a) Combustion in S.I. engine:** stages of combustion, factor influencing the flame speed, the phenomenon of knock in S.I. engine, effect of engine variable on knock, effects of detonation, Pre-ignition, effect of preignition. **b) Combustion in C.I. engine:** stages of combustion, factor influencing the delay period,, the phenomenon of knock in C.I. engine, effect of engine variable on knock, comparison between knock in S.I. and C.I. engine.
UNIT- III	**a) Fuel Supply System in S.I. Engine:** Properties of air-petrol mixtures, air fuel mixture requirement low power, normal power and maximum power range, air fuel mixture requirement for idling & acceleration, simple carburetor, limitation of simple carburetor, Gasoline injection system: Type of injection system, components of injection system, Electronic gasoline fuel injection system, multi-point fuel injection system, working, advantages and disadvantages. **b) Fuel Supply System in C.I. Engine:** Requirement, type of injection systems, Bosch fuel injection pump, type of fuel injector, type of nozzle, atomization, spray penetration and spray direction. Electronic diesel injection System.
UNIT- IV	**a) IgnitionSystem:**Batteryandmagnetoignitionsystemandtheircomparativestudy,sparkplugheatrange,electronicignitionsystem,firingorder,Ignitiontiming,centrifugaland vacuumignitionadvance. **b) CoolingSystem:**Coolingrequirement,aircooling,liquidcooling,typeofliquidcoolingsystem,advantageanddisadvantageofaircoolingandwater coolingsystem,Antifreezemixture. **c)LubricationSystem:**Functionoflubricatingsystem,Classificationoflubricatingsystem,mistlubricationsystem,drysumplubrication, wetsumplubrication-splash,andmodifiedandfull pressuresystem. **d) Emission and Pollution:** S. I. Engine and C. I. Engine emissions and its control and comparison. Effect of pollution on Human health and biosphere.

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UNIT-V	**Testing and Performance:** Performance parameters, Measurements of brake power, indicated power, Friction power, Fuel and air consumption, Exhaust gas calorimeter, Calculation of various performance parameter, Heat balance sheet. Performance curves for S.I. and C.I. engine with load and speed.

Text Books:	
1.	A Course in Internal Combustion Engines – M.L. Mathur& R.P. Sharma – DhanpatRai& Sons, Delhi
2.	Internal Combustion Engine – V. Ganeshan – TMH, New Delhi

Reference Books:	
1.	Internal Combustion Engine – R. Yadav – Central Publishing House, Allahabad
2.	A Course in Internal Combustion Engine – V.M. Domkundwar – DhanpatRai&Sons,Delhi
3.	Internal Combustion Engines – R.K.Rajput – Laxmi Publications
4.	Internal Combustion Engine Fundamentals-John B. Heywood- McGraw Hill International, Delhi
5.	Fundamental of Internal Combustion Engine – Paul W. Gill, James H. Smith, Eugene – Oxford and IBH Publishing company
6.	Fundamental of Internal Combustion Engine- H.N. Gupta-PHI- New Delhi

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Describe the construction and working principle of various internal combustion engines. Explain the concepts of fuel air cycle and actual cycle and apply it to analyze related practical problems.
2.	Explain the theory of combustion of S.I. engine and C.I. engine, describe I.C.Engine fuels and solve problem related to flue gas analysis.
3.	Discuss properties of air-petrol mixtures and describe fuel supply system of S.I. and C.I. Engine.
4.	Describe ignition system, cooling system, lubrication system and Engine emissions and its control.
5.	Describe various performance parameter of I.C. Engine, its method of testing and analyze related practical problems.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **V**
Branch: **Mechanical Engineering**	Code: **C037512(037)**
Subject: **Solid Mechanics**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The objective of this course is to impart an understanding of analysis of structural member by energy methods, analysis of fixed and continuous beam, pressure vessel and application plane stress and plain strain to analyze related practical problems.

UNIT- I	**Energy Methods:** Introduction, Strain energy, Elastic strain energy in tension, compression, bending and torsion. Impact loading in tension and bending, Theorem of Castiglione's and its applications, Reciprocal relations, Maxwell -Betti theorem, Introduction to plasticity.
UNIT-II	**Fixed Beams**: Fixed beam subjected to different types of loads and couples, Calculations of fixing moments and reactions at supports, deflection. Effect of sinking of support. **Continuous beams:** Continuous beams subjected to different type of loads and couples, beams with overhang, beams with one end fixed, Chaperon's theorem. Effect of sinking of supports.
UNIT- III	**Thin Pressure Vessel**: Thin Pressure Vessels, Circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shell under internal pressure, **Thick Pressure Vessel:** Introduction, Lames Theorem, Thick Pressure vessels subjected to internal pressure, External Pressure & both, compound cylinders.
UNIT- IV	**Columns:** Struts and Columns, Stability of columns, Euler's formula for different end conditions, Equivalent load, Eccentric loading, Rankine's formula. **Shear center:** Definition, Position of shear center for angle, Channel and I-sections.
UNIT-V	**Plane stress and plane strain problems**: introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems. Plane stress and plane strain application to rotating discs, torsion of non-circular cross-sections, stress concentration problems, thermo-elasticity, 2-d contact problems.

Text Books:	
1.	Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC,New York, USA.
2.	Mechanics of Materials - Ferdinand P. Beer, E. RusselJhonston Jr., John T. DEwolfm, TMH

Reference Books:	
1.	Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
2.	Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: PearsonPrentice Hall
3.	Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill
4.	Y. C. Fung, Foundations of Solid Mechanics, Prentice Hall International,
5.	Lawrence. E. Malvern, Introduction to Mechanics of a Continuous Medium, Prentice Hallinternational

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze problems related to deformable body under load using energy methods.
2.	Analyze fixed beams and continuous beams under load.
3.	Analyze thin and thick pressure vessels.
4.	Analyze column and find shear center.
5.	Solve plane stress and plain strain problems.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **V**
Branch: **Mechanical Engineering**	Code: **C037513(037)**
Subject:**Fluid Machines**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

The objectives of this course is to impart an understanding boundary layer concepts, principle of operation of turbinesand pumps and its and performance characteristic.

UNIT- I	**Boundary Layer Theory :**Boundary layer definition and characteristics, momentum equation, Laminar andturbulent boundary Layer, Total drag, separation and control. Flow around submerge bodies Force exerted byflowing fluid on a body:Drag and lift; stream lined and bluff body, Drag on sphere and cylinder, circulationand lift oncircular cylinder,lift ofanairfoil, induceddrag.
UNIT-II	**Impact of Free Jets:** Impulse momentum principle, force exerted by the jet on stationary flat and curved plate, hinged plate, moving plate and moving curve vanes, jet propulsion of ship. **Impulse Turbine:** Classification of turbine, impulse turbine, Pelton wheel, Construction working, work done, head efficiency and Design aspects, Governing of impulse turbine.
UNIT- III	**Reaction Turbine:** Radial flow reaction turbine, Francis turbine: construction, working, work done, efficiency, design aspect, advantages & disadvantages over Pelton wheel. Axial flow reaction turbine Propeller and Kaplan turbine, bulb or tubular turbine, draft tube, specific speed, unit quantities, cavitation, degree of reaction, performance characteristics, surge tanks, governing of reaction turbine.
UNIT- IV	**Centrifugal Pumps :** Classification of Pumps, Centrifugal pump, Construction, working, work done, heads, efficiencies, multistage centrifugal pump, pump in series and parallel, specific speed, characteristic, net positive suction head, cavitation.
UNIT-V	**Reciprocating Pumps:** Classification, component and working, single acting and double acting pump, discharge, work-done and power required, slip & coefficient of discharge, indicator diagram, air vessels.

Text Books:	
1.	Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria& Sons-Delhi
2.	Fluid Mechanics- Yunush A Cengel, John M. Cimbala- TMH,Delhi

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Reference Books:	
1.	A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd.,Delhi
2.	Fluid Mechanics & Hydraulics Machines-R.K.Bansal- Laxmi Publications,Delhi
3.	Mechanics of Fluid – B.S. Massey – English Language Book Society(U.K.)
4.	Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas- TMH,Delhi
5.	Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi, & SM Seth-Standard,Delhi
6.	Hydraulic Machines: Fundamentals of Hydraulic Power Systems – P. Kumar – BSP Books Pvt, Ltd.,Hyderabad

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Explain the concepts of 'boundary layer theory' and ' lift and drag theory' and apply to solve related practical problems
2.	Explain the principle of impulse-momentum and impulse turbines and apply it to analyze related problems.
3.	Explain the construction and principle of operation of reaction turbine and apply it to analyze related problems.
4.	Explain the construction and principle of operation of centrifugal pump and apply it to analyze related problems.
5.	Explain the construction and principles of operation of reciprocating pump and apply it to analyze related problems.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: Bachelor of Technology	**Semester: V**
Branch: Mechanical Engineering	**Code: C037514(037)**
Subject: Dynamics of Machines	**Total Tutorial Periods: 01**
Total Theory Periods: 02	**Maximum Marks: 100**
Class Tests: Two (Minimum)	**Minimum Marks: 35**
Assignments: Two (Minimum)	**ESE Duration: Three Hours**

Course Objectives:

The objective of this course is to introduce the approaches and mathematical models used in dynamic analysis of machinery to develop understanding of characteristics of governors, dynamic balancing, gyroscopic forces and moments, mechanical vibrations, inertia force and flywheel analysis.

UNIT- I	**Governors:** Characteristics of centrifugal governors, Gravity controlled governors, Porter and proell. Spring controlled centrifugal governor: Hartung, & Hartnell governor. Performance parameter: Sensitivity, stability, Isochronisms, Governor Effort and power.
UNIT-II	**Balancing:** Balancing of rotating masses,Static and dynamic balancing, Determination of balancing masses in two plane balancing, Balancing of internal combustion engines, Balancing of in-line engines, Firing order, Balancing of V-twin and radial engines, Forward and reverse crank method, Balancing of rotors.
UNIT- III	**Gyroscope:** Gyroscopic forces and couple, gyroscopic effect in Airplanes, Ship motion and Vehicles movingoncurvedpath.
UNIT- IV	**Mechanical Vibrations:** One- dimensional ,longitudinal, Transverse, andtorsional vibrations, Natural frequency,Effect of damping on vibrations, Different types of damping .Forced vibration, Forces and displacement, Transmissibility ,Vibration Isolation, Vibration sensors: seismometer and Accelerometers, Whirling of shafts with single rotor.
UNIT-V	**(a)Inertia force analysis :**Effective force and inertia force on link, Inertia force on reciprocating engine. Inertia force in four bar chain mechanism. **(b)Turning moment diagram and flywheel:** Turning moment diagram for single and multi cylinder internal combustion engine, Coefficientof fluctuation of speed, Coefficient of fluctuation of energy, Flywheel.

Text Books:	
1.	Theory of Machine- S.S.Rattan - Tata McGraw Hill,New Delhi
2.	Theory of Machines - Thomas Bevan, - CBS/ Cengage Publishers

Reference Books:	
1.	Theory of Machines and Mechanism– Uicker, Pennock, &Shigley – Oxford Univ. Press
2.	Theory of Mechanisms and Machines- A. Ghosh, A. K. Mallik – EWP Press.
3.	Mechanism and Machine theory-Ambekar-PHI,Delhi
4.	Theory of Machine – P.L. Ballaney – Khanna Publishers, New Delhi
5.	Theory of Machine -JagdishLal- Metro Politan Books, New Delhi

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Explain principles of operation of mechanical governors and analyze its performance parameters.
2.	Apply the theory of balancing to rotating and reciprocating masses.
3.	Analyze gyro-effect on moving bodies.
4.	Explain principles of vibrations of different systems and analyze related practical problems.
5.	Perform inertia force analysis of machine elements. Draw turning moment diagram of reciprocating engine and analyze performance parameter of flywheel.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **V**
Branch: **Mechanical Engineering**	Code: **C037531(037)**
Subject: **Operation Research**	Total Tutorial Periods: **Nil**
Total Theory Periods: **02**	Maximum Marks: **01**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

The objective of this course is to impart an understanding the mathematical tools that are needed to solve optimization problems.

UNIT- I	**Introduction:**Various stages ofO.R., Fields ofapplication, optimization anditsclassification. GeneralLinear Programming Problems- Introduction, maximization and minimization of function with or withoutconstraints, formulation of a linear programming problem, graphical method and simplex method, Big M method degeneracy, application of L.P.P. inMechanicalEngineering.
UNIT-II	**The Transportation Problems:** Mathematical formulation computational procedures, Steppings tone method, Modified Distribution Method, Vogels Approximation Method, Solution of balanced and unbalancedtransportationproblemsandcase ofDegeneracy. The Assignment Problems: Mathematical formulation of assignment problems ,solution of assignment problems, traveling sales man problems, Aircrew Assignment problems.
UNIT- III	**Waiting Line Theory:** Basic queuing process, basic structure of queuing models, some commonly knownqueuing situationsKendall'sservicetime, solutionto M/M/1:∞ /FCFSmode
UNIT- IV	**NetworkAnalysis:**CPM/PERT,NetworkRepresentation,Techniquesfordrawingnetwork.Resourcesmoothing andleveling,projectcost,Optimumprojectduration,projectcrashing,updating,TimeestimationinPERT.
UNIT-V	***Game Theory:*** Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists,when no saddle point exists,solution of 2xnandmx2game. **Simulation:**Basic concept of simulation, applications ofsimulation,meritsanddemerits ofsimulation,MonteCarlo simulation, simulationofInventorysystem, simulationofQueuingsystem.

Text Books:	
1.	OperationResearch–Hira&Gupta–S.Chand&Co.
2.	OperationResearch–N.D.Vohra–TMH

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Reference Books:	
1.	OperationResearch–S.D.Sharma–S.Chand&Com.NewDelhi
2.	Operations Research – Hamdy.M. Taha – TMH, New Delhi
3.	Operations Research Theory and applications J K Sharma, Macmillan
4.	Operations Research, Col. D. S. Cheema, University Science Press, New Delhi
5.	Operations Research- A. P. Verma – S. K. Kataria& Sons

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Formulate and solve real-world problems as linear programs for better decision-making.
2.	Solve specialized linear programming models like the transportation and assignment Models.
3.	Model a dynamic system as a queuing model and compute important performance measures.
4.	Use CPM and PERT techniques, to plan, schedule and control project activities.
5.	Propose the best strategy using decision making methods under game theory & apply concepts of Simulation to optimize practical problems.

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Chhattisgarh Swami Vivekanand Technical University,Bhilai	
Name of program: **Bachelor of Technology**	Semester:**VI**
Branch: **Mechanical Engineering**	Code: **C037532(037)**
Subject: **Composite Materials**	Total Tutorial Periods: **Nil**
TotalTheoryPeriods:**02**	MaximumMarks:**100**
ClassTests:**Two(Minimum)**	MinimumMarks:**35**
Assignments:**Two(Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The objective of this course is to develop an understanding of the design, processing, and behavior of compositematerials.

UNIT-I	**Introduction to Composites:** Definition, classification/ types and characteristics of composite materials; Basic composite constituents – fiber and matrix; Properties of unidirectional long fiberandshortfibercomposites;Polymericmaterialsandpolymericcomposites;Honeycomband Sandwich Composite Structure; Application areas of composites.
UNIT-II	**Manufacturing, Testing and Environmental Issues:** Moulding, pultrusion, filament winding, other advanced manufacturing techniques; Quality inspection and testing–uniaxial tension test, uniaxial Compression test, sheartest , fracture toughness testing of composites .Environmental Issues related with composite manufacturing and their applications.
UNIT-III	**Material Properties:** Orthotropic and Anisotropic materials ;properties relating stress stostrain, properties relating temperature to strain ,properties relating moisture tostrain,properties relating stress(or strain) to failure, Failure Criterion–Maximum Stress and Maximum Strain ;Review of force tensors,stress tensors,strain tensors.
UNIT-IV	**Elastic Response Analysis:** Hooke's law for orthotropic and anisotropic materials; Linear Elasticity for Anisotropic Materials; Unidirectional composite laminates; Rotations of Stresses,Strains; Residual Stresses; Stress and environmental effects on composites behaviour.
UNIT-V	**CompositeLaminates:**Thin-platetheory,classicallaminationtheory;Angle-ply and cross ply laminates; Static, dynamic and stability analysis for simple cases of composite plates; Inter laminar Stress behaviour; Composite Joints; Design with Composites.

TextBooks:	
1.	Composite Materials Science and Engineering-Krishan K.Chawla-Springer
2.	Compositematerials:production,properties,testingandapplications-K.Srinivasan-AlphaScience

ReferenceBooks:	
1.	Introductiontocompositematerialsdesign -EverJ.Barbero.–CRC Press
2.	DesignandAnalysisofCompositeStructures:WithApplicationstoAerospace-ChristosKassapoglou-Wiley
3.	Mechanicsofcompositestructures-LászlóP.Kollár,GeorgeS.-Springer.
4.	Damageandfailureofcompositematerials-RameshTalreja,ChandraVeerSingh-WoodheadPublishing
5.	ASMHandbookVolume21

CourseOutcomes:	
Onsuccessfulcompletionofthecourse,thestudent willbeableto:	
1.	Discussvarioustypesofcomposites.
2.	Discussmanufacturing,testingandenvironmentalissuespertainingtocomposites.
3.	Explainthevariationinpropertiesofcompositesinrelationtovariousaffectingparameters
4.	Explainelasticresponseofcomposites.
5.	DiscussCompositeLaminates.

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ChhattisgarhSwamiVivekanandTechnicalUniversity,Bhilai	
Name of program:**Bachelor of Technology**	Semester:**VI**
Branch:**Mechanical Engineering**	Code: **C037533(037)**
Subject:**Gas Dynamic and Jet Propulsion**	TotalTutorialPeriods:**Nil**
Total Theory Periods: **02**	MaximumMarks:**100**
ClassTests:**Two(Minimum)**	MinimumMarks:**35**
Assignments:**Two(Minimum)**	ESEDuration:**ThreeHours**

Course Objectives: The objective of this course is to impart an understanding ofthe basic difference between in compressible and compressible flow, phenomenon of shock waves and its effect on flow and fundamentals of jet propulsion and Rocket Propulsion.

UNIT-I	**Basic concepts and isentropic flows:** Energy and momentum equations of compressible fluid flows–Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility –Isentropicflowthroughvariableducts –NozzleandDiffusers
UNIT-II	**Flow through ducts:** Flows through constant area ducts with heat transfer(Rayleigh flow)and Friction (Fann of low)–variation of flow properties.
UNIT-III	**Normal and obliques hocks:** Governing equations–Variation of flow parameters a cross thenormal And oblique shocks–Prandtl–Meyerrelations–Applications.
UNIT-IV	**Theoryofjetpropulsion**: Thrustequation –Thrustpower andpropulsiveefficiency–Operatingprinciple,cycleanalysisanduseofstagnationstateperformanceoframjet,turbojet,turbofanand Turbo propengines.
UNIT-V	**Spacepropulsion:**Typesofrocketengines–Propellants-feedingsystems–Ignitionandcombustion –Theoryofrocketpropulsion–Performancestudy–Staging –Terminalandcharacteristicvelocity–Applications–spaceflights.

TextBooks:	
1.	Fundamentals of Compressible Flow-Yahya,S.M.-New Age International
2.	ModernCompressibleflow -Anderson,J.D.-McGrawHill

ReferenceBooks:	
1.	MechanicsandThermodynamicsofPropulsion-Hill.P.andC.Peterson-Addison–Wesley
2.	PrinciplesofJetPropulsionandGasTurbinesZucrow.N.J-ZucrowN.J.-JohnWiley
3.	Aircraft and Missile Propulsion-Zucrow.N.J-ZucrowN.J.-JohnWiley
4.	Rocket Propulsion Elements-Sutton.G.P.-Johnwiley
5.	Dynamics and Thermodynamics of Compressible fluid Flow-Shapiro.A.H.-Johnwiley
6.	Gas Turbines- Ganesan .V-TMH
7.	Gas Dynamics and Jet Propulsions-Somasundaram.PR.S.L.-NewAge
8.	Gas Turbine Theory-Cohen.H.,G.E.C.RogersandSaravanamutto-Longman

CourseOutcomes:	
Onsuccessfulcompletionof thecourse,thestudentwillbeableto:	
1.	Apply the concept of compressible fluid flows invariable areaducts
2.	Apply the concept of compressible flows in constant area ducts
3.	Examinetheeffectofcompressionandexpansionwavesincompressibleflow.
4.	UsetheconceptofgasdynamicsinJetPropulsion
5.	ApplytheconceptofgasdynamicsinSpacePropulsion.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:**V**
Subject: **Internal Combustion Engine Lab**	Code: **C037521(037)**
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks: **40**	Minimum Marks:**20**

Course Objectives:
The core objective of this lab is to impart an understanding of construction and working of Petrol and Diesel Engines and to understand how the different engine variables affect the engine performance.

List of Experiments: *(At least Ten experiments are to be performed by each student)*	
1.	Study of IC Engine.(Engine components, material used and engine nomenclature)
2.	Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut sectionmodels.
3.	Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.
4.	Study of fuel supply system of petrol engine(fuel pump and simplecarburettor)
5.	Study of complete caurburettor
6.	Study of Petrol Injection System.
7.	Study of fuel supply system of a Diesel engine(fuel pump and fuel injector)
8.	Study of Ignition systems of an IC Engine (Battery and Magneto ignition system and Electronic ignitionsystem).
9.	Study of Lubrication system of an ICEngine (Mist, Splashand Pressure lubrication)
10.	Study of cooling systems of an IC Engine(Air cooling and water cooling)
11.	To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed.
12.	To determine friction power of diesel engine by Willan's line or fuel rate extra polation method.
13.	To conduct a performance test on the variable compression ratio engine and to draw the heat balance sheet forgivencompressionratio, speedand load andplottheperformancecurves.
14.	To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.
15.	To calculate the indicated power, friction power and mechanical efficiency of four stroke four cylinder petrol engine at full load and rated speed by Morsetest.
16.	To draw the valve timing diagram of a four-stroke S.I. or C.I. Engine using experimental setup.
17.	Analysis of engine exhaust gases using Orsat apparatus/gas analyzer.

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List of Equipment/Instruments/Machines/Software Required:	
1.	Model of Two & Four Stroke Petrol Engine
2.	Model of Two & Four Stroke Diesel Engine
3.	Single Cylinder Actual S.I.Enginein Cut Section
4.	Single CylinderActual C.I..Engine in Cut Section
5.	Four Stroke,Four-Cylinder Petrol Engine in Cut Section
6.	Carburettorsin Cut Section/Without Cut Section.
7.	Model of Petrol Injection System
8.	Bosch Fuel Pump in Cut Section
9.	Nozzles in Cut Section.
10.	Diesel Injectors in Cut Section
11.	Four Stroke Single-Cylinder Diesel Engine Test Rig
12.	Variable Compression Ratio Engine Test Rig.
13.	Four Stroke Multi- Cylinder Petrol Engine Test Rig
14.	Experimental Setup for Drawing Valve Timing Diagram Of Four Stroke S.I .or C.I.Engines.
15.	Orsat Apparatus/Gas Analyzer for Engine Exhaust Gas Analysis.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Describe the basic engine nomenclature and working principle of four stroke and two stroke Petrol and Diesel engine.
2.	Describe the fuel supply system of a Petrol and Diesel engine.
3.	Describe Ignition, Lubrication and cooling system of an internal combustion engine.
4.	Analyze the performance parameters of diesel engine.
5.	Analyze the performance parameters of petrol engine.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:**V**
Subject: **Fluid Machines Lab**	Code: **C037523(037)**
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks:**20**

Course Objectives:
The core objective of this course is to impart an understanding of performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head and to develop an understanding of basic working principles of various fluid machines.

List of Experiments/Studies to be Performed (Minimum seven experiments and three studies are to be performed by each student)	
1.	Performance characteristics of Pelton wheel turbine.
2.	Performance characteristics of Francis turbine
3.	Performance characteristics of Kaplan turbine.
4.	Performance characteristics of variable speed centrifugal pump.
5.	Performance characteristics of rated speed centrifugal pump
6.	Performance characteristics of multi stage centrifugal pump.
7.	Study of Wind Tunnel (Open Circuit blower type)
8.	Determination of Lift and drag force over an airfoil.
9.	To study the working of fluid ic devices (Analog and Digital)
10.	To study the Hydraulic Accumulator
11.	To study the Hydraulic Intensifier
12.	To study the Hydraulic Crane
13.	To study the Hydrauliclift
14.	To study the Hydraulic Ram
15.	To study the Jet Pump
16.	To study the Air Lift Pump

List of Equipment/Instruments/Machines/Software Required:	
1.	Pelton Wheel Turbine
2.	Francis Turbine Test Rig
3.	Kaplan Turbine Test Rig
4.	Variable Speed Centrifugal Pump Test Rig
5.	Rated Speed Centrifugal Pump Test Rig

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6.	Multi Stage Centrifugal Pump Test Rig
7.	Reciprocating Pump Test Rig
8.	Complete setup of Wind Tunnel (Open circuit blow type) with minimum wind speed not less than 30m/sec
9.	Fluidic devices (Analog and Digital)
10.	Air of oil with the provision of measurement of pressure distribution over the surface.
11.	Cut section model of Hydraulic Accumulator
12.	Cut section model of Hydraulic Intensifier
13.	Cut section model of Hydraulic Crane
14.	Cut section model of Hydraulic Lift
15.	Cut section model of Hydraulic Ram
16.	Cut section model of Hydraulic Jet and Air lift pump.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze the performance parameters of Pelton Turbine.
2.	Analyze the performance parameters of Francis and Kaplan Turbine
3.	Analyze the performance parameters of Centrifugal Pump and Reciprocating Pump.
4.	Determine Lift and drag force over an air foil.
5.	Explain the construction and working of various fluidicdevices.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:V
Subject: **Dynamics of Machine Lab**	Code: **C037522(037)**
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks:**20**

Course Objectives:
The overall objective of this course is to impart an understanding of techniques for dynamic analysis of machines and their components

List of Experiments: *(At least Ten experiments are to be performed by each student)*	
1.	To find out the oscillations of simple pendulum with universal vibration apparatus.
2.	To find out the oscillations of Compound pendulum with universal vibration apparatus.
3.	To find out the radius of gyration of bi-filler suspension with universal vibration apparatus.
4.	To find out undamped torsional vibrations of single rotor system with universal vibration apparatus.
5.	To find out the frequency of damped torsional vibration of single rotor system with universal vibration apparatus
6.	To measure the frequency of torsional vibrations of single rotor system with universal vibration apparatus.
7.	To measure the frequency of torsional vibrations of double rotor system with universal vibration apparatus.
8.	To find out free vibration of helical coiled spring with universal vibration apparatus.
9.	To study forced damped vibration of a spring mass system and simple supported beam with universal vibration apparatus
10.	To find out the Gyroscopic couple and prove the Gyroscopic law with Gyroscope apparatus.
11.	To find out the Power and effort of Proel, Porter & Hartnell Governor with Governor Apparatus
12.	To find out the critical speed for different diameters of shaft by whirling of shaft apparatus.
13.	To verify the static and dynamic balancing for different planes and masses by balancing apparatus

List of Equipment/Instruments/Machines/Software Required:	
1.	UniversalVibrationApparatus
2.	WhirlingofShaftApparatus.
3.	Balancing Apparatus (Both Static & Dynamic)
4.	Epi cyclic Gear Train and Holding Torque Apparatus
5.	Gyroscope apparatus
6.	Governor apparatus with differential attachment

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze the vibration parameters of various systems.
2.	Analyze gyroscopic parameters.
3.	Analyze various types of governors.
4.	Find the critical speed of different diameters of shafts.
5.	Analyze the effects of unbalance in machine and methods to reduce/eliminate these effects.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: BTech **Semester: V**
Subject: Environmental Studies **Code: C000506(020)**
Period per week (L-T-P): (2-0-0) / Week **Non-Credit**
Total Contact Hours: 40 **No. of assignments to be submitted: 05**
PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:

1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

COURSE DETAILS:

UNIT I: Introduction to environmental studies, ecology and ecosystems **(06 hours)**
Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II: Biodiversity and conservation **(06 hours)**
Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III: Natural resources and environment **(08 hours)**
Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV: Human communities, social issues and environment **(08 hours)**
Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V: Environmental pollution, policies, legislations, assessment and practices **(12 hours)**
Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

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On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO):

On completion of the course, students will able to:

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.

TEXT BOOKS:

1. De, A.K., (2006).*Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006).*Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971).*Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005).*Ecology and Environment*. Rastogi Publications.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester:**VI**
Branch: **Mechanical Engineering**	Code: **C037611(037)**
Subject :**Design of Machine Elements**	TotalTutorialPeriods:**01**
TotalTheoryPeriods:**03**	MaximumMarks:**100**
ClassTests:**Two(Minimum)**	MinimumMarks:**35**
Assignments:**Two(Minimum)**	ESEDuration:**FourHours**

Course Objectives: The objective of this course is to teach students how to apply the concepts of stress analysis, theories of failure and material science analyze/ design commonly used machine components.

UNIT-I	**GeneralConsiderations:**SelectionofMaterials,DesignStress,FactorofSafety,Stressconcentrationfactor intension,bendingandtorsion,theoriesof failures.Notchsensitivity,designstressforvariableand repeatedloads,fatiguestressconcentrationfactor,endurancediagrams.
UNIT-II	**Mechanical Joints:** Design of socket pigot cotter joint, design of sleeve and cotter joint ,design of Knuck le joint. **KeysandSplines:**Types ofkeys,designofkeys,designofsplines. **Couplings:** Types of couplings, design of flange and flexible couplings, compression coupling, muff coupling.
UNIT-III	**Shafts and Axles :** Transmission shaft, Design against static load, Design for strength, rigidity and stiffness, design under continuous loading for fatigue. **Clutches:** Friction clutches, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, centrifugal clutches.
UNIT-IV	**Threaded Fasteners:** Geometry of thread forms, terminology of screw threads and thread standards,specifications of steel bolts, initial tension, and relation between bolt tension and torque, design ofstaticallyloadedtensionjoints,designofboltedjointsduetoeccentricloading. **Power Screws:** Powerscrews,Forceanalysis-squareandtrapezoidalthreads,Collarfriction,Stressesin screw,coefficientoffriction,efficiencyof thread.
UNIT-V	**Riveted Joints:** Types of rive threads, types of riveted joints, failure of riveted joint , strength of rivet joint, efficiency of riveted joint, design of riveted joint for boiler. **Welded Joints:** Types of welded joints, stresses in butt and fillet welds, strength of welded joints, location and dimension of weld design, eccentrically loaded joint, welded joint subjected to bending moment ,design procedure, fillet weld sunder varying loads, stress relieving techniques.

Text Books:	
1.	Design of Machine Elements-V.B.Bhandari- TMH,NewDelhi
2.	Mechanical Engineering Design-Shigley– McGrawHill,Delhi

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Reference Books:	
1.	Machine Design-Moving– MIR Publishers, Moscow
2.	Machine Design-Fundamental & Application–Gope–PHI,NewDelhi
3.	Machine Design-Sharma & Agrawal– Katson,NewDelhi
4.	Principles of Mechanical Design-R. Phelan–McGrawHill,NewDelhi.
5.	MachineDesign–Sundarajamoorthy&Shanmugum–AnuradhaAgencies,Chennai

CourseOutcomes:	
Onsuccessfulcompletionofthecourse,thestudent willbeableto:	
1.	Select proper material for specific application with proper assumptions with respect to design stress, factor of Safety, stress concentration factor and theory of failure.
2.	Design and analyze Mechanical Joints, keys and couplings.
3.	Design and analyze shafts, axle and clutches.
4.	Design and analyze threaded fastener and power screws.
5.	Design and analyze riveted and welded joint.

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Chhattisgarh Swami Vivekanand Technical University,Bhilai	
Name of program: **Bachelor of Technology**	Semester:**VI**
Branch: **Mechanical Engineering**	Code: **C037612(037)**
Subject :**Manufacturing Technology**	Total Tutorial Periods:**01**
Total Theory Periods:**03**	Maximum Marks:**100**
Class Tests: **Two (Minimum)**	MinimumMarks:**35**
Assignments:**Two(Minimum)**	ESE Duration: **Three Hours**

CourseObjectives:

To impart basic knowledge and understanding about grinding, surface finishing, unconventional machining, bulk metal forming and sheet metal forming.

UNIT-I	**Grinding:** Processes. Grinding wheels, compositions- abrasives, bonding materials. Grinding wheel characteristics-abrasive type, grain size, bonding material, structure, and grade. Wheel specification and selection. Wheel life. Types of grinding operations, design consideration for grinding, specification of grinding wheel, process ,parameters, economics of grinding. Surfacefinishingoperations:Honing,lapping,superfinishing,polishing,buffing,processparameters andattainablegradesofsurfacefinish
UNIT-II	**Unconventional Machining:** Advantages, application and limitation, Processes-Electro Discharge Machining(EDM), Electro Chemical Machining(ECM),Ultrasonic Machining(USM), Abrasive Jet Machining (AJM),Electron Beam Machining (EBM), Laser Beam Machining (LBM), Electro Chemical grinding(ECG). Mechanics of metal removal, tooling, equipment ,process parameters and surface Finish obtained & specific applications
UNIT-III	**Introduction to metal forming:** Classification, Hot and Cold working. **Forging:** Principle. Forging operations, drawing out and upsetting. Types of forging method-smith,drop, press and machine forging. Forging equipment. Forging dies. Tools and fixture of forging, forgingdies. Forging design, Forging designs factors. Drop forging die design, Upset forging die design. Forgingpractice–sequenceofsteps.Forgingdefects.Inspectionandtestingofforgedparts. **Extrusion:**Principle,extrusionprocesses-hotextrusion,coldextrusions. Process parameters.Extrusion equipment.Extrusionofseamlesstubes.Extrusiondefects.
UNIT-IV	**Rolling:** Principle, classification of rolled products, Types of rolling mills, rolling mill train components,Rollpass sequences-break down passes, roughing passes, finishing passes.Rollpasses design forcontinuous mill. Roll separating force. Rolling load calculation. Power required in rolling. Effect of frontand back tensions. Effect of friction. Shape rolling operations-ring rolling, thread rolling. Defects inrolledproducts. **Drawing:** Principle. Wire drawing, tube drawing. Drawing equipments and dies. Calculation of drawingloadandpowerrequirement

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UNIT-V	**Sheet metal forming:** Types of presses, Selection of press, component sofa simple press, press working operations shear, bending. Shearing operations: Blanking, piercing ,trimming, shaving, nibbling and notching. Calculation of punching force and shear force. Punch and die size calculation.**Drawingoperation:**Principleofoperation.Drawdiesdesign. **Bending operation:** Principle of operation. Bend allowances .Bending force.Length of sheet estimation. Bendradius.Springbackeffect.Otheroperation:Spinning.Stretchforming,Embossing andCoining.

TextBooks:	
1.	Manufacturing Technology(Vol.-I&II)–P.N.Rao–Tata McGraw Hill Pub. Company, NewDelhi
2.	A Text Book of Production Technology(Manufacturing Processes)–P.C.Sharma–S.Chand

ReferenceBooks:	
1.	Manufacturing Engineering and Technology –S.Kalpakjian & S.R.Schmid– AWL,NewDelhi
2.	Tool Engineering & Design–G.R.Nagpal–Khanna Publishers–New Delhi
3.	A Text Book of Production Technology–O.P.Khanna – Dhanpat Rai&Sons, New Delhi
4.	Manufacturing Science – A.Ghosh & A.K. Mallik –East West Press Pvt.Ltd.,NewDelhi
5.	Production Technology–R.K.Jain–Khanna Publishers, New Delhi

CourseOutcomes:	
On successful completion of the course, the student will be able to:	
1.	Explain the principles and techniques of grinding and other surface finishing operations.
2.	Explain the principles and appropriateness of unconventional machining processes and analyze related Process parameters.
3.	Describe the principles and techniques of forging and extrusion operations, determine their suitability and Analyze related process parameters.
4.	Describe the principles and techniques of rolling and drawing operations and be able to analyze related Process parameters.
5.	Describe the principles and techniques of sheet metal forming operation and be able to analyze related Process parameters.

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Chhattisgarh Swami Vivekanand Technical University,Bhilai	
Name of program :**Bachelor of Technology**	Semester:**VI**
Branch: **Mechanical Engineering**	Code: **C037613(037)**
Subject: **Heat & Mass Transfer**	Total Tutorial Periods:**01**
TotalTheoryPeriods:**03**	MaximumMarks:**100**
ClassTests:**Two(Minimum)**	Minimum Marks: **35**
Assignments:**Two(Minimum)**	ESEDuration:**ThreeHours**

CourseObjectives:

The main objective of the course is to impart an understanding of the governing laws for heat and mass transfer; The focusison explaining steady state and transient conduction ,convection, heat transfer with phase change (boiling/condensation),heat exchangers ,radiation and mass transfer.

UNIT-I	**Introduction:**Heat transfer, Difference between heat transfer and thermodynamics, Various modes ofheattransfer,Fourier's,Newton'sandStefanBoltzman'sLaw,Combinedmodesofheattransfer,thermal diffusivity, overall heat transfer coefficient. The thermal conductivity of solids, liquids andgases,factorsinfluencingconductivity **Conduction:** Heat conduction without heat generation: Derivation of general differential equation ofheat conduction in Cartesian co-ordinate. One dimensional steady state conduction, linear heat flow through a plane and composite wall,heat conduction without heat generation in cylinder and sphere, Critical thickness of insulation. Conduction with heat generation in flat wall and solid cylinder.
UNIT-II	**Heat transfer from extended surface (Fins):**Types of fins, Fin equation for uniform cross sectional area(rectangular profile), Solution for infinite length, negligible heat loss from fin tip, finite long and heat transfer from fin tip .Fine effectiveness and efficiency . Error in temperature measurement from thermometer. **Transient/Unsteady State Heat Conduction:** Lumped system analysis ,criteria for lumped system analysis ,solution of transient heat conduction in large plane wall ,long cylinder sand sphere through Heisler`schart.
UNIT-III	**Forced Convection:** Physical Mechanism of Forced Convection, Dimensional analysis for forced convection, velocity and Thermal Boundary layer, Flow over plates, Flow across cylinders and spheres,Flowintubes,Reynold'sanalogy. **Natural Convection:** Physical Mechanism of Natural Convection ,Dimensional analysis of natural convection; empirical relationship for natural convection.
UNIT-IV	**Two Phase Heat Transfer:** Boiling heat transfer, Pool boiling, boiling regimes and boiling curve, heattransfer correlations in pool boiling. Condensation heat transfer, Film condensation, derivation for theaverage heat transfer coefficient 'h' for the case of laminar film condensation over vertical plate, Heat transfer correlation for inclined plates, vertical tubes, Horizontal bank tubes. **IntroductiontoMassTransfer:**Massandmoleconcentrations,moleculardiffusion,eddydiffusion, Molecular diffusion from an evaporating fluid surface, Introduction to mass transfer in laminar and turbulent convection Combined heat and mass transfer, the wet and dry bulb thermometer.

UNIT-V	**Heat Exchangers:** Different types of heat exchangers; Determination of heat exchanger performance, Heat exchanger transfer units, Analysis restricted to parallel and counter flow heat exchanger (LMTDandNTU method). **Thermal Radiation:** Introduction, absorbtivity, reflectivity & transmissivity. Concept of black body &grey body. Emissive power of surface, Kirchhoff's law, emissivity, Concept of shape factor. Radiat heat exchange between two parallel grey surface and concentric cylinders. Errors in temperature Measurement due to radiation. Concept of irradiation and radiosity.

TextBooks:	
1.	Heat Transfer–S.P.Sukhatme–TMH,Delhi
2.	Heat & Mass Transfer–D.S.Kumar–S.K. Kataria & Sons, Delhi

ReferenceBooks:	
1.	Heat transfer-C PArora,T MH ,Delhi
2.	Heat & Mass Transfer–R,Yadav,Central Publishing House,Allahabad
3.	Heat & Mass Transfer–R.K. Rajput,S.Chand,Delhi
4.	Heat & Mass Transfer–P.K. Nag,TMH,Delhi
5.	HeatTransfer–J.P.Holman–TMH,Delhi
6.	Heat Transfer–A Practical Approach–Yunus A. Cengel –Mc GrawHill, Delhi
7.	Heat Transfer–P.S.Ghosh dastidhar–Oxford University Press
8.	Heat And Mass Transfer Fundamentals And Applications-Cengel, Yunus,A and A J Ghajar,T MH,Delhi
9.	A Course In Heat And Mass Transfer-S.C. Arora & S Donkundwar,S- DhanpatRai, Delhi
10.	Heat and Mass Transfer Data Book-C.P.Kothandaraman C.P. &S. Subramanyan,NewAge, Delhi

CourseOutcomes:	
Onsuccessfulcompletionof thecourse,thestudentwillbeableto:	
1.	Explain the principles of heat transfer due to conduction, convection and radiation and analyze problems Related to conduction.
2.	Analyze problems related to heat transfer from extended surfaces and unsteady state heat conduction.
3.	Analyze problems related to forced convection and natural convection.
4.	Apply basic concepts of phase change processes and principles of mass transfer to solve relatedpractical problems.
5.	Analyzeheatexchangersandproblemsrelatedtoradiation.

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ChhattisgarhSwamiVivekanandTechnicalUniversity,Bhilai	
Name of program: **Bachelor of Technology**	Semester:**VI**
Branch: **Mechanical Engineering**	Code: **C037631(037)**
Subject: **Finite Element Analysis**	Total Tutorial Periods:**01**
Total Theory Periods: **02**	Maximum Marks:**100**
Class Tests: **Two(Minimum)**	Minimum Marks:**35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

CourseObjectives:

To introduce importance and applications of Finite Element Method /analysis and learn to apply to formulate fundamental engineering problems related to solid mechanics and heat transfer.

UNIT-I	**Introduction to finite element analysis:** Basic concepts of finite element analysis, steps infinite element analysis, finite element formulationtechniques:weightedresidualmethod,Ritztechnique,stiffness Matrix and boundary conditions. Numerical integration-one and two dimensional.
UNIT-II	**One-dimensional problems:** One dimensional second order equations dis cretization, element types-linear and higher order elements, derivation of shape functions and stiffness matrices and force vectors, assembly of matrices, solution of problems from solid mechanics and heat transfer .Direct formulation Of spring mass system.
UNIT-III	**Beam and truss elements:** Finite element formulation for linear static analysis of solids and structures: Beam and frame element, solutions of problems from beam and frame.
UNIT-IV	**Two dimensional scalar variable problems:** Second order 2D equations involving scalar variable functions, variational formulation, finite element formulation, triangular and quadrilateral elements – shape functions and element matrices, application of field problems-thermal problems, torsion of non Circular shafts.
UNIT-V	**Two dimensional vector variable problems:** Equations of elasticity, plane stress ,plane strain and Axis symmetric problems, body forces and temperature effects, stress calculations–plate and shell elements.

Text Books:	
1.	ReddyJN; An introduction to finite element method;TMH
2.	SeshuP; Text book of Finite Element Analysis; PHI.

Reference Books:	
1.	A First Course in Finite element Method; Logan DL; Cegage
2.	Finite Element Analysis, theory and programming; Krishnamoorthy;TMH
3.	Fundamentals of Finite Element Analysis;Hutton D; TMH
4.	The Finite Element Method in Engineering ;Rao ,S.S.,Peragamon Press, Oxford.
5.	Introduction to Finite Elements in Engineering ,Chandrupatla,T.R.and Belegundu,A.D.,PHI

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Describe the concepts of finite element formulations.
2.	Solve one dimensional solid mechanics and heat transfer problems.
3.	Solve one dimensional beam and frame element.
4.	Describe two dimensional elements and solve for thermal and tensional problems
5.	Solve problems related to plate and shell elements.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VI**
Branch: **Mechanical Engineering**	Code: **C037632(037)**
Subject: **Power Plant Engineering**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

The objective of this course is to provide an overview of power plants and the associated energy conversion issues.

UNIT- I	**Elements of Power Plant:** General Sources of power, Importance of Central Power Stations, types of power stations – steam, nuclear, diesel and hydro – Elements of modern power stations (Steams only) brief layout and arrangement of elements and complements, sitting of different power stations, foundation. Elements of Electric power systems primary and secondary distribution substations.
UNIT-II	**Steam Power Plant:** Steam power plants, selection of working medium, Heat Balance in steam cycles, Heat rates, comparison of efficiencies gas loop, fuels and fuel handling. Equipment's, fuel gas cleaning and ash handling. Air pre-heater, feed water pre-heaters, steam re-heaters, deaerators, feed water treatment, pumping and regulation water walls, modern developments in steam boilers, Important instrumentation and piping of gas and water loop. Factors to be controlled from maximum efficiency and variable output.
UNIT- III	**Hydro Electric power station:** Potential power with reference to rainfall and catchments area, Water storage, equipment used in hydroelectric power stations. Characteristics of hydraulic turbines. Comparison of the factors governing the cost of hydro steam and diesel power stations. **Diesel power station**: Suitability of diesel engines for bulk power, advantages and limitations of diesel, power stations, efficiency and heat balance.
UNIT- IV	**Nuclear Power Station**: Evolution of nuclear energy from atoms by fission and fusion. Chain reactions, fission materials, types of reactors, gas cooled, boiling water liquid, metal cooled and fast reactor, arrangements of various elements in a nuclear power station, stem cycles and boilers coolant heat exchangers, Reactor control,Reactor shielding and safety methods.
UNIT-V	**Variable load problems**: Idealized and realized load curves, effect of variable load on plant design and operation variable load operation and load dispatch. **Power station Economics**: Source of income, cost of plant and production, elements of cost, depreciation and replacement theory of rates

Text Books:	
1.	Power Plant Engineering – P.K. Nag – Tata McGraw-Hill Pub. Com., New Delhi
2.	Power Plant Technology - M. M. El-wakil– Tata McGraw-Hill

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Reference Books:	
1.	Power Plant Engineering - Elliot T.C., Chen K and Swanekamp R. C.- McGraw Hill.
2.	Text Book of Power Plant Engineering – R.K. Rajput – Laxmi Publications
3.	Power Plant Engineering – P.C. Sharma – S.K. Kataria& Sons
4.	Power Plant Engineering – G.R. Nagpal – Khanna Publishers
5.	Steam and gas turbine and power plant engineering- R. Yadav-CPH Allahabad
6.	A Course in Power Plant Engineering – S.C. Arora, S.Domkundwar – Dhanpat Rai & Co.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Describe the elements of power plant.
2.	Describe the working principle and basic components of steam power plants and analyze and its working .
3.	Describe the working principle and basic components of hydro electric and diesel power stationand analyze its working.
4.	Describe the working principle and basic components of nuclear power stationand analyze and its working.
5.	Discuss variable load problems and power station economic

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ChhattisgarhSwamiVivekanandTechnicalUniversity,Bhilai	
Name of program: **Bachelor of Technology**	Semester:**VI**
Branch: **Mechanical Engineering**	Code: **C037633(037)**
Subject: **Maintenance and Reliability**	Total Tutorial Periods:**01**
Total Theory Periods:**02**	Maximum Marks:**100**
Class Tests: **Two (Minimum)**	Minimum Marks:**35**
Assignments: **Two(Minimum)**	ESE Duration:**ThreeHours**

Course Objectives: The objective of this course is to impart an understanding of fundamentals of maintenanceand reliability engineering; the application of concepts of the course leads to the optimization of equipment, procedures, and departmental budgets to achieve better maintain ability, reliability ,and availability of equipment.

UNIT-I	**Maintenance Engineering:** Objective and functions, organization and administration, economics and maintenance policies . Types of maintenance systems-planned, unplanned, preventive, predictive, conditional monitoring, total predictive maintenance.
UNIT-II	**Failure Analysis:** Analysis of source, identification, classification and selectivity of failures, catastrophic, wear out and cumulative failures, failure rate Mortality distribution, statistical and reliability concept of failure analysis, equipment replacement policy.
UNIT-III	**Reliability Engineering:** Concept, bath tubcurve, elements, Hazard Models-constant, linearly increasing, weibull. System Reliability-Series configuration,parallel configuration, mixed configuration, reliability improvement – Improvement of components, Redundancy – element, unit, stand by, repairable and nonrepairable systems, reliability, availability, maintain ability, MTBF, MTTR, reliability allocation for simple series system.
UNIT-IV	**Maintenance Management:** Maintenance planning, maintenance scheduling, work orders, workmeasurement, maintenance cost budgeting, store and spare control, maintenance planning and control techniques,Incentives for maintenance work.
UNIT-V	**Maintenance of Mechanical System:** Introduction, Bearings, Friction Clutches, Couplings, Fastening Devices, Chains, Gear Drives ,Support Equipment, Cooling Towers.

Text Books:	
1.	Reliability, Maintain ability and Risk: Practical Methods for Engineer-David J.Smith- Elsevier Science
2.	Maintenance Engineering & Management–R.CMishra, K.Pathak–Prentice Hall of India, New Delhi

Reference Books:	
1.	Maintenance Engineering Handbook- by Keith Mobley, Lindley Higgins, Darrin Wikoff ,McGraw-Hill
2.	Maintenance Engineering–S.Shrivastava–S.Chand &Sons–New Delhi
3.	Industrial Maintenance–H.P.Garg–S.Chand Publication,New Delhi
4.	Maintenance Planning &Control–A.Kelly–TMH, New Delhi
5.	Concept in Reliability–LS.Srinath–Affiliated East- West Press,NewDelhi

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Explain the basic concepts and types of maintenance systems
2.	Describe failure analysis and equipment replacement.
3.	Apply their liability tools and techniques.
4.	Describe the various concepts of maintenance management.
5.	Discuss various tools for maintenance of mechanical system.

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Chhattisgarh Swami Vivekanand Technical University,Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:**VI**
Subject: **Design of Machine Element Lab**	Code: **C037621(037)**
Total Lab Periods: **48**	Batch Size–**30**
Maximum Marks:**40**	Minimum Marks:**20**

Course Objectives: The primary objective of this course is to learn how the principles learned in theory courses are applied to provide design solution.

List of Experiments/Activities

1.	Select a product used in day to day life and design the conceptual design by applying the design process taking the controllingparameters
2.	Make a list of mechanical components studied in and list out their materials and suggest some alternative materials for the each one of them.
3.	Design cotter joint and knuckle joint for given loading condition
4.	Find a flange coupling in the college laboratory and justify its design by actual measurements
5.	Design a shaft used in some practical application ,by actual working and loading conditions
6.	Justify the design of single plate clutch of an engine assembly
7.	Design a wall bracket, which is being used in real life by actual measurement of load using : a) Weldedjoints b) Riveted and bolted joints c) In addition, justify your findings.
8.	Design a screw jack.
9.	Design a machine element by using any software in some high level language or excel sheets for design of a component
10.	**Mini Project: Student team od maximum four students** will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. The report in given format will be submitted at the end of semester.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Design a daily use product by applying the conceptual design process and able to suggest some alternative material for it.
2.	Design Flange coupling/ shaft/ single plate clutch/screw jack used in practical application and justify its design
3.	Design welded joint/riveted joint/ bolted joint used in real life and justify its design.
4.	Design machine element using software.
5.	Design complete system/subsystem using design hand book and/or design software.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:**VI**
Subject: **Computer Aided Modeling & Analysis Lab**	Code: **C037622(037)**
Total Lab Periods:**48**	Batch Size-**30**
Maximum Marks:**40**	Minimum Marks:**20**

Course Objectives: The objective of this course is to develop skills among students to use modeling software to create 2D and 3D models of simple mechanical parts and analysis using modern tools.

List of Experiments

***(At least five exercises are to be* completed from each part)**

Part-I: Computer Aided Modeling	
1.	Introduction to modeling software ,and its working procedure.
2.	Discuss various CAD tools required to model the engineering problems such as extrusion, rotation, sweep, Boolean algebra etc.
3.	Modeling of part for structural problem such as bar,beam ,frame etc.
4.	Modeling of part for heat transfer problem such as plate ,shell etc.
5.	Modeling of part for fluid flow problems such as pipes, mixing elbow, flow over cylinder etc.
6.	Practice with 3D model like butterfly assembly, sprocket etc.
Part-II:Analysis	
1.	Introduction to analysis software and its working procedure.
2.	Discuss structural module of the software and mesh generation.
3.	Discuss CFD module of the software and mesh generation.
4.	Analysis of structural problem.
5.	Analysis of heat transfer problem.
6.	Analysis of fluid flow problem.

Note:

1. Computer aided modeling software Such as Creo, solidworks,Catiaetc.
2. Lab operating requirements: Computer system with good configuration depending upon the requirement of software .

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate working knowledge in Computer Aided Design methods and procedures.
2.	Construct solid modeling using 3D modeling standard software.
3.	Describe boundary conditions for structural, heat and fluid flow problems.
4.	Solve simple structural and heat problems using standard FEA software.
5.	Solve fluid flow problems using standard FEA software.

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Chhattisgarh Swami Vivekanand Technical University,Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:**VI**
Subject: **Heat & Mass Transfer Lab**	Code: **C037623(037)**
Total Lab Periods:**48**	Batch Size–**30**
Maximum Marks:**40**	Minimum Marks:**20**

Course Objectives: The objective of this laboratory course is to further rein force the students' under standing of the analysis of applications pertaining to Heat and Mass Transfer through suitably designed experiments.

List of Experiments:*(At least Ten experiments are to be performed by each student)*	
1.	To Determine Thermal Conductivity of Insulating Powders.
2.	To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3.	To Measure the thermal Conductivity of Liquid.
4.	To determine the transfer Rate & Temperature Distribution For a Pin Fin.
5.	To Measure the Emmissivity of the Test plate Surface.
6.	To Determine Stefan Boltzman Constant of Radiation Heat Transfer.
7.	To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
8.	Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.
9.	To Determine Critical Heat Flux in Saturated Pool Boiling.
10.	To Study Performance of Simple Heat Pipes.
11.	To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
12.	To Find the Heat transfer Coefficient in Forced Convection in a tube.
13.	To determine the total thermal conductivity and thermal resistance of the given compound resistance in series.
14.	To find out the thermal conductivity of given slab material.
15.	To determine the individual thermal conductivity of different lagging in a lagged pipe
16.	To study the rates of heat transfer for different materials and geometries
17.	To understand the importance and validity of engineering assumptions through the lumped heat capacity method.
18.	Testing and performance of different heat insulators

List of Equipment/Instruments/Machines/SoftwareRequired:	
1.	Thermal Conductivity of Insulating Powder Apparatus
2.	Thermal Conductivity of Metal Bar Apparatus
3.	ThermalConductivityofLiquidApparatus
4.	Transfer Rate and Temperature Distribution For A Pin Fin Apparatus

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5.	Emmissivity of The Test Plate Surface And Plotting A Graph of Emmissivity Versus Temperature Apparatus
6.	Stefen-Boltzman Constant Of Radiation Of Heat Transfer Apparatus
7.	Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection Apparatus
8.	Heat Transfer Coefficient In Drop Wise And Film Wise Condensation Apparatus
9.	Critical Hat Flux In Saturated Pool Boiling Apparatus
10.	Performance Of Different Heat Pipe Apparatus
11.	Heat Transfer Rate Through Heat Exchanger Apparatus
12.	Heat Transfer Coefficient In Forced Convection of Air in a Tube Apparatus
13.	Heat transfer through composite wall Apparatus
14.	Thermal conductivity of insulating slab Apparatus
15.	HeattransferthroughlaggedpipeApparatus
16.	UnsteadystateheattransferApparatus
17.	TestingandperformanceTestRigforheatinsulators

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate conduction,convection and radiation heat transfer through experiments.
2.	Determine thermal conductivity and temperature distribution in different system.
3.	Determine heat transfer coefficient of different system.
4.	Determine emissivity and Stefen-Boltsman constant of radiation.
5.	Analyze the performance characteristics of heat transfer equipments.

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ChhattisgarhSwamiVivekanandTechnicalUniversity,Bhilai	
Name of program:**Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester:**VI**
Subject: **Virtual Lab2**	Code: **C037624(037)**
Total Lab Periods:**48**	Batch Size–**30**
Maximum Marks: **40**	Minimum Marks:**20**

Courseobjective:

The objective of this course is to inculcate a habit of self learning in our students through virtual lab. Virtual Labs isa project initiated by the Ministry of Human Resource Development, Government of India, under the National Mission on Education through Information and Communication Technology. Virtual lab provides remote experimentation which furnishes basic leaning skill, and built advanced concepts as well. It provide complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.

ListofExperiments

Sl.	Name of Virtual Lab	Website link	
A.	**Remote Triggered Virtual Lab on Automotive Systems**	**http://vlabs.iitkgp.ac.in/rtvlas/**	**(Any03)**
	1. PV Diagram of a SI Engine 2. Torque Crank Angle Curve of a SI Engine 3. Load Test on a SI Engine 4. Mechanical Efficiency of a SI Engine 5. Determination of Cylinder Mean Effective Pressure 6. Engine Health Monitoring by Vibration Analysis 7. Variation of Exhaust Noise with Engine Speed 8. Tensional Vibrations of an Engine		
B.	**Machine Dynamics and Mechanical Vibrations Lab**	**http://mdmv-nitk.vlabs.ac.in/#**	**(Any02)**
	1. Free vibration of cantilever beam 2. Free vibration of simply supported beam 3. Free vibration of fixed beam 4. Forced vibration of SDOF system 5. Base Excitation 6. Rotating Unbalance 7. 2D OF Forced vibration 8. Dynamic Vibration Absorber		

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C.	**Rotating Machinery Fault Simulation Lab**	**http://vlabs.iitkgp.ac.in/rmfs/**	**(Any02)**
	1. Diagnosis of Shaft Misalignment and its Effects 2. Static Balancing Studies of Rotary Systems 3. Mechanical Looseness 4. Bearing Defects of Various Types 5. Effects of Bent Shafts on Rotor Performance 6. Cavitation of Centrifugal Pump		
D	**Fabrication Laboratory (FABLAB)**	http://fab-coep.vlabs.ac.in/	**(Any02)**
	1. Computer Controlled Cutting of wooden object 2. 3D Machining 3. PCB design & fabrication 4. Interface & Application Programming 5. Digital Fabrication of Flexible Circuit board 6. Digital Fabrication and Project Development		
E.	**Metal forming virtual simulation Lab**	**http://msvs-dei.vlabs.ac.in/msvs-dei/**	**-**
	Study of metal forming processes ,equipments and applications.		

Equipment/Machines/Instruments/Tools/Software Required:	
1.	Computer system with good connectivity to Internet, any specific software is not required.

Note:	
1.	Refer Virtual Labs website which is an initiative of ministry of education under the national mission on Education through ICT to conduct virtual lab .Link: https://www.vlab.co.in/
2.	It is advised to visit https://www.vlab.co.in/broad-area-mechanical-engineering frequently for any update And new experiments on the listed subjects.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze auto motive systems.
2.	Analyze vibration through virtual simulator.
3.	Analyze rotating machinery fault
4.	Describe digital fabrication after learning the process through fabrication laboratory
5.	Describe metal forming processes ,equipments and applications.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Program / Semester: **B.Tech (VI)**	Branch: **Humanities**
Subject: **Technical Communication & Soft Skills**	Course Code: **C000601(046)**
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication&writing CVs, Cover Letters for correspondence.Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting.On Saying "Please", How to say "NO".

UNIT-5Positive Pschycology: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger, Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman& Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three "As" of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: **D037711(037)**
Subject: **Design of Transmission System**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks**: 100**
Class Tests: **Two(Minimum)**	Minimum Marks: **35**
Assignments: **Two(Minimum)**	ESE Duration: **Four Hours**

Course Objectives:

The objective of this course is to impart skills required to model, analyze and design different components of transmission system e.g. gears, spring, brakes, bearings, chain drive, belt drive etc.

UNIT-I	**Gears:** Gear Drives, Classification of Gears, Selection of type of Gears **Spur Gears:**Law of Gearing, Force Analysis, Gear Tooth Failures, Selection of Material, Number of Teeth, Face Width, Beam Strength of Gear Tooth, Effective Load on Gear Tooth, Estimation of Module Based on Wear Strength, Lewis equation, Gear Design for Maximum Power Transmitting Capacity, Gear Lubrication.
UNIT-II	**Helical Gears:** Helical Gears, Terminology of Helical Gears, Virtual Number of Teeth, Tooth Proportions, Force Analysis, Beam Strength of Helical Gears, Effective Load on Gear Tooth, Wear Strength of Helical Gears. **Bevel Gears:** Bevel Gears, Terminology of Bevel Gears, Force analysis, Beam strength of Bevel Gears, Wear Strength of Bevel Gears, Effective Load on Gear Tooth.
UNIT-III	**Spring:** Spring materials and their mechanical properties, Equation for stress and deflection, Helical coil Springs of circular section for tension, Compression and torsion, Dynamic loading, Fatigue loading, Wahl line, Leaf spring and laminated spring. **Brakes:** Energy equation, Types of brakes, Block brake, Band brake, Disk brake, Thermal consideration.
UNIT-IV	**Bearings - Rolling Contact Bearings:** Types of ball and roller bearings, selection of bearing for radial and axial load, bearing life, methods for selection of bearings for cyclic load ,Reliability of bearings , Bearing failure causes and remedies. **Sliding Contact Bearings:** Modes of lubrication, viscosity , Petroff's equation and McKee"s curve, , Hydrodynamic theory of lubrication, Journal Bearing design – Selection of parameters, Sommerfeld number, heat balance, self-contained bearings, bearing materials.
UNIT-V	**Chain Drives:** Chain drives, roller chains, geometric relationships, designation,dimensions of chain components, polygonal effect, selection of roller chain, power rating of roller chains. **Belt Drives**: Flat and V-belts, belt constructions, geometrical relationships for length of the belt, analysis of belt tensions, condition for maximum power, selection of flat & V-belts, adjustment of belt tensions.

TextBooks:

1.	Design of Machine Elements, V.B.Bhandari, TMH, New Delhi
2.	Mechanical Engineering Design, Shigley, McGraw Hill, Delhi

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ReferenceBooks:	
1.	Design Data Book, PSG, Coimbtore
2.	Machine Design, Movnin, MIR Publishers, Moscow
3.	Machine Design - Fundamental & Application, Gope, PHI, New Delhi
4.	Machine Design, Sharma &Agrawal, Katson, New Delhi
5.	Principles of Mechanical Design, R. Phelan, McGraw Hill, New Delhi

CourseOutcomes:	
On successful completion of the course, the student will be able to:	
1.	Model, analyze and design spur gears.
2.	Model, analyze and design helical and bevel gears.
3.	Model, analyze and design springs and brakes.
4.	Model, analyze and design bearings.
5.	Model, analyze and design chain and belt drives.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: **D037712(037)**
Subject: **Refrigeration and Air Conditioning**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is to familiarize with the terminology associated with refrigeration and air conditioning systems and to acquire the skills required to model, analyze and design different refrigeration as well as air conditioning processes and components.

UNIT-I	**Introduction:** Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle. Vapour Compression Refrigeration System, Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle, Introduction to Multiple Evaporator and compound compression systems.
UNIT-II	**Gas Cycle Refrigeration:** Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative H.E. **Air Cycle for Aircraft:** Necessity of cooling of aircraft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.
UNIT-III	**Vapour Absorption System:** Simple vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System. **Refrigerants:** Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants. **Refrigeration Equipments:** Compressor, condenser, evaporator, expansion devices – types & working.
UNIT-IV	**Psychrometry:** Psychrometric properties, psychometric relations, psychrometric charts, psychrometric processes, cooling coils, By-pass factor and air washers. Human Comfort Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.
UNIT-V	**Cooling Load Calculations:** Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, **Air Conditioning System:** Central, split and window air conditioning system.

TextBooks:

1.	Refrigeration and Air Conditioning –C. P. Arora – TMH,Delhi
2.	Refrigeration and Air Conditioning – Manohar Prasad – New Age - Delhi

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ReferenceBooks:	
1.	Refrigeration and Air Conditioning – Arora&Domkundwar – DhanpatRai,Delhi
2.	Refrigeration & Air Conditioning-R.K.Rajput-S.K. Kataria, Delhi
3.	Refrigeration and Air Conditioning – P.L. Ballaney – KhannaPub.,Delhi
4.	Refrigeration & Air Conditioning – AhmadulAmeen - PHI, Delhi
5.	Refrigeration and Air Conditioning- Stocker & Jones, McGraw Hill, Delhi
6.	Basic Refrigeration and Air-Conditioning- P.N.Ananthanarayanan, TMH,Delhi
7.	Principles of Refrigeration-Roy J.Dossat , -Pearson,Delhi
8.	Refrigeration and Air Conditioning –R.C.Arora -PHI, Delhi
CourseOutcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze vapour compression refrigeration system.
2.	Analyze gas and air cycle refrigeration system.
3.	Analyze vapour absorption system, describe refrigerant and refrigeration equipment.
4.	Explain terminologies ofpsychrometry and human comfort and apply to analyze related problems.
5.	Carry out cooling load calculations and describe air-conditioning systems.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program :**Bachelor of Technology**	Semester:**VII**
Branch: **Mechanical Engineering**	Code: **D037713(037)**
Subject:**Automation in Manufacturing**	TotalTutorialPeriods:**01**
TotalTheoryPeriods:**02**	MaximumMarks:**100**
ClassTests:**Two(Minimum)**	MinimumMarks:**35**
Assignments:**Two(Minimum)**	ESEDuration:**ThreeHours**

Course Objectives:
The objective of this course is to impart anunderstanding of the importance of automation in the of field machine tool based manufacturing, the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC and the basics of product design.

UNIT-I	**Introduction:** Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling, Assembly, Flexible fixturing.
UNIT-II	**Computer Aided Design:** Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods.
UNIT-III	**Computer Aided Manufacturing:** CNC technology, PLC, Micro-controllers, CNC-Adaptive Control
UNIT-IV	**Low cost automation:** Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies.
UNIT-V	**Introduction to Modeling and Simulation:** Product design, process route modeling, Optimization techniques, Case studies & industrial applications.

TextBooks:

1.	Automation, Production Systems, and Computer-integrated Manufacturing, Mikell P. Groover, Prentice Hall
2.	Manufacturing – Engineering and Technology, SeropeKalpakjian& Steven R. Schmid, 7th edition, Pearson

ReferenceBooks:

1.	Computer control of manufacturing system, YoramKoren, 1st edition
2.	CAD/CAM: Theory & Practice, Ibrahim Zeid, 2nd edition.

CourseOutcomes:

Onsuccessfulcompletionofthecourse,thestudent willbeableto:

1.	Illustrate the basic concepts of automation in machine.
2.	Explain the fundamentals of CAD.
3.	Explain the basics of computer aided manufacturing.
4.	Discuss the low cost automation systems.
5.	Explain the basic concepts of modeling and simulation.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **VII**
Subject: **Refrigeration & Air-Conditioning Lab**	Code: **D037721(037)**
Total Lab Periods: **24**	BatchSize–**30**
MaximumMarks:**40**	MinimumMarks:**20**

Course Objectives:
The main objective of the course is to further reinforce the students understanding of the refrigeration and air conditioning through suitably designed experiments in refrigeration & air-conditioning lab.

List of Experiments: (At least Seven experiments are to be performed by each student)

1. To study domestic refrigerator.
2. To study the hermetically sealed compressor.
3. To study Refrigeration Tutor and to determine the following:-
   a. Theoretical coefficient of performance
   b. Actual coefficient of performance.
   c. Theoretical capacity of the plant
   d. Actual capacity of the plant
4. To study the mechanical heat pump and to determine the following:-
   a. Theoretical coefficient of performance
   b. Actual coefficient of performance.
   c. Theoretical capacity of the plant
   d. Actual capacity of the plant
5. To study the air and water heat pump and to determine the following:-
   a. Theoretical coefficient of performance of the system as a refrigerator and as a heat pump.
   b. Actual coefficient of performance of the system as a refrigerator and as a heat pump.
   c. Capacity of the system in tons as a refrigerator.
   d. Capacity of the system in kW as a heat pump under the following conditions of operation:-
      i. Water cooled condenser and water-cooled evaporator.
      ii. Water-cooled condenser and air-cooled evaporator.
      iii. Air-cooled condenser and air-cooled evaporator.
      iv. Air-cooled condenser and water-cooled evaporator.
6. To study the following processes onthe air conditioning test rig:
   a. Sensible heating
   b. Sensible cooling
   c. Sensible cooling/cooling dehumidification
   d. Humidification and cooling
7. To find the efficiency of cooling tower test rig.
8. To study the simple vapor absorption system.
9. To study the AC Simulator and to determine the following:
   a. Sensible heating
   b. Sensible cooling
   c. COP of R-22
   d. Air washer efficiency
   e. Sensible heat load applied
   f. Latent heat load applied
   g. RSHF
   h. ESHF
   i. Creation of different climatic conditions in AC simulator

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Describe the construction and working of different refrigeration and air conditioning equipments.
2.	Analyze performance parameters of refrigeration system.
3.	Analyze performance parameters of mechanical heat pump.
4.	Analyze performance parameters of air conditioning system.
5.	Simulate and analyze various air conditioning processes.

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Chhattisgarh Swami Vivekanand Technical University,Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **VII**
Subject: **CIM & Automation Lab**	Code: **D037722(037)**
TotalLabPeriods:**24**	BatchSize–**30**
MaximumMarks:**40**	MinimumMarks:**20**

Course Objectives: The main objective of the course are:to demonstrate the concepts discussed in Computer Integrated Manufacturing course, to introduce CNC part programming for simulation of various machining operations, to educate the students on Flexible Manufacturing System and Robot Programming and also on the hydraulics, pneumatics and electro–pneumatic systems.

List of Experiments:	
1.	**PART – A** CNC part programming using CAM packages. Simulation of Turning, Drilling, Milling operations. 3 typical simulations to be carried out using simulation packages like Master- CAM, or any equivalent software.
2.	**PART – B** **(Only for Demo/Viva voce)** a. FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components. b. Robot programming: Using Teach Pendent & Offline programming to perform pick and place, stacking of objects, 2 programs.
3.	**PART – C** **(Only for Demo/Viva voce)** Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.

CourseOutcomes:	
Onsuccessfulcompletionof thecourse,thestudentwillbeableto:	
1.	Demonstrate an understanding of concepts discussed in Computer Integrated Manufacturing courseandits implementation in manufacturing
2.	Write CNC part programs using CADEM simulation package for simulation of machining operations such as Turning, Drilling & Milling.
3.	Write programs for Flexible Manufacturing Systems.
4.	Write programs for Robotics.
5.	Demonstrate an understanding of the operating principles of hydraulics, pneumatics and electro–pneumatic systems.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: **D037731(037)**
Subject: **Machine Tools Technology**	Total Tutorial Periods: **01**
Total Theory Periods: **01**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of this course is to impart understanding cutting tool geometry,tool material,mechanics ofmetalcutting,machinability,cuttingfluid, thekinematicsof speedandfeed gearbox andprocedureofacceptancetestofmachinetool.	
Unit- I	**CuttingTool**–Types,requirements,specification&application **Geometry of Single Point Cutting Tool-** tool angle, Tool angle specification system, ASA, ORS and NRS and inter-relationship. **Mechanics of Metal Cutting** Theories of metal cutting, chip formation, types of chips,chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting.
Unit- II	**Machinability:** Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life,Tool life equation, Machinability index, factors affecting machinability. **Thermal Aspects in Machining and Cutting Fluid** Source of heat in metal cutting and its distributions ,temp measurement in metal cutting ,function of cutting fluid, types of cutting fluid.
Unit- III	**Design of Machine Tool Elements:** Design of Lathebed-Material and construction feature, various bed section, analysis of force under head stock, tail stock and saddle, torque analysis of lathe bed, bending of lathe bed, designing for torsional rigidity, use of reinforcing stiffener inlathebed. Design of Guide ways, Material and construction features, overturning diagram ,Antifriction guide ways.
Unit- IV	**Design of Speed Gear Box:**Drives in Machine Tool, classification, selecting maximum and minimum cutting speeds, speed loss, kinematicadvantageofGeometric progression, kinematic diagrams,design of GearBox of6,9,12 and18 speeds.
Unit- V	**Design of Feed Gear Box:** Elements of feed gear box, classification-Norton drive, draw key drive, Meander's drive, Design of feed gear box forlongitudinalandcross feedand for threadcutting. **Acceptance Test of Machine tool:** Testing, Geometrical checks ,measuring equipment for testing, acceptance test for Lathe and Radial drilling machines

Text Books:	
1	Machine Tool Engineering–G.R. Nagpal– Khanna Publishers, NewDelhi
2	Fundamentals of Metal Cutting & Machine Tool–B.L.Juneja ,G.S.Sekhan ,Nitin Sethi–New Age Publishers–New Delhi

Reference Books:	
1	Manufacturing Engineering & Technolgy–Serope Kal pakjian-Pearson,Delhi
2	Production Technology–R.K.Jain–Khanna Publisher–New Delhi
3	Manuacturing Technology Vol.-II–P.N.Rao –TMH Delhi
4	Production Engineering – P.C. Sharma–S.Chand & Company–NewDelhi
5	Principle of Metal Cutting-Sen, Bhattacharya–New Central Book Agency,Calcutta

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Demonstrate an understanding of cutting tool materials and tool geometries and apply mechanics of metal cutting for analysis of related problems.
2	Demonstrate an understanding of concepts of machinability, mechanism of tool failure, thermal aspects in machining and cutting fluid.
3	Describe the construction features of machine tool elements and analyze the forces and torque acting on it.
4	Design speed gear box.
5	Design feed gear box and describe acceptance tests of machine tools.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: **D037732(037)**
Subject: **Quality Control & Total Quality Management**	Total Tutorial Periods: **01**
Total Theory Periods: **01**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The objectives of the course are:to define and understand various terms associated with quality control, enhance the students understanding of the complexity of statistical analysis and interpretation, provide an introduction to the fundamental concept of SPC, total quality management, six sigma, quality function deployment and applications of these concepts, understanding the philosophies of TQM in order to better evaluate the TQM implementation proposals and access exactly where an organization stands on quality management with respect to ISO 9000 quality management.

Unit- I	**Basic Concept of Quality:** Quality and quality control, concept of quality, quality characteristics, Quality of design and quality of conformance ,History of quality control, Quality policy and objectives, Economics of quality. **Statistical Concept of Variation:** Concept of variation frequency distribution, continuous and discrete, probability distributions viz. Normal, Exponential and Weibull distribution,pattern of variation, significance tests, Analysis of variance, statistical aids in limits and tolerances.
Unit- II	**Quality Assurance:** Concept, advantages, field complaints, quality rating, quality audit, inspection planning, quality mindness, quality budget, vendor quality rating (VQR), vendor rating (VR), manufacturing planning for quality, Quality function deployment (QFD). **Statistical Quality Control:** Objectives, Growth and applications of S.Q.C., S.O.C, Techniques in manufacturing planning. Process capability analysis, Control charts forvariables and attributes and their analysis, process capability, concept of six sigma.
Unit-III	**Acceptance Sampling:** Fundamental concept in acceptance sampling, operating characteristics curve. Acceptance plans, single, double and introduction of multiple plans.
Unit-IV	**Total Quality Management:** Total Quality Control (TQC), Concept of Total Quality Management (TQM), TQM philosophies, Deming approach to TQM, Juran ten steps to Quality Management, Taguchi Philosophy, Crosby fourteen steps, TQM models, Tools and techniques of TQM.
Unit- V	**Quality system:** Quality system, need for quality system, ISO 9000 Quality Management Standards, ISO 9000:2000 requirement, Quality Auditing, ISO 14000, Benefits of ISO 14000

Text Books:

1	Quality Planning and Analysis –Juran&Gryana – McGraw Hill, New York
2	Statistical Quality Control – R.C. Gupta – Khanna Publishers, Delhi

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Reference Books:	
1	Statistical quality control – Grant and Leavenworth – McGraw Hill, New York
2	Engineering Statistics and Quality Control – I. W. Burr- McGraw Hill, New York
3	Managing for Total Quality - Logothetis – PHI Delhi
4	Statistical Quality Control – M. Mahajan – DhanpatRai – New Delhi
5	Total Quality Management – Suganthi& Samuel - PHI, Delhi
6	Total Quality Management - Charantimath, Poornima – Pearson, Delhi
7	Total Quality Management – K.C. Arora - S.K. Kataria- New Delhi

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Explain the basic concept of quality &statistical concept of variation.
2	Demonstrate the understanding of basic concepts of quality assurance & use of the control charts.
3	Apply the principles of acceptance sampling to solve practical problems.
4	Demonstrate an understanding on quality management philosophies and frameworks
5	Demonstrate an in-depth understanding of Quality System.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: **D037733(037)**
Subject: **Thermal System Design**	Total Tutorial Periods: **01**
Total Theory Periods: **01**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of this course is to impart understanding of the concepts of thermal system design and to familiarize with modeling, simulation and optimization techniques of thermal systems

Unit- I	**Introduction to Thermal System Design:** Thermal system design, concept and major applications, categories of thermalsystem design. **Designing A Workable Thermal System:** Introduction, Workable vs. Optimum system, various design basis, design of a food freezing plant and several other examples
Unit- II	**Economics of Thermal Systems:** Introduction, Major and minor costs, Interest, present and future worth, economicevaluation of thermal system design, Life cycle costing (LCC)method of economic evaluation, Effect of inflation, Presentworth of yearly installment taking inflation into account, Preliminary cost estimation, equipment cost estimating parameter,effect of time factor on costs, energy costs, Taxes, Depreciation.
Unit- III	**Modeling of Thermal Systems:** Introduction, curve fitting or equation fitting for one, two and polynomial independentvariable, Example of curve fitting for thermal systems, Best fit equation, least square method with example, Some example ofmathematical modeling of thermal systems.
Unit- IV	**Thermal System Simulation:** Introduction, classes of systems, information flow diagrams, Sequential and simultaneouscalculations, Formulation of information flow diagram of thermal systems some example like water pumping systems, wasteheat utilization systems. **Methods of Simultaneous Calculations**: Successive substitution method and Newton-Raphson method, Newton-Raphson method for multiple functions, Simulation of Gas turbine system.
Unit- V	**Optimization of Thermal Systems:** Introduction, Mathematical representation of optimization problem with example ofwater chilling system, Lagrange multipliers, Heat exchanger optimization with Lagrange multipliers

Text Books:

1	Design of Thermal Systems - Stoecker W.F. - McGraw Hill
2	Advanced Thermodynamic for Engineers - Wark K. - John Wiley

Reference Books:

1	Advanced Engineering Thermodynamics - Bejan A. - John Wiley
2	Advanced Engineering Thermodynamics - Annamalai K. &Puri - CRC Press
3	Thermal Design & Optimization - Bejan A., Tsatsarones G. & Moran M - John Wiley
4	Fundamentals of Engineering Thermodynamics - Moran M.J. & Shapiro H.N - John Wiley

Course Outcomes:

On successful completion of the course, the student will be able to:

1	Demonstrate a basic understanding of concepts of thermal system design.
2	Discuss about economics of thermal system
3	Model and analyze of thermal systems.
4	Demonstrate a basic understanding of concepts of thermal system simulation and methods of simultaneous calculations.
5	Demonstrate a basic understanding of optimization of thermal systems.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: D037734(037)
Subject: **Industrial Hydraulics**	Total Tutorial Periods: **01**
Total Theory Periods: **01**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is impart an understanding of basic concepts, terminologies, construction and working principle of various hydraulic power system, pumps, actuators, valves ,hydraulic circuits, accumulators and intensifiers.

Unit- I	**Fluidics:** Technology, Terminology, types of fluid logic elements, amplifiers, logic states, methods of obtaining input signals and power outputs, application of fluidics, third generation fluidics.
Unit- II	**Hydraulic Fluid:** Types of hydraulic fluids, properties of fluid, selection of fluids, JIC/ISO symbols for hydraulic circuits. **Fluid Power System:** Components, advantages, applications in the field of Machine Tools, material handling, presses, mobile and stationary machines, clamping & indexing devices etc., transmission of power at static and dynamic states.
Unit-III	**Pumps:** Types, classification, principle and working of vane, gear, radial and axial plunger pumps, power and efficiency calculations, selection of pumps for hydraulic transmission. **Actuators:** Linear and rotary actuators, hydraulic motor types & construction methods of control of acceleration, types of cylinder and mountings, calculation of piston velocity, thrust under static and dynamic application.
Unit-IV	**Control of Fluid Power:** Principle, working types of the following valves, pressure control, direction control, flow control, relief valves, sequence values etc.
Unit- V	**Hydraulic Circuits:** Meter in, meter out circuits, Pressure control for cylinders, Flow divider circuits, Circuit illustrating use of pressure reducer valves, sequence valve, counter balance valves, unloading valves with the use of electrical control, accumulators etc. **Accumulators and Intensifiers:** Types, function, application, selection and design procedure.

Text Books:

1	Hydraulic Machines including fluidics – Dr. JagdishLal, Metropolitan Book Company, New Delhi
2	Introduction to Fluid Power – Sahastrabadhe, NiraliPrakashan, Pune

Reference Books:

1	Industrial Hydraulics manual by Vickers
2	Industrial Hydraulics – Pipenger & Hicks, McGraw Hill Company, New York
3	Hydraulics Vol. 1 & 2 by Rexroth
4	Fluid Power – Goodwin

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Explain basic concepts and terminologies of fluidics.
2	Describe various fluid power systems.
3	Describeconstruction and working principle of various pumps &actuators.
4	Describeconstruction and working principle of various type of valve.
5	Demonstrate understanding of hydraulic circuits, accumulators and intensifiers.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **VII**
Branch: **Mechanical Engineering**	Code: D037735(037)
Subject: **Applied Elasticity and Plasticity**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is to study the classical theory of linear elasticity for two and three dimensional state of stress and obtain solutions for selected problems and to understand the plastic stress strain relations, criteria of yielding and elasto-plastic problems.

Unit- I	**Theory of Elasticity:** Introduction, Definition of stress and strain at a point, components of stress and strain at a point in cartesian and polar co-ordinates, constitutive relations, equilibrium equations, compatibility equations and boundary conditions in 2-D and 3-D cases. Transformation of stress and strain at a point, principal Stresses and principal strains, invariants of stress and strain, hydrostatic and deviatoric stress, spherical and deviatoric strains, maximum shear stress, maximum shear strain.
Unit- II	**Plain Stress and Plain Strain:** Airy's stress function approach to 2-D problems of elasticity, simple problems of bending of beams, solution of axis-symmetric problems, stress concentration due to the presence of a circular hole in planes.
Unit-III	**Elementary Problems of Elasticity in Three Dimensions:** Stretching of a prismatic bar by its own weight, twist of circular shafts, torsion of non-circular sections, membrane analogy, Propagation of waves in solid media. Applications of finite difference equations in elasticity
Unit-IV	**Theory of Plasticity:** Stress-strain diagram in simple tension, perfectly elastic, Rigid - Perfectly plastic, Linear work - hardening, Elastic Perfectly plastic, Elastic Linear work hardening materials, Failure theories, yield conditions, stress - space representation of yield criteria through Westergard stress space, Tresca and Von-Mises criteria of yielding
Unit- V	**Plastic Stress-Strain Relations:** Saint Venant's Theory of Plastic flow, Elastic plastic Deformations, Prandtl's stress equations, Levy - Mises equation, Reuss theory of elastic - plastic deformation, Hencky's theory of small plastic deformations, Plastic potential, Flow Rule.

Text Books:

1	Theory of Elasticity – Sadhu Singh – Khanna Publisher, New Delhi
2	Theory of Plasticity – Sadhu Singh - Khanna Publisher, New Delhi

Reference Books:

1	Theory of elasticity -Timoshenko and Goodier - McGraw Hill
2	Theory of Plasticity - J. Chakrabarthy - McGraw Hill
3	Plastic Analysis of Structures-P. S. Hodge-John Wiley and Sons.
4	Plastic Methods of Structural Analysis-Neal B. G.-Chapmen and Hall, 1977, III Edition.
5	Plasticity for Mechanical Engineers-W. Johnson and P. B. Mellor-D.VanNostrand
6	Introduction to the Theory of Plasticity for Engineers-Haffman& Sachs-Mc,Graw Hill.
7	Theory of Inelastic structures-T. H. Lin-John Wiley and sons.
8	Plastic Analysis and Design of Plates, Shells and Discs- Massonnet-North Holland.
9	Plastic Design of Steel Frames-Beedle L. S.-John wiley.
10	Foundations of Solid Mechanics- Y. C. Fung- Prentice-Hall.

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11	Continuum Mechanics fundamentals- S. Vallappan-Oxford and IBH.
12	Theory of Plasticity-M. Kachanov-Mir publishers, Moscow.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Discuss the basics of theory of elasticity and principle stresses and strains.
2	Apply plain stress and strain to solverelated problems.
3	Solve the elementary problems of elasticity in three dimensions
4	Explain the basics of theory of plasticity.
5	Discuss the theories related to plastic stress-strain relations.

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Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program: Bachelor of Technology
Semester: B. Tech – 7th **Branch: Mechanical Engg.**
Subject: Universal Human values 2 **Course Code: D000701(046)**
Total Marks in End Semester Exam: **L: T: P: 2 Credits: 0**

Course Objective(s):

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I Introduction- Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
- Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in 'I'.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.
- Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life.
- Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
- Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

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- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
- Holistic perception of harmony at all levels of existence.
- Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  - At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  - At the level of society: as mutually enriching institutions and organizations
- Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
3. Small is Beautiful - E. F Schumacher.

Course Outcome:

After completion of course, student should be able to

- To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Subject Code: **D037811(037)**
Subject: **Robotics**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks**: 100**
Class Tests: **Two(Minimum)**	Minimum Marks: **35**
Assignments: **Two(Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

The main objective of the course is to impart an understanding of fundamentals of robotics, theory of robot design and their applications.

UNIT-I	**Introduction:** Fixed & flexible automation, evolution of robots and robotics, laws of robotics, progressive, advancement in robots, manipulator anatomy, arm configuration & workspace, human arm characteristics, design and control issues, manipulation and control, actuators, sensors and vision, programming of robots, applications material handling, processing applications, assembly applications, inspection applications etc, the future prospects, notations.
UNIT-II	**Coordinate Frames, Mapping and Transforms:** Coordinate frames, description of objects in space, transformation of vectors, inverting a homogeneous transform, fundamental rotation matrices. Mechanical structure and notations, description of links and joints, kinematic modeling of the manipulator.
UNIT-III	**Kinematic Modeling of Robots:** Denavit Hartenberg notation, kinematic relationship between adjacent links, manipulator transformation matrix. Position analysis - direct and inverse kinematic models of robotic manipulators, various examples, velocity analysis-Jacobian matrix, introduction to inverse kinematic model.
UNIT-IV	**Robotic Sensors and Vision:** Introduction regarding sensing technologies, sensors in robotics, classification, characteristics, internal sensors – position, velocity, acceleration sensors, force sensors, external sensors–proximity, touch and slip sensors. Robotic vision, process of imaging, architecture of robotic vision systems, image acquisition, components of vision system, image representation, image processing
UNIT-V	**Motion Planning and Control of Robot Manipulators:** Trajectory planning of robotic manipulator: joint space and Cartesian space techniques. Open and close loop control, linear control schemes, examples of control models. **Robot applications:** Industrial applications, material handling, processing applications, assembly applications, inspection application, principles for robot application and application planning, justification of robots, robot safety, non-industrial applications, and robotic application for sustainable development.

Text Books:

1.	Robotics & Control–R.K.Mittal & I.J.Nagrath–TMH Publications.
2.	Introduction to Robotics Analysis, Systems Applications-Saeed B .Niku, Pearson

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Reference Books:	
1.	Principle of Robot Motion-Choset–PHI, Delhi
2.	Kinematics and Synthesis of linkages–Hartenberg and Denavit–McGrawHill.
3.	Robotics Control Sensing-Vision and Intellgence – K.S.Fu, McGrawHill.
4.	Robotic Engineering–An Integrated Approach-R.D.Klafter– PHI.Delhi.
5.	Introduction to Robotics- S.K.Saha – McGraw Hill.
6.	Introduction to Robotics–Mechanics and Control-John J.Craig

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate the basic knowledge of terminologies, characteristics, components and applications of robotics systems.
2.	Apply spatial transformation to obtain forward kinematics equation of robot manipulators.
3.	Perform position analysis and velocity analysis of direct and inverse kinematic models of robots.
4.	Describe sensing technologies and robotics vision system and choose the appropriate for a given application.
5.	Develop and analyze the mathematical model for motion planning and control of robot manipulators and describe robotics applications.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Code: **D037831(037)**
Subject: **Automobile Engineering**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: 35
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
The main objective of the course is to impart an understanding of the basic structure of an automobile and its suspension system, transmission system, braking system, steering system and electrical system.

UNIT-I	**Vehicle structure:** Type of automotive vehicles, general layout, vehicle construction-chassis, frame and body, types of frames, frameless and unitary construction, position of power unit. **Suspension system :**Objects & principles of suspension, system, types, rigid axle suspension & Independent suspension for front & rear ends, simple & double arm parallel & perpendicular type of suspension system. Gas filled suspension system. **Springs -** Purpose, types viz. leaf, coiled, rubber, air, suspension system, torsion bar, stabilizer,telescopic damper.
UNIT-II	**Clutches:** Characteristics, functions, principles of operation of clutch, friction clutch, single-plate, multi-plate, centrifugal clutch, positive clutch, friction plate clutch lining materials. Torque transmitted and related problems. **Fluid flywheel:** Construction, working principles & characteristics.
UNIT-III	**Gear Box -** Object of Gear Box, air, rolling & gradient resistance, tractive effort variation with speed, performance curve. **Types of Gear Boxes -** Sliding mesh, constant mesh, synchromesh device, automatic transmission, overdrive, lubrication of gear box. **Torque Converter -** Principles of working, characteristics, Torque converter with direct drive. **Testing of Automobiles**
UNIT-IV	**Universal Joint -** Types, propeller shaft, slip joint. **Differential** – Functions, single & double reduction differential, limited slip differential. **Front Axle -** Live & dead axle, stub axle. **Back Axle** – Hotchkiss drive, torque tube drive. **Tyres -** Types specification, causes of tyre wear & rim. **Brakes & Braking system -** Purpose, principles, layout of braking system. Classification, mechanical, hydraulic, master cylinder, Tandem master cylinder, wheel cylinder, self energizing & self adjusting brakes, disc brakes, antiskid brakes, power operated brakes.
UNIT-V	**Steering system**:- Gear & links, types of steering gears, reversibility of steering, center point steering, steering geometry viz. castor, camber, king pin inclination toe in, toe out, cornering power, under-over steer; power steering, effect of shimmy, condition of true rolling, calculation of turning radius. Correct steering equation and related problems. **Electrical System**: Battery: construction, maintenance, testing and charging. Cut-out, lighting circuit,horn, signals etc.

Text Books:

1	Automobile Engineering – Kripal Singh – Standard Publications, New Delhi
2	Automobile Mechanics - N. K. Giri – Khanna Publishers, New Delhi

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Reference Books:	
1	Automobile Engineering – G.B.S. Narang – Khanna Publishers, New Delhi
2	Automotive Mechanics: Principles and Practices- W.H.Crouse, and D.L. Anglin, TMH
3	Automobile Engineering – K. R. Govindan – Anuradha Agencies
4	The Automobile-Harbans, Reyat Singh- S.Chand , New Delhi
5	Automotive Mechanics – Joseph Heitner-CBS Pub., New Delhi
6	Motor Vehicle – Newton & Steeds – Life & Sons Limited.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Describe the basic structure of an automobile with applied engineering principle in its design.
2	Describe clutches and fluid flywheel and solve related problems.
3	Describe construction and working principle of gear box and torque converter and analyze problem related automobile performance.
4	Describe construction and working of propeller shaft, differential, axle assembly, tyres and braking system of an automobile
5	Describe construction and working of steering and electrical systems with applied engineering principle in its design.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Code: **D037832(037)**
Subject: **Computational Fluid Dynamics**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is to introduce the students to widely used techniques in the numerical solution of fluid equations, issues that arise in the solution of such equations, and modern trends in CFD.

UNIT-I	**Fundamental Concepts:** Introduction- Governing Equations of Fluid Dynamics. Mathematical Behavior of Partial Differential Equations - Elliptic, Parabolic and Hyperbolic equations. Physical Classification of fluid dynamics problems, Well-posed problems.
UNIT-II	**Finite Element and Finite Difference Method:** Overview of Finite Element and Finite difference Techniques in Computational Fluid Dynamics. Strong and Weak Formulations of a Boundary Value Problem.
UNIT-III	**Finite Volume Schemes:** General Discretization Methodologies: Cell Centered Formulation- Lax-Vendoroff Time Stepping, Runge-Kutta Time Stepping, Multi-stage Time Stepping. Cell Vertex Formulation - Multistage Time Stepping. Discretization of convective fluxes: Flux-vector splitting formulation, Flux-difference splitting formulation. Up-wind formulation.
UNIT-IV	**Discretization:** Boundary layer Equations and methods of solution -Implicit time dependent methods for inviscid and viscous compressible flows - Concept of numerical dissipation –Stability properties of explicit and implicit methods - Conservative up-wind discretization for Hyperbolic systems - Further advantages of upwind differencing.
UNIT-V	**Principles of Grid Generation:** Structured grid: C-, H- and O-Grid topology. Algebraic, Elliptical and Hyperbolic Grid Generation, Unstructured grid: Delaunay Triangulation, Advancing-Front Method, Generation of Anisotropic Grids, Mixed-Element/Hybrid Grids, Assessment and Improvement of Grid Quality.

Text Books:	
1	Introduction to Computational Fluid Dynamics: The Finite Volume Method-Versteeg & Malalasekera-Addison- Wesley.
2	Introduction to Computational Fluid Dynamics – Niyog & Chakraborty – Pearson ,Singapore

Reference Books:	
1	Computational Techniques for Fluid Dynamics, - Vols. I and II - Fletcher C.A.J. – Springer, Verlag, Berlin, 1988.
2	Computational Fluid Dynamics: An Introduction - John F. Wendt (Editor) – Springer, Verlag, Berlin.
3	Numerical Computation of Internal and External Flows, Vols. I and II -Charles Hirsch-John Wiley & Sons,New York.
4	Computational Fluid Dynamics for Engineers, Vols. I & II - . Klaus A Hoffmann and Steve T. Chiang – Engineering Education System, W. Wichita, K.S., 67208 – 1078 USA.
5	Fundamentals of Aerodynamics - Anderson, Jr.D - McGraw Hill.

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Discuss the fundamental concepts of computational fluid dynamics.
2	Discuss Finite element and Finite difference Techniques in CFD.
3	Discuss the concept of finite volume schemes.
4	Describe the mathematical basis in the technique of discretization of CFD equations.
5	Discuss the principle of grid generation.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Code: **D037833(037)**
Subject: **Product Design and Development**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is to acquaint the students with the knowledge regarding conceptualization, design and development of a new product.

UNIT-I	**Product Development Process:** Background for design, design theory, design materials, human factors in design applied ergonomics, product development processes and organization, identifying customer needs, establishing product specifications, concept generation and selecting product architecture.
UNIT-II	**Product Design Methods:** Generating concepts, selection of a concept, Testing of concept, product architecture, Creative and rational clarifying objectives- the objective trees methods, establishing functions – the function analysis methods, setting requirement- requirements specification methods determining characteristics – the QFD method, generating alternatives-the morphological chart method, evaluating alternatives-the weighted objectives methods, improving details-the value engineering method and design strategies.
UNIT-III	**Design for Manufacture:** Estimating manufacturing costs, reducing component, assembly and support cost design for assembly, design for disassembly, design for environment, design for graphics and packaging, effective prototyping – principle and planning.
UNIT-IV	**Industrial Design:** Its need - Ergonomic needs, Aesthetic needs, impact, accessing the quality, steps involved in Industrial design process, Management of Technology & user driven products.
UNIT-V	**Patents, Product Development & Project Management:** Legal issues in product design, trademarks, trade-secret, copy rights, patents – types, steps for disclosure, design resources, economics – quantitative & qualitative analysis, management of product development projects, Design Structure Matrix, Gantt Chart, Project schedule, budget, risk plan, accelerating project, execution, assessing and correction, Intellectual property rights

Text Books:	
1	Product Design & Development - Karl. T. Ulrich and Steven D. Eppinger – TMH,Delhi.
2	Product Design – Kevin Otto and Kristin wood - Pearson Education.

Reference Books:	
1	Product Development – Chitale & Gupta - Tata McGraw Hill.
2	Product Design and Manufacturing – Chitale & Gupta – PHI, Delhi.
3	Product Design: Creativity, Concepts and Usability – Kumar – PHI, Delhi .
4	Concurrent Engineering in Product Design and Development- Imad Moustapha – New Age.
5	Operations Management- Monks, J.G - McGraw Hill.
6	Product Design and Development - Ulrich & Eppinger – TMH Delhi.
7	Facility Layout and Location - Francis, R. L., and White, J. A. - Prentice Hall of India

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Explain the product development process of a new product.
2	Explain product design methods.
3	Explain the concepts of design for manufacture.
4	Explain the concepts of Industrial design.
5	Discuss legal issue pertaining to product design and management of product development projects.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Code: **D037834(037)**
Subject: **Vibration and Noise Control**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:

The main objective of the course is to apply knowledge of Vibration & Noise Control for understanding, formulating and solving engineering problems.

UNIT-I	**Fundamentals of Vibrations:** Simple harmonic motion, combination of two simple harmonic motions, beats, Fourier analysis Single degree of freedom system: Free un-damped vibrations: Equivalent systems linear and torsional, natural frequency estimation, energy methods **Damped Vibrations:** Damping models, structural, coulomb, and viscous damping, critically, under and over-damped system, logarithmic decrement **Forced Vibrations:** Harmonic excitation, support motion, vibration isolation, critical speeds of shafts in bending
UNIT-II	**Two Degree of Freedom System:** Free vibrations of spring coupled system, general solution, torsional vibrations, two degree of freedom mass coupled system, bending vibrations in two degree of freedom system, forced vibrations of an undamped two degree of freedom system, dynamic vibration absorber, forced damped vibrations
UNIT-III	**Multi-Degree of Freedom System:** Free un-damped analysis. **Numerical Methods:** Dunkerley's, Rayleigh, Holzer methods. **Experimental Methods in Vibration Analysis:** Vibration measurement devices and analyzers, balancing of rigid rotors
UNIT-IV	**Analysis and Measurement of Sound:** One dimensional wave in a gas, sound perception and the decibel scale, the ear, combining sound levels in decibels, octave bands, loudness, weightings, directionality of acoustic sources and receivers, directivity index
UNIT-V	**Noise Control:** Noise criteria, sound absorption and insulation, noise barriers, acoustic enclosures, silencers

Text Books:

1	Mechanical Vibrations –Thomson W T- Prentice Hill of India
2	Theory & Practice of Mechanical Vibrations – J.S. Rao, Gupta - New Age International.

Reference Books:

1	Mechanical Vibrations and Noise Engineering – A G Ambekar – PHI, Delhi
2	Mechanical Vibrations – G.K. Grover - S. Chand & CO.
3	Acoustics for Engineers - Turner &Pretlove - Macmillan
4	Acoustics and Noise Control - Smith, Peters & Owen - Addison-Wesley-Longman.
5	Industrial Noise Control: Fundamentals and Applications - Bell and Bell, Marcel-Dekker
6	Vibration And Noise For Engineers – KewalPujara – DhanpatRai,Delhi

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7	Environmental Noise Pollution and its Control – G R Chhatwal – Anmol Publications,Delhi
8	Noise Pollution and Control – Singal S P – Narosa Publications, Delhi
9	Mechanical Vibrations and Noise Controls – Sadhu Singh – Khanna Publisher, New Delhi
10	Fundamentals of Noise and Vibration - Fahy FJ, Walker JG - E&Fnspon – New York

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Discuss the fundamentals of vibrations.
2	Discuss the fundamentals of vibration system with two degree of freedom
3	Discuss the fundamentals of vibration system with multi-degree of freedom
4	Demonstrate the ability to analysis and measurements of sound.
5	Discuss noise criteria and control of noise

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Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Code: **D037835(037)**
Subject: **Mechanical Handling System and Equipments**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is to familiarize with concepts of identifying material handling systems and equipment requirements for a specific process and for various locations and working conditions

UNIT-I	**Elements of Material Handling System:** Importance, Terminology, objectives and benefits of better Material Handling, Principles and features of Material Handling System, Interrelationships between material handling and plant layout, physical facilities and other or organizational functions, Classification of Material Handling Equipment.
UNIT-II	**Selection of Material Handling Equipment:** Factors affecting for selection, Material Handling Equation, Choices of Material Handling Equipment, General analysis Procedures, Basic Analytical techniques, the unit load concept Selection of suitable types of systems for applications, Activity cost data and economic analysis for design of components of Material Handling Systems, functions and parameters affecting service, packing and storage of materials.
UNIT-III	**Design of Mechanical Handling Equipment:** Design of Hoists, Drives for hoisting, components, and hoisting mechanisms, rail traveling components and mechanisms, hoisting gear operation during transient motion, selecting the motor rating and determining breaking torque for hoisting mechanisms. Design of Cranes, Hand-propelled and electrically driven E.O.T overheat traveling cranes, Traveling mechanisms of cantilever and monorail cranes, design considerations for structures of rotary and cranes with fixed radius, fixed post and overhead traveling cranes, Stability of stationary rotary and traveling rotary cranes.
UNIT-IV	**Design of Load Lifting Attachments:** Load chains and types of ropes used in Material Handling System, Forged, Standard and Ramshorn Hooks, Crane Grabs and Clamps, Grab Buckets, Electromagnetic Design consideration for conveyor belts, Application of attachments.
UNIT-V	**Study of Systems and Equipment used for Material Storage:** Objectives of storage, Bulk material handling, Gravity flow of solid through slides and chutes, Storage in bins and hoppers, Belt conveyors, Bucket-elevators, Screw Conveyors, cabin vibratory Mobile racks etc.

Text Books:

1	Material Handling Equipments - N. Rudenko - Peace Publishers, Moscow.
2	Material handling System Design - James M. Apple, John-Wiley Publication, New York

Reference Books:

1	Materials Handling Principals and Practice - Allegri T H - CBS Publication, New Delhi
2	Material Handling - John R. Immer - McGraw Hill Co. Ltd., New York.
3	Material Handling in Machine shops - Machinery Publication Co. Ltd., London.
4	Material Handling Equipment - M. P. Nexandrn - MIR Publication, Moscow.
5	Bulk Solid Handling - C. R. Cock and J. Mason - Leonard Hill Publication Co. Ltd. U.S.A.

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6	Material Handling Hand Book - Kulwiac R. A - John Willy Publication, New York.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Discuss the elements of material handling system.
2	Discuss the factors affecting selection of material handling equipment.
3	Discuss the design considerations of mechanical handling equipment.
4	Discuss the design considerations of load lifting attachments.
5	Describe the systems and equipment used for material storage.

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Name of program: **Bachelor of Technology**	Semester: **VIII**
Branch: **Mechanical Engineering**	Code: **D037836(037)**
Subject: **Numerical Control of Machine Tools**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The main objective of the course is to understand the emergence and development of numerical control machine, characteristics and application areas.

UNIT- I	**Introduction:** Fundamentals of numerical control, advantages limitations of N.C systems -classification of N.C systems. **Computer Numerical Control:** Nomenclature, types and features of CNC machine tools, machine control unit, position control and its significance, engineering analysis of NC positioning systems, open loop and closed loop systems, precision in NC positioning systems-control resolution, accuracy and repeatability. Actuators: servomotors, stepper motors, transducers and feedback elements.
UNIT-II	**Features of NC Machine tools:** Design consideration of N.C machine tools - increasing productivity with N.C machines, tooling for CNC machine. **System Device:** Feedback system-counting devices digital analog converters **Interpolations:** DDA integrators, simple and symmetrical DD reference word CNC interpolators.
UNIT-III	**Part Programming:** Process planning and flow chart for part programming, systems nomenclature and tool geometries, Tool presetting & modular tooling. Selection of tools based on machining capacity, accuracy and surface finish, elements of programming for turning and milling, part programming. Preparatory codes G, miscellaneous functions M, Interpolation, tool compensations, cycles for simplifying programming, typical part programming **Control Loops for NC Systems:** Introduction-control loops for point and counting systems.
UNIT-IV	**Computerized Numerical Control:** CNC concepts-advantage of CNC reference planes, sampled data techniques, microcomputers in CNC. **Adaptive Control Systems:** Adaptive control with optimization and constraints-variable gains AC systems.
UNIT-V	**Modern CNC Machines:** CNC lathes, turning centers, machining centres, automatic pallet changers, automatic tool changers, direct numerical control and applications, CNC machine design features.

Text Books:	
1	Numerical control of machine tool – Koren& Ben Uri – Khanna Publisher,Delhi
2	Automation, Production Systems and Computer Integrated Manufacturing - Groover – PHI.

Reference Books:	
1	CNC Programming - S.K. Sinha - Galgotia
2	Mechatronics - HMT –TMH,Delhi
3	Numerical Control and Computer Aided Manufacturing -Tewari, Rao, Kundra- TMH, Delhi
4	Machine Tool Design and Numerical Control – N.K.Mehta – TMH Delhi
5	Fundamentals of Computer Numerical Control – NIIT – Prentice Hall, Delhi

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Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Discuss the operating principles, components and control of NC/CNC machine tools.
2	Discuss the design features of N.C machine tools.
3	Develop part program for various operations.
4	Discuss CNC concepts & adaptive control systems.
5	Describe modern CNC machines.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **VIII**
Subject: **Robotics (Lab)**	Code: **D037821(037)**
Total Lab Periods: **24**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives: The main objective of the course is to further enhance the students understanding of concepts of robotics through exposure to suitably designed experiments in robotics laboratory.

List of Experiments: (At least Ten experiments are to be performed by each student)	
1.	Demonstration of Cartesian/cylindrical/spherical robot.
2.	Demonstration of Articulated/SCARA robot.
3.	Virtual modeling for kinematics and dynamic verification any one robotic structure using suitable software.
4.	Design, modeling and analysis of two different types of grippers.
5.	Study of sensor integration.
6.	Two program for linear and non-linear path.
7.	Study of robotic system design.
8.	Programming for forward kinematics problems.
9.	Dynamic analysis of manipulators using software.
10.	Study and demonstration of actuators and vision system.
11.	Study of various robotic applications.
12.	Setting robot for any one industrial application after industrial visit.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate the working of different types of robot
2.	Demonstrate the knowledge of the robotic system design, sensors, actuators, vision systems and robotic application.
3.	Design, model and analyze gripper
4.	Write the program for linear and nonlinear trajectories and forward kinematic problems by using software.
5.	Develop virtual model for kinematic and dynamic verification of robotics structure using software

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Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **VIII**
Subject: **Computer Aided Simulation & Analysis (Lab)**	Code: **D037822(037)**
Total Lab Periods: **24**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives:
The objective of this course is to expose the students to the modern software for simulation and analysis for various applications in the field of mechanical engineering.

Minimum eight assignments are to be completed on following area using appropriate commercial simulation and analysis software.

1. Structural Analysis
2. Thermal Analysis
3. Fluid Flow Analysis
4. Coupled Field Analysis
5. Modal Analysis.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Model and analyze structural problem using commercial simulation and analysis software.
2.	Model and analyze Thermal problem using commercial simulation and analysis software.
3.	Model and analyze Fluid Flow problem using commercial simulation and analysis software.
4.	Analyze Coupled field problems using commercial simulation and analysis software.
5.	Determine the natural frequency of an object using commercial simulation and analysis software.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Scheme of Teaching & Examination
M. Tech. in CAD/CAM Robotics
I Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mech. Engg	558111 (37)	Product Design and Development Strategies	3	1	-	100	20	20	140	4
2	Mech. Engg	558112 (37)	Computer Aided Design	3	1	-	100	20	20	140	4
3	Mech. Engg	558113 (37)	Automation in Manufacturing	3	1	-	100	20	20	140	4
4	Mech. Engg	558114 (37)	Robotics	3	1	-	100	20	20	140	4
5	Refer Table - I		Elective – I	3	1	-	100	20	20	140	4
6	Mech. Engg	558121 (37)	CAD Lab	-	-	3	75	-	75	150	2
7	Mech. Engg	558122 (37)	Robotics Lab	-	-	3	75	-	75	150	2
Total				15	5	6	650	100	250	1000	24

L- Lecture   T- Tutorial
P- Practical ,   ESE- End Semester Exam
CT- Class Test   TA- Teacher's Assessment

Table-I

ELECTIVE I

S.No.	Board of Study	Subject Code	Subject
1	Mech Engg	558131 (37)	Composite Materials
2	Mech Engg	558132 (37)	Computational Techniques
3	Mech Engg	558133 (37)	Stress Analysis and Vibration

Note (1) – **1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.**

Note (2) – **Choice of elective course once made for an examination cannot be changed in future examinations.**

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Mechanical Engineering**
Subject: **Product Design and Development Strategies** Code: **558111 (37)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Nature and Scope of Product Engineering: Creative thinking and organizing for product Innovation criteria for product success in life cycle of a product. Concurrent Engineering (CE) design Methodology Collaborative product development in CE.

UNIT 2
Design Process Product lifecycle: Technological Forecasting, Market identification Bench Marking Human factors in design Industrial Design. quality by Design Robust Design, FEMA for product development, reengineering.

UNIT 3
Materials Section: Motivation for selection, cost basis and service requirements- Selection for mechanical prosperities, strength, toughness, fatigue and creep- Selection for surface durability, corrosion and wear resistance- Relationship between materials selection and processing Case Studies in materials selection with relevance to aero, auto marine, machinery and nuclear applications. Cost versus performance relations-weighted property index, value analysis, Coating and their effect on wear characteristic of material.

UNIT 4
Functional and product design: Form design-influence of basic design, mechanical loading and material on form design- form design castings, and forgings, plastic moldings, welded fabrications, manufacture by machining methods. Influence of space, size, weight, etc., on form design aesthetic and ergonomic considerations.

UNIT 5
Dimensioning and Tolerancing a product: Functional production and inspection, datum-tolerance analysis. Tolerance work sheets and centrality analysis, examples. Design features to facilitate machining datum features- functions and manufacturing, CMM (Coordinate measuring machine) and its potential.

TEXT BOOKS

1. Engineering Design – G.E. Dieter, McGraw Hill Publication
2. Product Design and Development – Karl T. Ulrich and Steven D. Eppinger , McGraw Hill

RFERENCE BOOKS

1. Engineering Design – Robert Maouseek, Backie & Sons Ltd.
2. Product Design and Process Engineering – B. W. Biebel, A.B. Draper, McGraw Hill
3. Designing for Manufacture – Hary Peck, Sir Issac Pitman and Sons ltd

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Branch: **Mechanical Engineering**
Subject: **Computer Aided Design**
Code: **558112 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

UNIT 1
CAD TOOLS: Definition of CAD Tools, Types of system, CAD/CAM Robotics system evaluation criteria, brief treatment of input and output devices. Graphics standard, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software.

GEOMETRIC MODELLING: Types of mathematical representation of curves, wire frame models wire frame entities parametric representation of synthetic curves hermite cubic splines Bezier curves B-splines rational curves.

UNIT 2
SURFACE MODELING: Mathematical representation surfaces, Surface model, Surface entities surface representation, Parametric representation of surfaces, plane surface, ruled surface, surface of revolutions.

UNIT 3
PARAMETRIC REPRESENTATION OF SYNTHETIC SURFACES: Hermite Bi-cubic surface, Bezier surface, B-Spline surface, COONs surface, Blending of surface, Sculptured surface, Surface manipulation – Displaying, Segmentation, Trimming, Intersection, Transformations (both 2D and 3D).

UNIT 4
GEOMETRICMODELLING-3D: Solid modeling, Solid Representation, Half - spaces Boundary Representation (B-rep), Constructive Solid Geometry (CSG), sweep representation, Analytic Solid Modeling.

UNIT 5
CAD/CAM Robotics Data Exchange: Evolution of data – exchange format, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.
Introduction to Mass property calculations, Mechanical Assembly and Mechanical Tolerencing.

TEXT BOOKS
1. CAD / CAM Robotics Theory and Practice – Ibrahim Zeid, TMH Publication
2. Mathematical Elements for Computer Graphics – Rogers and Aadms, TMH Publication

REFERENCE BOOKS
1. Mastering CAD/CAM Robotics -- Ibrahim Zeid, TMH
2. CAD/CAM Robotics -- P.N.Rao, TMH.
3. Computer Aided Mechanical Desing and Analysis – V Ramamurti – TMH Publication
4. CAD / CAM Robotics – Groover, Zimmer, PHI Publication

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Branch: **Mechanical Engineering**
Subject: **Automation in Manufacturing**
Code: **558113 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Fundamentals of Manufacturing Automation: Basic Principles of automation, types of automated systems, degrees of automation, Automation - reasons, Production operations and automation strategies- Plant Layout, production concepts and mathematical models - design the parts for automation. Automatic loading systems.

UNIT 2
Assembly Systems and Line Balance: Manual assembly lines - line balancing problem – methods of line balancing -ways to improve line balancing -flexible manual assembly lines-automated assembly systems, Analysis of multi station assembly.

UNIT 3
Automated Material Handling: Types of equipment and functions, design and analysis of material handling system, conveyor system. Automated guided vehicle system, components, operation, types, design of automated guided vehicles and applications. Automated storage / retrieval systems - types, basic components and applications.

UNIT 4
Group Technology: Part families, part classification and coding, machine Cell design, Benefits. Flexible automation and manufacturing system. Flexible manufacturing system. Components of FMS, Functions of FMS.

UNIT 5
Computer Aided Process Planning: Planning function. Retrieval type. Process Planning System. Generative process, benefits and limitations. **Automated Inspection And Testing:** Automated inspection principles and methods-sensors techniques for automated inspection-techniques for automated inspection-contact and non-contact inspection methods-in process gauging, CMM's, construction, types, inspection probes, types, and applications.

TEXT BOOKS

1. Automation Production System and CIM – M.P. Grower, PHI Publication
2. Robotic Technology and Flexible Automation – S. R. Deb, TMH Publication.

RFERENCE BOOK

1. CAD / CAM Robotics / CIM -- P. Radha Krishnan & S. Subrahamanyam, New Age International Publishers.
2. Automation and Advanced manufacturing systems – Dr. K. C. Jain, Sanjay Jain, Khanna Publisher.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Branch: **Mechanical Engineering**
Subject: **Robotics**
Code: **558114 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

UNIT 1
INTRODUCTION: Historical perspective of robots, classification of robot, major components of robot, fixed versus flexible automation. Current robotic application in the field of welding, spray painting, grinding parts sorting and assembly operations. Robot application in the future.

SYSTEM OVERVIEW OF A ROBOT: Basic component of robot systems, robot system in an application, functions of robot systems, specification of robot systems.

UNIT 3
TRANSFORMATION AND KINEMATICS: Homogeneous coordinates, coordinate reference frames, properties of transformation matrices, establishing link coordinate frame, the denavit-hartenberg matrix, comments on forming forward solution, examples of forward solution applied to 2 DOF planer manipulator arm, cylindrical arm, articulated arm and 3 DOF polar arm. Inverse Kinematics

UNIT 4
ROBOTIC SENSORY DEVICES:- Non optical position sensors, optical position sensors, velocity sensors, accelerometers, proximity sensors , touch and slip sensors, force and torque sensors.

UNIT 5
COMPUTER VISION FOR ROBOTIC SYSTEMS: Imaging components, image representation, hardware consideration, picture coding, object recognition and categorization, software consideration, need for vision training and adaptation.

TEXT BOOKS

1. Robotic Engineering An integrated approach – Richard D. Klafter etl, PHI Publication
2. Robot Technology Fundamentals -- James G. Keramas, Vikas Publication

RFERENCE BOOKS

1. Mechanics of Robot Manipulation – M. T. Mason, PHI Publication
2. Remote Control Robotics -- Craig Sayers
3. Computational Principles of Mobile Robotics -- Michael Jenkin, Gregory Dudek

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Branch: **Mechanical Engineering**
Subject: **Composite Materials**
Code: **558131 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT 2
Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.

UNIT 3
Manufacturing methods: Autoclave, tape production, bag moulding process, filament winding, hand layup,sprayup techniques, pultrusion, RTM

UNIT 4
Coordinate transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

UNIT 5
Elastic behavior of unidirectional composites: Elastic constants of lamina, relation ship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

TEXT BOOKS

1. Mechanics of Composite Materials – R. M. Jones, McGraw Hill Company, New York
2. Analysis and performance of fibre Composites – B. D. Agrawal and L. J. Broutman, Wiley – Interscience, New York.

REFERENCE BOOKS

1. Analysis of Laminated Composite Structures – L. R. Calcote, Van Nostrand Rainfold, New York, 1969.
2. Engineering Mechanics of Composite Materials – Isaac,M. Daniel, Oxford University Press.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **Computational Techniques**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**
Code: **558132 (37)**
Total Tutorial Periods: **12**

UNIT 1
Getting Derivatives and Integrals Numerically, Derivatives from Difference Tables, Higher Order Derivatives, Extrapolation Techniques, Newton-Cotes Integration Formulas, Gaussian Quadrature, Adaptive Integration , Multiple Integrals, Multiple Integration with Variable Limits, Application of Cubic Splines, An application of Numerical Integration - Fourier Transforms.

UNIT 2
the Spring - Mass Problem-A variation, Multistep Methods, Milnes Methods, The Adams-Moulton Method, System of equations and higher Order Equation, Comparison of Methods, Stiff Equation.

UNIT 3
Temperature Distribution in a rod. The Shooting Methods, Solution Through a Set of Equations, derivative Boundary conditions, Characteristics Value Problems, Temperature distribution in slab. The alternating Direction Implicit Method.

UNIT 4
Types of partial differential Equations, The heat Equation and Wave Equation, Solution Technique for the Heat equation in one dimension, solving the vibrating string problems, Parabolic equations in two or three Dimensions, The wave equation in two dimensions.

UNIT 5
The Rayleigh - Ritz Method, The Collection and Galerkin methods, Finite Elements for ordinary Differential Equations, Finite elements for elliptic Partial Differential equations, Finite Elements for Parabolic and Hyperbolic Equations.

TEXT BOOKS

1. Applied Numerical analysis – Curtis F. Gerald, Patrick O Wheatley, Addision Wisley.
2. Numerical Methods for engineers – S.C. Chapra and R.P. Canale, TMH Publisher

RFERENCE BOOKS

1. Calculus of Finite Difference sand Numerical Analysis -- P.P. Gupta, G.S. Malik and S. Gupta, Krishna Prakashan Media (P) Ltd.
2. Numerical Methods for Scientific and Engineering Computation -- M.K. Jain, S.R.K. Iyengar and R.K. Jain, New age International Publishers.
3. Computational Methods for Partial differential Equation -- M.K. Jain, S.R.K. Iyengar and R.K. Jain, New age International Publishers.
4. Numerical Methods – E. Balaguruswamy, TMH Publications

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **Stress Analysis and Vibration**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

Branch: **Mechanical Engineering**
Code: **558133 (37)**
Total Tutorial Periods: **12**

UNIT 1
Two dimensional elasticity theory in Cartesian coordinates, plane stress problem in polar coordinates Thick cylinders, Rotating discs – stress concentration.

UNIT 2
Torsion of non circular prismatic sections, rectangular and axisymmetric.Circular plates, introduction to shell theory – contact stresses.

UNIT 3
Single degree freedom, two degree freedom system without and with damping – Free and forced vibrations. Transient vibrations.

UNIT 4
Transient vibrations of single and two degree systems, multi-degree systems –applications of matrix methods continuous systems.

UNIT 5
Free and forced vibrations of strings bars and beams. Principle of orthogonality – classical and energy methods.

TEXT BOOKS

1. Theory of Elasticity – Timeshenko and Goodier, McGraw Hill Book Company
2. Theory of Vibrations with applications – W.T. Thomson, CBS Publishing

RFERENCE BOOKS

1. Mechanical Vibrations—S.S. Rao, Addisons Wesely Longman.
2. Advanced Strength of Material –J.P. Den Hartog,, Dover Publications
3. Mechanical Vibrations—J.P. Den Hartog, Dover Publications
4. Advanced Mechanism of Solid – L. S. Shivnath, Tata McGrawhill

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **CAD LAB**
Total Practical Periods: **40**
Total Marks in End Semester Exam. : **75**

Branch: **Mechanical Engineering**
Code: **558121(37)**

1. NX – 4.0, BY Unigraphics
2. Solid Edge
3. NASTRAN
4. Autocad
5. Visual Studio 6.0
6. MAT LAB- 6.0 with the following toolboxes
   - Spline Toolbox
   - Communication Toolbox
   - Excel Link Toolbox.
7. ANSYS
8. CATIA (UG)

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **Robotics Lab**
Total Practical Periods: **40**
Total Marks in End Semester Exam. : **75**

Branch: **Mechanical Engineering**
Code: **558122(37)**

1. BOE – Bot robotics kit with gozbot infrared distance sensor
2. Hex – Crawler kit (six legged robot)
3. Toddler Kit
4. Robotics Arm Trainer

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MPCCET, BHILAI

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Scheme of Teaching & Examination

M. Tech. in CAD/CAM Robotics

II Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mech. Engg	558211 (37)	Computer control of M/c tools	3	1	-	100	20	20	140	4
2	Mech. Engg	558212 (37)	Optimization Technique	3	1	-	100	20	20	140	4
3	Mech. Engg	558213 (37)	Rapid Prototyping	3	1	-	100	20	20	140	4
4	Mech. Engg.	558214 (37)	Finite Element Analysis	3	1	-	100	20	20	140	4
5	Refer Table - II		Elective-II	3	1	-	100	20	20	140	4
6	Mech. Engg	558221 (37)	CAM LAB	-	-	3	75	-	75	150	2
7	Mech. Engg	558222 (37)	OT LAB	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment
Note : Duration of all theory papers will be of Three Hours.

Table-II

ELECTIVE- I I

S.No.	Board of Study	Subject Code	Subject
1	Mech Engg	558231 (37)	Mechatronics
2	Mech Engg	558232 (37)	Computer Aided Process Planing
3	Mech Engg	558233 (37)	Design for Manufacturing

Note (1) – **1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.**

Note (2) – **Choice of elective course once made for an examination cannot be changed in future examinations.**

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Branch: **Mechanical Engineering**
Subject: **Computer control of M/c tools**
Code: **558211 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

UNIT 1
Introduction to Numerical Control: Need of NC machine tools, Elements of NC manufacturing, Axis of NC machines, NC machine tools, Steps in NC manufacturing.

UNIT 2
CNC DNC AND Adaptive control: Principle of operation of CNC, Features of CNC, Adaptive Control, Direct Numerical Control, Standard Communication interfaces, Programmable logic controllers, Communication networks, Configuration of CNC systems.

UNIT 3
Control of NC Machines: Open and closed loop controls, controlling task.
System Devices: Introduction, Stepper Motors, DC Motors, Feedback devices, Digital technology.

UNIT 4
Part programming: Introduction, Manual Part Programming, Labeling of programs and subprograms, Fixed cycles, Subroutines or subprograms, Canned Cycle macros, verification documentation, computer assisted part programming languages, APT language structure, Post processor commands, Compilation control commands, repetitive programming.

UNIT 5
CAD TO CAM: Introduction, Manufacturing process, Cam facilities desired, Automatic cut path generation, Surface machining.

TEXT BOOKS
CAD/CAM Robotics Computer Aided Design and Manufacturing– M P Groover, Pearson Education.
CAD/CAM Robotics– Chris Mc Mohan, Jimmie Brown, Pearson Education.

RFERENCE BOOKS
CAD/CAM Robotics – P.N.Rao, TMH Publication.
Computer Added Manufacturing – R.K. Srivastav, S.J.Pawar, Umesh Publcation.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Branch: **Mechanical Engineering**
Subject: **Optimization Technique**
Code: **558212 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

UNIT 1
Integer programming cutting plane method, Branch & Bound method, Sensitivity analysis – Changes in b_i, changes in c_j, changes in a_{ij}.

Parametric Programming – Parametric variation in c_j, b_i & a_{ij}, simultaneous parametric variations. Goal Programming.

UNIT 2
Non- linear Programming- langragian function, saddle point, Kuhn- tucker conditions, primal & dual problem, Quadratic programming, separable programming.
Geometric programming – Generalization high Kuhn- Tucker theory.

UNIT 3
Dynamic Programming – Serial multistage model, backward & forward recursion, system with more than one constraints, Application of Dynamic Programming in continuous system.
Direct search & Gradient methods- one dimensional & n- dimensional search.

UNIT 4
Taguchi Technique – Introduction to DOE, ANOVA, F-Test, Response surface Methodology. Markov chain.

UNIT 5
Introduction to modern Oplimization Technique- ANN, Fuzzy logic, Genetic Algorithms. Memetic Algorithms, Antz colony Algorithm, Tabu Search.

TEXT BOOKS

1. Optimization methods in Operation Research & System Analysis- K.V. Mithal & C. Mohan.- New Age International Publishers.
2. Neural Networks & Fuzzy System- Bart Kosko- PHI publications.
3. Quality Engineering using Robust Design- M.S. Phadke, PHI publication.

RFERENCE BOOKS

1. Operation Research Principles and Practice- Ravindran, Phillips, solbers Wiley Publication.
2. Established Quality Control- Engene L.Grant, Richard. S. Leaven Worth- TMH
3. Neural Engineering – Computation, Representation and Dynamics in Neurobiological systems.- Chris Eliasmith and Charles H. Anderson.- EEE
4. Quantitative Technique in Management – N.D. Vohra, - TMH Publication.
5. Neural Network in Computer intelligence – Li Min Fu - TMH.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Branch: **Mechanical Engineering**
Subject: **Rapid Prototyping**
Code: **558213 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Introduction: Historical Development, Fundamentals of RP, Advantages of RP, Classification of RP. RP Process: Process chain, 3D modeling, data conversion and transmission, checking and preparing, building, post processing.

UNIT 2
Liquid Based RP System: 3D systems' SLA, Cubital's SGC, Sony's SCS, Other similar commercial RP systems, micro fabrication.

UNIT 3
Solid Based RP System: Helisys' LOM, Stratasys' FDM, 3D systems MJM, Other similar commercial RP systems.

UNIT 4
Powder Based RP Systems: DTM's selective laser sintering (SLS), MIT's 3D printing (3DP), BPM Technology's ballistic particle manufacturing (BPM)

UNIT 5
Rapid Prototyping Data formats: STL format, STL file problem, Consequences of building a valid and invalid tessellated model, STL file repair, newly proposed formats.

TEXT BOOKS

1. Rapid Prototyping : Principles and Applications - Chua Chee Kai, Leong Kah Fai, Lim Chu-Sing, World Scientific Pub Co.
2. Rapid Manufacturing – D.T. Pham and S. S. Dimov, Springer Publication.

RFERENCE BOOKS

1. Rapid Prototyping : Theory and Practice - Ali Kamrani, Emad Abouel Nasr (Editors), Springer Publication
2. Rapid Prototyping: Principles and Applications- Rafiq I. Noorani, Wiley.
3. Rapid Prototyping -- Andreas Gebhardt, Hanser Gardner Publications

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Subject: **Finite Element Analysis**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**
Code: **558214 (37)**
Total Tutorial Periods: **12**

UNIT 1
Introduction to FEM: basic concepts, historical back ground, application of FEM, general description, comparison of FEM with other methods.

UNIT 2
Variational approach, Galerkin Methods. Co-ordinates, basic element shapes, interpolation function. Virtual energy principle, Rayleigh - Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain displacement relations

UNIT 3
1-D structural problems – axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape function. Analysis of Trusses – Plane Truss and Space Truss elements.

UNIT 4
Analysis of beams – Hermite shape functions – stiffness matrix – Load Vector – Problems 2-D problems –Constant Strain Triangles, force terms, Stiffness matrix and load vector, boundary conditions.

UNIT 5
Application of FEM to elasticity, structural, fluid flow and lubrication problems
Scalar field problems - 1-D Heat conduction – 1-D fin element – 2-D heat conduction problems – Introduction to Torsional problems.

Dynamic considerations, Dynamic equations – consistent mass matrix – Eigen Values, Eigen Vector, natural frequencies – mode shapes – modal analysis.

TEXT BOOKS
The Finite Element Method -- O C Zienkiewicz, R L Taylor
An Introduction to the Finite Element Method – J. N. Reddy, TMH Publication

RFERENCE BOOKS
Finite Element Analysis – P. Seshu, PHI Publication
Introduction to Finite Element Method – C.S. Desai and J. F. Abel
Introduction to Finite Elements in Engineering – T. R. Chandrupatla & A. D Belegundu, PHI Publication.
Applied Finite Element Analysis – L. J. Segerland , John Wiley Publications

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Subject: **Mechatronics**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**
Code: **558231 (37)**
Total Tutorial Periods: **12**

UNIT 1
Introduction: Mechatronics, Measurement Systems, Basic Electrical Elements, Kerchoeff's Law, Voltage And Current Sources and Meters, Thevenin and Norton Equivalent Circuits, Alternating Current Circuit Analysis, Power in Electrical Circuits, Transformer, Impendence Matching, Grounding and Electrical Interference.

UNIT 2
Semiconductor Electronics: Introduction, Semiconductor Physics as the Basis for Understanding Electronic Devices, Junction Diode, Bipolar Junction Transistor, and Field Effect Transistors

UNIT 3
Microcontroller Programming and Interfacing: Microprocessor and Microcomputers, Microcontrollers, The PIC16F84 Microcontroller, Programming a PIC, Pic Basic Pro, Using Interrupts, Interfacing Common PIC Peripherals, Interfacing to the PIC,

Data Acquisition: Introduction, Quantizing Theory, Analog-to-Digital Conversion, Digital-to-Analog (D/A) Conversion,

UNIT 4
Sensors: Introduction, Position and Speed Measurement, Stress and Strain Measurement, Temperature Measurement Vibration and Acceleration Measurement, Pressure and Flow Measurement, Semiconductor sensors and Microelectromechanical Devices.

UNIT 5
Actuators: Introduction, Electromagnetic Principles, Solenoids and Relays, Electric Motors, DC Motors, Stepper Motors, Selecting a Motor, Hydraulics, Pneumatics,

TEXT BOOKS

1. Introduction to Mechatronics and Measurement Systems – David G. Alciatore, Michael B. Histand, TMH Publication.
2. Mechatronics – Principles, Concepts and Applications – Dan Necsulescu, Published by Pearson Education (Singapore)

RFERENCE BOOKS

1. Mechanical Measurments– Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard V, Pearson Education.
2. Mechatronics -Principles, Concepts and Applications – Nitaigour Premchand Mahalik, Tata McGraw-Hill Publication.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Branch: **Mechanical Engineering**
Subject: **Computer Aided Process Planning**
Code: **558232 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

UNIT 1
Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process plannning system, feature recognition, methods.

UNIT 2
Generative CAPP system: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications.

UNIT 3
Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.

UNIT 4
Determination of machining parameters: reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.

UNIT 5
Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods.

TEXT BOOKS
1. Automation , Production systems and Computer Integrated Manufacturing System – Mikell P.Groover, PHI Publication.
2. Computer Aided Engineering – David Bedworth, TMH Publishers

RFERENCE BOOKS
1. Computer Aided Design and Manufacturing – Dr.Sadhu Singh, Khanna Publisher

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Branch: **Mechanical Engineering**
Subject: **Design for Manufacturing**
Code: **558233 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Introduction: Design philosophy – steps in Design process – General Design rules for manufacturability – basic principles of designing for economical production – creativity in design.

UNIT 2
Materials: Selection of Materials for design – Developments in Material technology – criteria for material selection – Material selection interrelationship with process selection – process selection charts.

UNIT 3
MACHINING PROCESS: Overview of various machining processes – general design rules for machining -Dimensional tolerance and surface roughness – Design for machining – Ease – Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT 4
METAL CASTING: Appraisal of various casting processes, selection of casting process, - general design considerations for casting – casting tolerances – use of solidification simulation in casting design – product design rules for sand casting.

UNIT 5
METAL JOINING: Appraisal of various welding processes, Factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints.

TEXT BOOKS

1. Design for Manufacture – John,Cobert, Adisson – Wsely Publication
2. Engineering Design – A Material and Processing Approach – George E. Deiter, McGrawhill Publicatoin

RFERENCE BOOKS

1. Product Design and Manufacturing – A.K. Chitale and R.C. Gupta, PHI Publication.
2. Design and Manufacturing – Surender Kumar and Goutham Sutradhar, IBH Publising Co. Pvt. Ltd.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Subject: **CAM LAB**
Total Practical Periods: **40**
Total Marks in End Semester Exam. : **75**

Branch: **Mechanical Engineering**
Code: **558221(37)**

- Exercise in manual part programming of CNC lathe & Milling machines. Use of CAD/CAM Robotics software for simulation of turned and milled parts and simple surfaces.
- Automatic NC part program generation from CAD model and post processing for machining on CNC machines.
- RPT (optional)

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II**
Subject: **OT LAB**
Total Practical Periods: **40**
Total Marks in End Semester Exam. : **75**

Branch: **Mechanical Engineering**
Code: **558222 (37)**

1. MAT LAB – 6.0 with the following toolboxes
   - Spline Toolbox
   - Communication Toolbox
   - Excel link Toolbox
2. Visual Studio 6.0

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MPCCET, BHILAI

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Scheme of Teaching & Examination

M. Tech. in CAD/CAM Robotics

III Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mech. Engg	558311 (37)	Database Management System	3	1	-	100	20	20	140	4
5	Refer Table – III		Elective-III	3	1	-	100	20	20	140	4
6	Mech. Engg	558321 (37)	Preliminary work on dissertation	-	-	28	100	-	100	200	14
7	Mech. Engg	558322 (37)	Seminar Based on dissertation	-	-	3	-	-	20	20	2
Total				**6**	**2**	**31**	**300**	**40**	**160**	**500**	**24**

L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment
Note : Duration of all theory papers will be of Three Hours.

Table-III

ELECTIVE- III

S.No.	Board of Study	Subject Code	Subject
11	Mech Engg	558331 (37)	Computer Integrated Manufacturing
2	Mech Engg	558332 (37)	Computer Aided Production Management
3	Mech Engg	558333 (37)	Computational Fluid Dynamics

Note (1) – **1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.**

Note (2) – **Choice of elective course once made for an examination cannot be changed in future examinations.**

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. III**
Branch: **Mechanical Engineering**
Subject: **Database Management System**
Code: **558311 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Introduction: Data, Information, Record, File, File Organization like: Sequential, Indexed Sequential Random. Traditional file processing approach. Database approach of data management, Advantage of database approach over file processing approach.

Data Definition, Abstraction Models, Independence, Data Manipulation language, Data base manager and Administrator's System Signature.

UNIT 2
Entity Relation Model: Entity - Relationship, Attributes, Mapping constraints, Keys, E – R Diagrams and reduction to tables, Generalization and Aggregation, Extended E - R diagram.

UNIT 3
Relation Model: Structure, Relational algebra and calculus, Modification and views, SQL, QUEL, Integrity Constraints, Functional Dependencies.

UNIT 4
Relational Data Base Design: Pitfalls in RDB Design, Normalization using functional, Multivalues, Join dependencies, Domain key normal form, alternative approaches.

UNIT 5
SQL: Query languages, SQL as DDL, SQL as Query language, SQL as DML, Views in SQL.

TEXT BOOKS
1. H. K. Korth A. Silberschatz - Database System Concepts
2. C. J. Date – Introduction to Database System

RFERENCE BOOKS

1. J. D. Ullman – Principles of Database System
2. Bipin C. Desai -- Introduction to Database System, Galgotia Publication
3. Database Management system – R. Paneerselvan, PHI Publication
4. Fundamental of database system – R. Elmarsi,S. Navathe, Pearson Education

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. III**
Branch: **Mechanical Engineering**
Subject: **Computer Integrated Manufacturing**
Code: **558331 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

UNIT 1
Introduction: Evolution of CIM, scope of CIM, segments of generic CIM, Automated Process Planning – Process planning, group technology, variant and generative process planning methods, AI in process planning, process planning software. CNC technology – Principles of numerical control, features of CNC systems, programming techniques, capabilities of a typical NC CAM software, integration of CNC machines in CIM environment, DNC – Flexible manufacturing systems- Architecture, work stations.

UNIT 2
Manufacturing Systems: MRP II software, production control software, forecasting, master production schedule, materials requirements planning, capacity requirements planning, shop floor control, shop floor data collection techniques, inventory management, purchase orders, bill of materials, standard product routing, job costing, marketing applications.

UNIT 3
Robotics, Automated Assembly and Inspection: Types of robots and their performance capabilities, programming of robots, hardware of robots, kinematics of robots, product design for robotized manufacturing, selecting assembly machines, feeding and transfer of arts, applications of robots in manufacture and assembly, sensors. Automated quality control types of CMM, non-contact inspection methods, in process and post process metrology, flexible inspection systems. Computer Aided Inspection and on line quality monitoring.

UNIT 4
Data Communications and Technology Management: Technology issues, configuration management, database systems, management of technology, networking concepts, Local area Network (LAN), SQL fundamentals, Manufacturing Automation protocols (MAP) and Technical and office protocols (TOP)fundamentals.– CIM models, economics of CIM, implementation of CIM.

UNIT 5
Collabarative Engineering: Introduction, Faster Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering , supply chain management (SCM), customer relations management(CRM) Virtual Reality and Factory simulation, Agile and lean manufacturing, reverse engineering , Rapid prototyping.

TEXT BOOKS
1. Manufacturing Engineering and Technology – Serope Kalpakjian, and Steven R. Smith, Pearson education.
2. Automation , Production systems and Computer Integrated Manufacturing System – Mikell P.Groover, PHI Publication.

RFERENCE BOOKS
1. Computer Integrated Manufacuring Hand Book – Eric Teicholz and Joel Orr, McGraw Hill Publication.
2. Computer Integrated Manufacturing – Paul G. Ranky, CIMware Publishers.
3. CAD / CAM Robotics/ CIM – Radhakrishnan, New Age International Publication.

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CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. III**
Branch: **Mechanical Engineering**
Subject: **Computer Aided Production Management**
Code: **558332 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Production Planning and Control (PPC) :Traditional PPC and its problems ,Symptoms of poor PPC system ,Operating priorities and principles ,Computer-integrated production management system, its need and requirement

UNIT 2
Forecasting: Various methods , Comparison of various methods and suitability to different products ,Use of computer in demand forecasting. **Aggregate Planning:** Performance measures ,Qualitative and quantitative methods.

UNIT 3
Master Production Scheduling: Types of scheduling and need for re-scheduling ,Use of computers in planning activities. **Cost planning and control ,Capacity planning, its need and different methods:** Manufacturing Resource Planning (MRP-II) ,Importance of Inventory and inventory management, Inventory management systems, Material requirement planning (MRP),Working and benefits of different types of inventory system ,Performance measures ,Lot sizing methods, Comparison with MRP ,Structure and functions, Computer based MRP-II systems.

UNIT 4
Just In Time (JIT): Introduction and its comparison with MRP, Pull and push system ,Kanban-Types and benefits. **Shop Floor Control (SFC) and Computer Process Monitoring:** Functions of SFC ,SFC system ,Operation scheduling and techniques of operation scheduling ,Factory Data Collection System ,Computer process monitoring.

UNIT 5
Supply Chain Management: Supply Chain management models, Cost benefit analysis. **Enterprise Resource Planning (ERP):** Component and applications, ERP systems ,Tools for ERP, Problems in ERP.

TEXT BOOKS
1. Production Planning and Inventory Control – N.S.L. Mc Leavey, D.W. & P. J. Billigton, PHI Publisher
2. Production Systems Planning Analysis and Control – J.L. Riggs, John Wiley & Sons.

RFERENCE BOOKS
1. Systems Approach to Computer Integrated Design and Manufacturing – Singh Nanua, John Wiley & Sons New York.
2. Manufacturing Planning and Control System – T.E. Volmann, W.L. Bery, D.C. Whybark, Galgotia Publicaiton.
3. Computer Aided Production Management – P.B. Mahapatra, PHI Publisher

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. III**
Branch: **Mechanical Engineering**
Subject: **Computational Fluid Dynamics**
Code: **558333 (37)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT 1
Typical partial differential equation in fluid dynamics. Types of second order equations, second order wave equations, system of first order equations, Finite difference and finite volume discretisation, Equation of Parabolic Type.

UNIT 2
Equation of hyperbolic type: Explicit schemes, Lax-Wendroff scheme and variants, Implicit schemes, Second order wave equation, Method of characteristics for second order hyperbolic equations, Equation of elliptic type: the laplace equation in two dimension, iterative methods for solution of linear algebraic systems, solution of the pentadiagonal system.

UNIT 3
The basic equations of fluid dynamics: Basic conservation principals, Unsteady Navier-Stokes equation it Integral form, Navier-Stokes equation it Differential form, Boundary conditions for Navier-Stokes equation. Reynolds averaged Navier-Stokes equations, Boundary layer, thin layer and associated approximations. Grid generation.

UNIT 4
Inviscid Incompressible Flow, Potential flow problem, panel Methods, panel methods for subsonic and supersonic flows, Inviscid compressible flow: Small perturbation flow, Numerical solution of the full potential equation.

UNIT 5
Boundary Layer flow: Physical consideration , the boundary layer equations, computations of laminar boundary layer, Turbulent boundary layers, Viscous Incompressible flow computation, stream function Vorticity approach, Viscous compressible flow, RANS, Turbulence Modelling, Basic computational methods for compressible flow.

TEXT BOOKS

1. Computational Fluid Dynamics -- T. J. Chung, Cambridge University Press
2. Text book of Fluid Dynamics – Frank Chorlton, CBS Publications.

RFERENCE BOOKS

1. Computational Methods for Fluid Dynamics – Gerziger and Peric, Springer Publication.
2. Numerical Methods in Fluid Flow & Heat Transfer – Dr. Suhas Patankar.
3. Introduction to Computational Fluid Dynamics -- P.Niyogi, S.K. Chakrabartty and M.K.Laha, Pearson education
4. Computational Fluid Dynamics -- J.A. Anderson, McGraw-Hill Publication

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Scheme of Teaching & Examination

M. Tech. in CAD/CAM Robotics

IV Semester

S.N.	Board of Study	Subject Code	Subject Name	Periods per week			Scheme of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mechanical Engg.	558421 (37)	Dissertation + Seminar	6		34	300		200	500	23
Total				**6**	**-**	**34**	**300**		**200**	**500**	**23**

L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment

Scheme of marks Allotment

Semester	Total Marks	Grand Total
I	1000	3000
II	1000	
III	500	
IV	500	

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Scheme of teaching and examination

M.Tech. (Nanotechnology) in the Department E&TC

1st Semester

S. No	Board of Study	Subject Code	Subject	Period s per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P) / 2
				L	T	P	ESE	CT	TA		
1	E&TC	547111 (28)	Basics of Nanotechnology	3	1	-	100	20	20	140	4
2	E&TC	547112 (28)	Structure, Bonding & Quantum mechanics of Electronics	3	1	-	100	20	20	140	4
3	E&TC	547113 (28)	Nanotechnology for Energy Systems	3	1	-	100	20	20	140	4
4	E&TC	547114 (28)	Science and Technology of Thin Films	3	1	-	100	20	20	140	4
5	***Refer Table – I***		***Elective –I***	3	1	-	100	20	20	140	4
6	E&TC	547121 (28)	Nanotechnology for Energy System - Lab	-	-	3	75	-	75	150	2
7	E&TC	547122 (28)	Simulation Lab	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L- Lecture **T- Tutorial** **P- Practical** **ESE- End Semester Exam** **CT- Class Test**

TA- Teacher's Assessment

TABLE –I			
ELECTIVE -I			
S. No	**Board of Study**	**Subject Code**	**Subject**
1	E & TC	547131 (28)	Mathematical Modelling and Simulation
2	E & TC	547132 (28)	Opto Electronics
3	E & TC	547133 (28)	Lithography Techniques

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Subject: **Basics of Nanotechnology**
Total Theory Periods**: 40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **ET & T.**
Code: 547111 (28)
Total Tutorial Periods: **12**

Unit – I: Nanostructures: Zero-, One-, Two- and Three- dimensional structure, Quantum dots, Semi conducting nanoparticles, Energy bands and gaps in semiconductors, Fermi surfaces, Localized particles, Donors, Acceptors, Deep traps, Excitons, Mobility, Size dependent effects.

Unit–II: Optical properties: Photonic crystals, Quantum confinements, Luminescence, Photoluminescence, Fluorescence, Optically excited emission, Electroluminescence, Photo fragmentation and columbic explosion.
Thermo Electric Materials (TEM): Concept of phonon, Thermal conductivity, Specific heat, Exothermic & Endothermic processes.

Unit – III Magnetic properties: Basics of ferromagnetism – Ferro magnetic resonance and relaxation, Magnetic properties of bulk nanostructures, Magnetic clusters, Dynamics of nanomagnets, Nanopore containment of magnetic particles.

Unit-IV Carbon Nano Structures: DLCs, Fullerenes, C60, C80 SWNT and MWNT; Properties: Mechanical, Optical and Electrical properties.

Unit-V Ceramics: Dielectrics, ferroelectrics and magnetoceramics, Nanopolymers: Nanoparticles polymer ensembles; Applications of Nanopolymers in Catalysis. Nanocomposites: Metal-Metal nanocomposites, Polymer-Metal nanocomposites, Ceramic nanocomposites: Dielectric and CMR based nanocomposites.

Textbooks:
1. Introduction to Nano Technology by Charles. P. Poole Jr & Frank J. Owens. Wiley
2. Nanoscale Materials by Liz Marzan and Kamat, World Scientific Publishing company
3. Nanostructures and Nanomaterials: Synthesis, Properties and Applications by Guozhong Cao, World Scientific Publishing Company

Reference books:
1. Nano Technology and Nano Electronics – Materials, devices and Measurement Techniques by WR Fahrner , Springer
2. Nanotechnology: A Gentle Introduction to the Next Big Idea by Ratner and Ratner ,Prentice Hall
3. Nano Technology - Science, Innovation and Opportunity by Lynn E. Foster, Pearson Education.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Subject: **Structure, bonding & Quantum mechanics of electronics**
Total Theory Periods**: 40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **ET & T.**
Code: 547112 (28)
Total Tutorial Periods: **12**

Unit-I Crystal structure: Crystalline and amorphous solids, Crystal lattice and crystal structure, Translational symmetry, Space lattice, Unit cell and primitive cell, Symmetry elements in crystal, Seven crystal systems, Some imperfections in crystals, Wigner-seitz cells, Miller indices, Miller-Bravais indices, Indices of a lattice direction, The spacing of a set of crystal planes.

Unit-II Reciprocal lattice and crystal imperfections: Bragg law, Reciprocal lattice , Properties of Reciprocal lattice, Reciprocal lattice of simple cube, Reciprocal lattice of bcc, Reciprocal lattice of fcc, Diffraction conditions, Brillouion zones, Importance of lattice imperfections, Types of imperfection, Point defects, Dislocations.

Unit-III Introduction to quantum mechanics: Matter waves, Length scales , De-Broglie hypothesis – wave particle duality, Heisenberg's uncertainty principle, Schrodinger wave equation , General postulates of quantum mechanics, Particle in one dimensional box.

Unit-IV Quantum mechanics of electronics: Electron as particle and electron as wave, Time independent Schrodinger equation and boundary contestation on the wave function, Analogies between quantum mechanics and classical electromagnetic, Probabilistic current density, Multiple particle systems.

Unit-V Free and confined electrons: Free electrons, Free electron gas theory of metals, Electrons confined to abounded region of space and quantum numbers , Electrons confined to atom, The hydrogen atom and the periodic table, Quantum dots, Quantum wires, Quantum wells.

Textbooks:

1. An introduction to Solid States Electronic Devices by Ajay Kumar Saxena Macmillan India Ltd
2. Solid state Physics by Charles Kittle, Wiley
3. Quantum Mechanics by L. I. Schiff, Tata Mc-Graw Hill
4. Fundamentals of Nanoelectronics by George W. Hanson Pearson Education

Reference Books:

1. Introduction to Nanotechnology by Charles P. Poole Jr & Frank J. Owens; Wiley India Pvt. Ltd
2. The Feynman Lectures on Physics; Vol I to III, Publisher Basic Books
3. Nano Technology and Nano Electronics – Materials, Devices and Measurement Techniques by WR Fahrner – Springer
4. Hand book of Nano structured Materials; Vol I to V by Branch A. Brody & H. Tristram Engelhardt. Jr; Pearson Education
5. Quantum physics by A. Ghatak, Kluvar Academic Publisher

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Subject: **Nanotechnology for Energy System**
Total Theory Periods**: 40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **ET & T.**
Code: 547113 (28)
Total Tutorial Periods: **12**

Unit–I Battery materials and batteries: Battery anode, Battery cathode, Battery electrolyte, Lithium Ion based batteries, Chargeable Lithium ion batteries, Non-chargeable Lithium ion batteries, Modern batteries.

Unit–II Renewable energy Technology: Energy challenges, Nanomaterials and nanostructures in energy harvesting, Developments and implementation of nanotechnology based renewable energy technologies, Solar cell structures: quantum well and quantum dot solar cells, Photo- thermal cells for solar energy harvesting, Thin film solar cells, CIGS solar cells, Die sensitized solar cells.

Unit–III Hydrogen storage Technology: Hydrogen production methods and purification, Hydrogen storage methods and materials: metal hydrides and metal-organic framework materials, Volumetric and gravimetric storage capacities, Hydrating and dehydrating kinetics, High enthalpy formations and thermal management during hydrating reaction, Multiple catalytic – degradation of sorption properties, Automotive applications.

Unit–IV Fuel cell Technology: Fuel cell Principles, Types of fuel cells (Alkaline Electrolyte, Phosphoric acid, Molten Carbonate, Solid oxide and Direct Methanol and Proton Exchange Fuel Cells), Principle and operation of Proton Exchange Membrane (PEM) fuel cell, Materials and fabrication methods for fuel cell technology, Micro fuel cell power sources, Biofuels
Unit–V Micro fluidic Technology: MEMS & NEMS technology for micro fluidic devices, Micro and nano engines and driving mechanism, Power generation, Micro

channel battery pump , Piezoelectric membrane and their applications.

Text Books :

1. Hydrogen from Renewable Energy Source by D. Infield, Elsevier
2. Fundamentals of Industrial Catalytic Process by C.H. Bartholomew and Robert J. Farraoto, John Wiley & Sons Inc.
3. Fuel Cell Technology Handbook by Hoogers, CRC Press

References :

1. Renewable Energy Resources by J. T. Widell and T. Weir, E & F N Spon Ltd. London
2. Fuel Storage on Board: Hydrogen Storage in Carbon Nanostructures by R.A. Shatwell, Wiley
3. Hand Book of Fuel Cells: Fuel Cell Technology and Applications by Vielstich, CRC Press

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Subject: **Science and Technology of Thin Films**
Total Theory Periods**: 40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **ET & T.**
Code: 547114 (28)
Total Tutorial Periods: **12**

Unit – I Vacuum technology: Principles of vacuum pumps in range of 10 -2 torr to 10-11 torr, Principle of different vacuum pumps: Roots pump, Rotary, Diffusion, Turbo molecular pump, Cryogenic-pump, Ion pump, Ti-sublimation pump, Importance of measurement of vacuum, Concept of different gauges: Bayet- Albert gauge, Pirani guage, Penning and Pressure control.

Unit – II Conditions for the formation of thin films: Environment for thin film deposition, Deposition parameters and their effects on film growth, Formation of thin films (sticking coefficient, formation of thermodynamically stable cluster – theory of nucleation), Capillarity theory, Microstructure in thin films, Adhesion, Properties of thin films: Mechanical, electrical, and optical properties of thin films, Few applications of thin films in various fields.

Unit-III Physical Vapor deposition techniques: Thermal evaporation, Resistive evaporation, Electron beam evaporation, Laser ablation, Flash and Cathodic arc deposition

Unit -IV Electrical discharges used in thin film deposition: Sputtering, Glow discharge sputtering, Magnetron sputtering, Ion beam sputtering, Ion plating, Difference between thin films and coating.

Unit –V Various deposition techniques: Electro deposition, Molecular beam epitaxy and laser pyrolysis. Chemical vapor deposition techniques: Advantages and disadvantages of Chemical Vapor deposition (CVD) techniques over PVD techniques, Reaction types, Boundaries and flow, Different kinds of CVD techniques: Metallorganic CVD (MOCVD), Thermally activated CVD, CVD, Spray Pyrolysis.

Text Books:

1. Thin Film Phenomenon by K.L. Chopra, McGraw Hill
2. Methods of Experimental Physics (Vol 14) by G.L.Weissler and R.W. Carlson, "Vacuum Physics and Technology", Academic Press

References :

1. A User's Guide to vacuum Technology by J.F.O'Hanlon, John Wiley and Sons
2. Vacuum Physics and Techniques by T.A. Delchar, Chapman and Hall

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Branch: **ET & T.**
Subject: **Mathematical Modelling and Simulation (Elect-1)**
Code: 547131 (28)
Total Theory Periods**: 40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Unit I FUNDAMENTAL PRINCIPLES OF NUMERICAL METHODS: Scientific Modeling, Numerical data and Numerical operations ,Numerical Algorithms , Numerical Programs ,Numerical Software , Approximations in Mathematical Model building , Numerical integration , Differentiation -Variational finite element methods , Rayleigh's method, Ritz method.

Unit II MATHEMATICAL MODELING: Mathematical modeling , Physical simulation , Advantages and limitations, Process control , Transport phenomena, Concept of physical domain and computational domain, Assumptions and limitations in numerical solutions, Finite element method and Finite difference method.

Unit III DIFFERENTIAL EQUATIONS & APPLICATIONS: Euler method, Runge - Kutta method, Multi step - differential equations ,Boundary values, Elliptic equations , One dimensional parabolic equation, Hyperbolic equation , Partial differential equations , Sseparation of variables , Wave equation , Laplace equation , Nonlinear partial differential equations, Approximation methods of nonlinear differential equations.

Unit IV SIMULATION: Basic concepts of simulation , Data manipulation, Data exchange of the structure, Properties and processing of materials, Three dimensional models for capillary nanobridges and capillary forces , Molecular dynamics simulation.

Unit V MONTE CARLO METHODS: Basics of the Monte Carlo method , Algorithms for Monte Carlo simulation , Applications to systems of classical particles , modified Monte Carlo techniques , Percolation system , Variation Monte Carlo method , Diffusion Monte Carlo method , Quantum Monte Carlo method.

Text Books:

1. Discrete Event System Simulation by Jerry Banks, John. S. Carson, Barry .C. Nelson and David. M. Nicol, Printice Hall,.
2. Simulation Modeling and Analysis by Averill. M. Law, McGraw Hill.
3. Advanced Engineering Mathematics by Erwin Kreyzig, Wiley.

Reference Books:

1. Applied Numerical Methods for Engineers using MATLAB and C by R.J. Schilling and S.L. Harris, Thomson publishers,
2. Understanding molecular simulation from algorithm to applications by D. Frenkel and B. Smith, Academic Press
3. Computational Materials Science from Ab initio to Monte Carlo Methods by , K. Ohno, K. Esfarjani and Y. Kawazoe , Springer-Verlag,

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Subject: **Opto Electronics (Elect-1)**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **ET & T.**
Code: 547132 (28)
Total Tutorial Periods: **12**

Unit 1

Semiconductor-Light Generation & Amplification: Semiconductor physics background, GaAs lasers, Laser structures, Gain and absorption in semiconductors, Direct current modulation, Integrated optoelectronics, Semiconductor optical amplifiers, LEDs, Organic LEDs.

Unit 2

Electro-Optic Modulation: Linear electro-optic effect, Electro-optic phase and amplitude modulation, High frequency considerations, Electro-absorption and modulators based on it, Electro-optical effect in liquid crystals, Acousto-optical effect, scattering of light by sound, Bragg diffraction.

Unit 3

Optical Resonators & Oscillations: Fabry-Perrot Etalons and lasers, Resonators with spherical mirrors, Resonant frequencies, Losses, Ring resonator, Multicavity Etalons, Oscillation frequency, Three & four layer lasers, Power in oscillators, Multimode oscillation and mode locking.

Unit 4

Detection of Optical Radiation: Transition rates, Photomultiplier, Noise mechanism, Heterodyne detection, Photoconductive detectors, Photodiodes, Avalanche photodiodes, Power fluctuations and noise in lasers. Organic photo-detectors

Unit 5

Light Wave Propagation in Guided Medium: Dielectric slabs and fibers, TE and TM modes, Dispersion in waveguides, Propagation in periodic media, Bloch-waves, Spectral filters, Waveguide Coupling.

Text Books:

1. Photonics-Optical Electronics in Modern Communication, A. Yariv & P. Yeh. Oxford University Press.
2. Organic electronics-Sensors & Biotechnology, R. Shinar & J. Shinar, McGraw-Hill.

Reference Books:

1. Integrated Silicon Optoelectronics, H. Zimmermann, Springer.
2. Semiconductor Optoelectronics –Physics & Technology, Jasprit Singh Mc-Graw-Hill.
3. Fundamentals of Optoelectronics, C.R. Pollock, Wiley.
4. Optoelectronics, E. Rosencher & B. Vinter, Cambridge University Press.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. I Sem.**
Subject: **Lithography Techniques (Elect-1)**
Total Theory Periods**: 40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **ET & T.**
Code: 547133 (28)
Total Tutorial Periods: **12**

Unit 1
Resist Technology: Conventional photo resists, Deep UV resists, radiation resists, Future resists, Resists and develop track fabrication, DUV and resist wafer tracks,

Unit II
Optical Lithography: Diffraction and gratings, Abbe's theory of image formation, Transfer functions, Image effects, Image quality, Image placement, Mask issues.

Unit III
Electron & Ion Microbeam Lithography: Physics of exposures, Electron optical systems, Novel electron beam technologies, Positive electron beam resists, multilayer resist strategies, Ion surface interaction, Focused ion beam lithography, Masked ion beam lithography, Ion projection lithography

Unit IV
X- Ray Lithography: X-Ray printing methods, System components, Mask technology and construction, Resist, Metrology, X-ray systems.

Unit V
Nanolithography: Multispacer patterning, Patterning and ordering with nanoimprint technology, Nanoelectronic lithography, Extreme ultraviolet lithography

Text Books:
1. Handbook of VLSI Microlithography by J.N Helbert, Noyes Publications
2. Handbook of Nanophysics- Nanoelectronics and Nanophotonics, by K.D Sattler, CRC Press

Reference Books:
1. Microlithography Science & Technology by J.R Sheats & B.W Smith, Marcel & Dekker
2. Silicon Processing for VLSI Era, by Wolf, Lattice Press
3. Thin Film Phenomenon by K.L Chopra, McGraw-Hill

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M.Tech. I Sem.**
Branch: **E & TC**
Subject: **Nanotechnology for Energy System-Lab**
Code: 547121 (28)
Total Marks in End Semester Exam. : **75**
Total Lab Periods: **40**

List of Experiments

1. Fabrication and study of characteristics of dye-sensitized solar cell.
2. Fabrication and study of characteristics of alkaline electrolyte fuel cell
3. Fabrication and study of Proton Exchange membrane (PEM) fuel cell.
4. Study of various characteristics of Li-ion based batteries.
5. Fabrication and study of solid oxide fuel cells
6. Fabrication and study of micro fuel cell power sources.
7. To study solar energy harvesting using photo-thermal solar cells.
8. To study the volumetric and gravimetric storage capacities of hydrogen storage nano materials
9. Study of various characteristics of MEMS
10. Study of various characteristics of NEMS
11. Study of efficiencies and other parameters of various solar cell structures and their comparasion.
12. Study of the behaviour of the piezoelectric membranes and their applications.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M.Tech. I Sem.**
Branch: **E & TC**
Subject: **Simulation Lab**
Code: 528122 (28)
Total Practical Periods: **40**
Total Marks in End Semester Examination: **75**

List of Experiments

Use appropriate simulation software to study the following.

1. Use appropriate simulation software to study the Molecular Dynamics simulations of nano-materials
2. Simulate ballistic transport properties in 3D Carbon Nano Tube Field Effect Transistor (CNTFET) devices
3. Use appropriate simulation tool to compute molecular electronic spectra.
4. Simulate Coulomb Blockade through Many-Body Calculations in a single and double quantum dot system
5. Compute by simulation the electronic structure of various materials in the spatial configuration of bulk (infinitely periodic),
6. Apply simulation technique to compute the electronic structure of quantum wells (confined in one dimension)
7. Simulates pull-in behavior of Carbon nanotube based NEMS with fixed-fixed boundary conditions, with and without Vander Waal's effect .
8. Apply simulation techniques to visualise the surface texture of nanostructured ZnO material.
9. Express graphically the states of molecular vibrations in silver nanomaterials using simulation techniques.
10. Use simulation methods to study the characteristics of quantum dots
11. Use simulation methods to study the variation of energy band gap with size of nanomaterials.
12. Use simulation method for study of variation of surface energy with size of the nanoparticles.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Scheme of teaching and examination

M.Tech. (Nanotechnology) in the Department E&TC

IInd Semester

S. No	Board of Study	Subject Code	Subject	Period s per Week			Scheme of Examination			Total Marks	Credit L+(T+P) / 2
							Theory / Practical				
				L	T	P	ESE	CT	TA		
1	E&TC	547211 (28)	Chemistry of Nanomaterials & Fabrication	3	1	-	100	20	20	140	4
2	E&TC	547212 (28)	Synthesis of Nanomaterials	3	1	-	100	20	20	140	4
3	E&TC	547213 (28)	Material Characterisation Techniques	3	1	-	100	20	20	140	4
4	E&TC	547214 (28)	Electronics & Photonics	3	1	-	100	20	20	140	4
5	Refer Table-II		Elective - II	3	1	-	100	20	20	140	4
6	E&TC	547221 (28)	Synthesis Nanomaterials Lab-II	-	-	3	75	-	75	150	2
7	E&TC	547222 (28)	Characterisation of Nanomaterials	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L- Lecture **T- Tutorial** **P- Practical** **ESE- End Semester Exam** **CT- Class Test**
TA- Teacher's Assessment

TABLE –II			
ELECTIVE –II			
S. No	**Board of Study**	**Subject Code**	**Subject**
1	E & TC	547231 (28)	Carbon Nanotubes & its Functionalization
2	E & TC	547232 (28)	Laser Technology
3	E & TC	547233 (28)	Nanosensors : Principle, Design and Applications

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Tech. II Sem.**
Subject: **Chemistry of Nanomaterials & Fabrication**
Total Theory Periods**: 40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **E & TC.**
Code: 547211 (28)
Total Tutorial Periods: **12**

UNIT I

Atomic and Molecular Basics: The scope, The nanoscale systems, Defining nano dimensional materials, Size effects in nano materials, Application and technology development, General methods available for the synthesis of nano dimensional materials.

Particles and Bonds, Chemical bonds in Nano technology, The shapes of molecules, additional aspects of bonding, Molecular geometry: VSEPR Model, Hybridization, Van der Waals interactions, Dipole–Dipole Interactions, Ionic Interactions, Metal bonds, Covalent bonds, Coordinative bonds, Hydrogen bridge bonds and polyvalent bonds.

UNITII

Building Blocks of Nanotechnology: covalent architecture, coordinated architecture and weakly bound aggregates, Interactions and topology,

Chemical Properties: The effect of nanoscale metals on chemical reactivity, Effect of nanostructure on mass transport, Metal nanocrystallites , Supported nanoscale catalysts.

UNIT III

The effect of chemistry of nanostructures: Modification of nanoparticles, Langmuir Blodgett films, Self assembled surface films, Binding of molecules on solid substrate surfaces, Molecular nanostructures, Strategies of molecular construction, Synthetic supramolecules.

UNIT IV

Applied chemistry of nanomaterials:

Application to fundamenatal studies. Industrial applications: Photographic materials, Ceramic materials, Magnetic particles for recording media, Catalysts, Fuel cells electrocatalysis, Pigments, Nanostructured materials as new chemical reagents, Nanocomposite polymers, Fluids, inks and dyes, Block copolymers and dendrimers. Analytical and Environmental chemistry of nanoparticles.

UNIT V

Fabrication: Crystal growth and wafer preparation, Defects, Clean room concept, Wafer cleaning techniques, Oxidation, Diffusion, Epitaxy, Ion implantation, Metallization, Lithography, Etching, Masking sequences and bipolar and MOS device fabrication process flow, Integration of unit process, Process modeling, Topological design rules, Passive device such as registers and capacitors and their non idealities, Fabrication of nanoelectronics structures.

Text Books :

1. *Physical Chemitry* by P. W. Attkins , Oxford Press
2. *Introduction to Modern Colloid Science* by Robert J. Hunter, Oxford University Press.
3. Nanoscale Materials in Chemistry by Kenneth J. Khabhunde (ed.) Wiley Interscience.

References:

1. *Nanotechnology – An introduction to nanostructure of technique* by Michel Kohler and Wolfgang Frittsche , Wiley VCH
2. Materials Engineering by V. Raghavan, Prentice Hall.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Subject: **Synthesis of Nanomaterials**
Total Theory Periods: **40**
Total Marks in end Semester Exam.: **100**
Minimum number of class tests to be conducted: **02**

Branch: **E & TC.**
Code: 547212 (28)
Total Tutorial Periods: **12**

Unit-I Basics of Synthesis: Introduction to synthesis of nanostructure materials, Bottom-up approach : Bulk materials, Thin films , Heterostructures, Top-down approach : Nanocrystals, Molecular Wires, Proteins.

Unit-II Fabrication of Nanomaterials by Physical Methods: -Inert gas condensation, Arc, Plasma arc technique, RF plasma, MW plasma, Ion sputtering, Laser ablation, Laser pyrolysis, Ball Milling, Molecular beam epitaxy, Chemical vapour deposition method and Electro deposition.

Unit III Chemical methods: Chemical Routes for synthesis of nanomaterials: Chemical precipitation and coprecipitation; Metal nanocrystals by reduction, Sol-gel synthesis; Micro emulsions or reverse micelles, Solvothermal synthesis; Thermolysis routes, Microwave heating synthesis; Sonochemical synthesis; Electrochemical synthesis; , Photochemical synthesis,

Unit – IV Self Assembly and Catalysis: Process of self assembly, Semiconductors islands, Monolayers, nature of catalysis, Porous materials, Pillared clays, Colloids, Biometrics. Thermolysis route - spray pyrolysis and solvated metal atom dispersion, Sol-gel method, Solvothermal and hydrothermal routes, Solution combustion synthesis, Chemical vapor synthesis.

Unit – V Biological methods : Use of bacteria, fungi, actinomycetes for nano-particle synthesis, Magnetotatic bacteria for natural synthesis of magnetic nano-particle.

Textbooks:

1. Inorganic Materials Synthesis and Fabrication by J.N. Lalena, D.A. Cleary, E.E. Carpenter, N.F. Dean, John Wiley & Sons Inc.
2. Introduction to Nano Technology by Charles P. Poole Jr and Frank J. Owens. Wiley India.
3. The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Vol-I by C.N.R. Rao, Wiley

Reference books:

1. Encyclopedia of Nanotechnology by M.Balakrishna Rao and K.Krishna Reddy, Vol I to X, Campus books.

Nano: The Essentials – Understanding Nano Scinece and Nanotechnology by T.Pradeep; Tata Mc. Graw Hill

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Subject: **Material Characterization Techniques**
Total Theory Periods: **40**
Total Marks in end Semester Exam.: **100**
Minimum number of class tests to be conducted: **02**

Branch: **E & TC.**
Code: 547213 (28)
Total Tutorial Periods: **12**

Unit – I

Compositional and structural Characterization techniques:
X-ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-ray analysis (EDAX), Principles and applications of X-ray diffraction; electron diffraction, Electron probe microanalysis (EPMA), Ion beam techniques.

Unit – II

Surface characterization Techniques:
High resolution microscopy; Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM), Scanning tunneling microscopy (STM).

Unit – III

Spectroscopic techniques:
Fourier Transform infrared (FTIR) spectroscopy, Raman spectroscopy techniques: micro Raman and laser Raman.

Unit – IV

Electrical characterization techniques:
Measurement of resistivity by 4-prob method, Hall measurement, Seebeck coefficient measurements, nano indentation techniques, electron beam induced current measurement (EBIC).

Unit-V

Thermal and Magnetic characterization:
VSM, Thermal analysis, impedance and ferroelectric measurements

Text books:

1. Nano: The Essentials -Understanding Nano Scinece and Nanotechnology by T.Pradeep, Tata McGraw Hill
2. Introduction to Nano Technology by Charles. P. Poole Jr and Frank J. Owens, Wiley
3. A Practical Approach to X-Ray Diffraction Analysis by C.Suryanarayana, Springer
4. Electron Microscopy and Analysis by P.J. Goodhew and F.J. Humpreys, Springer

Reference Books:

1. Nanotechnology: Principles and Practices by Sulabha K. Kulkarni , Capital Publishing Company
2. Specimen preparation for Transmission Electron microscopy by John & Bravmno et al, Published by MRS
3. Photoelectron spectroscopy by JHD Eland, Butterworth & Co.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Branch: **E & TC.**
Subject: **Electronics & Photonics**
Code: 547214 (28)
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in end Semester Exam.: **100**
Minimum number of class tests to be conducted: **02**

Unit 1 Low Dimensional Semiconductors: Two dimensional semiconductor nanostructures, Square quantum well of finite depths, Parabolic and triangular quantum wells, Quantum wires and dots, Strained layers, Effect of strained layers, MOSFET structures, Heterojunctions, Superlattices.

Unit II Transport Phenomenon in Nanostructures: Parallel transport, Perpendicular transport, Quantum transport, Effect of magnetic field on a crystal, Low-dimensional systems in magnetic fields, Density of states of a 2D system in a magnetic field, The Aharonov–Bohm effect, The Shubnikov–de Haas effect, The Quantum Hall effect

Unit III Electronic Devices: MODFETs, Heterojunction bipolar transistor, Resonant tunneling effect and transistors, Single electron transistors,

Unit IV Optoelectronic Devices: Heterostructure semiconductor lasers, Quantum well semiconductor lasers, Vertical cavity surface emitting lasers (VCSELs), Strained quantum well lasers, Quantum dot lasers, Quantum well and superlattice photodetectors, Quantum well modulators, OLEDs, OPDs

Unit V Electronic Circuits & Applications: Fin-Fet circuits and applications, Hybrid Nano/CMOS circuits and applications, Nanowire arrays, Nanoscale ASIC, Carbon Nanotubes application, Graphene transistors and circuits, Resonant tunneling diodes application.

Text Books:

1. Nanotechnology in Microelectronics & Optoelectronics, J.M Martine Duart, R.J Martin Palma, F. Agullo Rueda, Elsevier

2. Nanoelectronic Circuit Design, N.K Jha, D Chen, Springer

Reference Books

1. Handbook of Nanophysics- Nanoelectronics & Nanophotonics, K.D Sattler, CRC Press

2. Organic Electronics-Sensors & Biotechnology- R. Shinar & J. Shinar, McGraw-Hill

3. Nanoelectronics, K. Iniewski, McGraw-Hill

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Branch: **E & TC.**
Subject: **Carbon Nanotubes & its Functionalization (Elect-II)**
Code: 547231 (28)
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in end Semester Exam.: **100**
Minimum number of class tests to be conducted: **02**

UNIT I Structure of carbon nanotubes
Preparation of Carbon Nano-Tubes (CNT): CVD, arc discharge and other methods of preparation
Properties: Electrical, Optical, Mechanical and Vibrational properties.

UNIT II Applications of carbon nanotubes: Field emission, Fuel Cells, Display devices **Functionalization of CNTs:** Fictionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes; Covalent Functionalization -Oxidative Purification; Defect Functionalization

Unit III: Physics of Carbon Nanotubes: Basics of physical properties of carbon nanotubes, explaination of the strange behaviour of carbon nanotubes, electrical conductivity of carbon nanotubes, thermal conductivity of carbon nanotubes, elasticity of carbon naotubes.

Unit IV Transport phenomena: Ficks law, Hydrodynamic equations, Application to confined fluids at nanoscale.
Surface tension: Static and dynamic contact angle, Surface energies, Capillary flows.

Unit V Micro fluidics devices: Micro array chips , Pump, Mixers, Valves, Lithography, Etching, Photo polymerization, Multilayer soft lithography.

Text Books:

1. Synthesis Functionalization and Surface Treatment of Nanoparticles by Marie Isabelle Baraton, American Scientific Publisher

2. Physical Properties of Carbon Nanotube by R Satio, Imperial College Press

3. Applied Physics Of Carbon Nanotubes : Fundamentals Of Theory, Optics And Transport Devices by S. Subramony & S.V. Rotkins, Springer

Reference:

1. Nanotubes and Nanowires by CNR Rao and A Govindaraj, RCS Publishing

2. Carbon Nanotubes: Multifunctional Materials – Ed. Prakash R. Somani and M. Umeno, Applied Science Innovations Pvt. Ltd., India

3. Physical Chemistry of Surfaces by Arthur W, Adamson and Alice P. Gast (John Wiley and Sons)

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Subject: **Laser Technology (Elect-II)**
Total Theory Periods: **40**
Total Marks in end Semester Exam.: **100**
Minimum number of class tests to be conducted: **02**

Branch: **E & TC.**
Code: **547232 (28)**
Total Tut Periods: **12**

Unit 1 Introduction to Lasers: Definition, Properties of lasers, Laser spectrum and wavelengths, Application of Maxwell's equations to dielectrics- laser gain medium, Dispersion equations, Coherence, Particle nature of light.

Unit II Radiative Properties of Matter: Molecular energy levels and spectra, Energy levels in liquids and solids- Dielectrics and Semiconductors, Radiating bodies, Cavity radiators, Absorption and stimulated emission.

Unit III Laser Amplifiers: Absorption and gain, Population inversion, Saturation intensity, Development and growth of laser beams, Exponential growth factors, Threshold requirements, Operation above threshold, Laser amplifiers.

Unit IV Laser Resonators: Longitudinal and Transverse cavity modes, Mode Properties, Stable curved mirror cavities, Gaussian beams, Unstable resonators, Q-Switching, Gain –Switching, Mode-Locking, Pulse shortening techniques, Ring lasers, Multi-mirror cavities, Cavities for gas lasers.

Unit V Laser Systems: Laser systems in low density gain media- Helium-Neon lasers, Argon-Ion lasers, Copper-vapor lasers, Carbon dioxide lasers, Excimer Lasers, X-ray plasma lasers, Free electron lasers. Laser systems in high density gain media- Organic Dye Lasers, Solid state Lasers, Ruby Lasers, Neodymium lasers, Alexandrite lasers, Fiber lasers, Semiconductor lasers.

Text Books:

1. Laser Fundamentals, W.T Silfvast, Cambridge University Press, 2004
2. Photonics and Lasers- An Introduction, R.S Quimby, Wiley Interscience, 2006

Reference Books

1. Handbook of Lasers- M.J Weber, CRC Press, 2001
2. Principles of Lasers and Optics, W.S.C Chang, Cambridge University Press, 2005
3. Lasers, A.E Siegman, University Science Books, 1986

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.** Branch: **E & TC.**
Subject: **Nanosensors : Principle Design and Applications(Elect-II)** Code: **547233 (28)**
Total Theory Periods: **40** Total Tut Periods: **12**
Total Marks in end Semester Exam.: **100**
Minimum number of class tests to be conducted: **02**

Unit I : Basics of Nanosensors:
Nanosensors based on different nanomaterials, Fabrication of nanosensors, Large-scale integration of nanosensor arrays, Common recognition elements, Surface chemistry and functionalization, Signal transduction, Practical applications .Properties of nanomaterials for designing powerful sensing and biosensing devices. Nanosensors based on metal nanoparticles, semiconductor nanowires and nanocrystals, and carbon nanotubes.

Unit II :Types of Nanosensors: Temperature Sensors, Smoke Sensors, Sensors for aerospace and defense, Accelerometer, Pressure Sensor, Night Vision System, Nano tweezers, Nano-cutting tools, Integration of sensor with actuators and electronic circuitry Biosensors.

Unit III: Inorganic Nanotechnology Enabled Sensors
Gas Sensing with nanostructured thin film, Adsorption on surfaces, Conductometric transducers suitable for Gas Sensing, Gas reaction on the surface, Effect of gas sensitive structures and thin films, Effects of deposition parameters and substrates, Metal Oxides Modification by additives, Surface modification, Filtering, Post deposition treatments.

Unit IV: Organic Nanotechnology Enabled Sensors
Proteins in nanotechnology enabled sensors, Structure of proteins, Analysis of proteins, Role of proteins in Nanotechnology, Using proteins as nanodevices, Antibodies in sensing applications, Antibody nanoparticle conjugates, Enzymes in sensing applications, Enzyme nanopraticle Hybrid based sensors, Motor proteins in sensing applications, Bioelectronic sensors based on DNA, DNA Sequencing with nanopores, Sensors based on molecules with dendritic architectures.

Unit V: Future Nanosensors
Nanometer and Picometer Displacement Sensors, Force Nanosensors, Thermal Nansensors, Heat-Flux Nanosensor, Micro-Thermocouple Sensor, Tunnelling Thermometer, Optical Nanosensors, Fiber-optic Nanosensors, Magnetic Nanosensors, Submicron Hall Probes, Micro-SQUID Sensors, Electronic Nose as a Sensor of Smell, Electronic Tounge as a Sensor of Taste, Advancement in Jaipur Foot by Various Sensors, Magnetic Stray Field Nanosensors, Magnetic Spin Sensors.

Text Book:
1. Sensors: Micro & Nanosensors, Sensor Market trends (Part 1&2) by H. Meixner.
2. Nanoelectronics and Nanosystems from Transistors to Molecular Quantum Devices by K. Goser, P. Glosekotter and J. Dienstuhl, Springer.
3. Nano Engineering in Science & Technology:An Introduction to the World of Nano Design by Michael Rieth.

Reference Books:
1. Handbook of Nanotechnology by Bharat Bhushan, Springer.
2. Nano Systems by K.E. Drexler , Wiley
3. Nanotechnology and Nanoelectronics : Materials, Devices and Measurement Techniques by W.R.Fahrner, Springer

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Subject: **Synthesis Nanomaterials Lab**
Total Practical Periods: **40**
Total Marks in End Semester Examination: **75**

Branch: **E & TC.**
Code: **547221 (28)**

List of Experiments (students have to perform at least 10 experiments)

1. Synthesis of nanocrystalline films of II-VI compounds doped with rare earths by chemical deposition technique

2. Fabrication of nanocrystalline films for use as optical filter for solar cells.

3. Synthesis of Alkaline earth aluminates in nanocrystalline form by combustion synthesis.

4. Preparation of surface conducting glass plate by spray pyrolysis method

5. Preparation of surface conducting glass plate by chemical route

6. Working with high vacuum coating unit and deposition of various metals on different substrates.

7. Preparation of nanostructured Y_2O_3: Eu phosphors

8. Formation of Prussian blue nano thin film and study of its electro chromic properties.

9. Fabrication of micro fluidic nanofilter by polymerisation reaction

10. Synthesis of aqueous Ferro fluid (colloidal suspension of magnetic nanoparticles)

11. Preparation and characteristics of Cadmium Selenide quantum dot nanoparticles.

12. Fabrication of nano silver arrays by nanosphere lithography.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M.Tech. II Sem.**
Subject: **Characterisation of Nanomaterials-Lab**
Total Practical Periods: **40**
Total Marks in End Semester Examination: **75**

Branch: **E & TC.**
Code: **547222 (28)**

1. Study of nanocrystalline films of II-VI compounds doped with rare earths for applications in light detectors, Solar cells, Lamp phosphors etc.

2. Absorption spectral studies of the prepared nanocrystalline films and determination of absorption coefficient.

3. Tauc's plots and determination of band gap from the absorption spectra

4.. Determination of particle size from the absorption spectral studies of nanocrystalline films.

5. Photoluminescence emission spectral studies of the prepared nanocrystalline films.

7. Study of luminescence characteristics of the prepared Alkaline earth aluminates.

8. Study of Hall effect in semiconductors and its application in nanotechnology.

9. Measurement of electrical conductivity of thin film of semiconductors by Four Probe Method and study of temperature variation of electrical conductivity.

10. Study and determination of optical and electrical properties. of surface conducting glass plate by spray pyrolysis method

11. Study and determination of i optical and electrical properties of surface conducting glass plate by chemical route

12. Study of luminescent properties of nanostructured Y_2O_3: Eu phosphors

13. Study of electro chromic properties Prussian blue nano thin film .

14. Study of aqueous Ferro fluid (colloidal suspension of magnetic nanoparticles) under external magnetic field.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Scheme of teaching and examination

M.Tech. (Nanotechnology) in the Department E&TC

3rd Semester

S. No	Board of Study	Subject Code	Subject	Period s per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P) / 2
				L	T	P	ESE	CT	TA		
1	E & TC	547311 (28)	Supramolecur & Surface Chemistry	3	1	-	100	20	20	140	4
2	Refer Table – III		Elective – III	3	1	-	100	20	20	140	4
3	E & TC	547321 (28)	Project Work	-	-	28	100	-	100	200	14
4	E & TC	547322 (28)	Seminar on Industrial training & Dissertation	-	-	3	-	-	20	20	2
Total				**6**	**2**	**31**	**300**	**40**	**160**	**500**	**24**

L- Lecture T- Tutorial P- Practical ESE- End Semester Exam CT- Class Test TA- Teacher's Assessment

TABLE –III			
ELECTIVE -III			
S. No	**Board of Study**	**Subject Code**	**Subject**
1	E & TC	**547331 (28)**	Nano-Biotechnology
2	E & TC	**547332 (28)**	MEMS & MEMS
3	E & TC	**547333 (28)**	Nanocomposites :- Structure Properties & Performance
4	E & TC	**547334 (28)**	Nanocomputing

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M. Tech III Sem.** Branch: **E & TC**
Subject: **Supramolecular & Surface Chemistry** Code: **547311 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT I
Basics of Supramolecular Chemistry: Non-covalent interactions; Definitions in supramolecular chemistry; Host – Guest chemistry; Complexation of cations, anions & neutral molecules (crown ethers template effect).

UNIT II
Structures & Design of Supramolecular Chemistry: Catenanes, rotaxanes; Molecular switches & devices; Fullerenes, graphene, carbon nanotubes; Materials for nonlinear optics (π – conjugated donor – acceptor systems); π – conjugated polymers (synthesis & conducting properties); Supramolecular design strategy & nanotechnology

UNIT III
Surface Chemistry: Adsorption and absorption, Adsorption isotherms, Freundlich adsorption isotherm,Langmuir adsorption isotherm, B.E.T. theory of multilayer adsorption, Gibbs adsorption isotherm, Application of adsorption.
UNIT IV
Colloids: Classification of Colloids, Preparation of colloidal solutions, Purification of colloidal solution,Properties of colloidal solution, Emulsion, Gels, Uses of colloids, Micelle formation, The critical micellization concentration, Factors affecting the c.m.c.
Colloidal state: Determination of size of colloidal particles; Types of surfactants: Anionic, cationic, gemini, zwitterionic & non-ionic (non-iogenic); Theory of surfactants; CMC – Effect of chemical structure, temperature; Kraft temperature; Emulsions & gels
UNIT V
Phase Behaviour of Concentrated Surfactant: Systems Micelle type, Micellar growth, Micellar solution saturation; Structure of liquid crystalline phases; Surfactant geometry & packing; Introduction to microemulsion.

Text Books:
1. Physical Chemitry by P. W. Attkins , Oxford Press
2. Introduction to Modern Colloid Science by Robert J. Hunter, Oxford University Press.
3. Nanoscale Materials in Chemistry by Kenneth J. Khabhunde (ed.) Wiley Interscience.

References:
1. Surfactants and Polymers in Aqueous Solution by K. Holmberg, B. Jonsson, B. Kronberg, B. Lindman, Wiley.
2. Dynamics of Surfactant Self-assemblies by Raoul Zana (Ed.), Taylor & Francis.
3. Supramolecular Chemistry by J.W. Steed, J.L. Atwood, Wiley

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M. Tech III Sem.**
Subject: **Nano – Biotechnology (Elect-III)**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

Branch: **E & TC**
Code: **547331 (28)**
Total Tutorial Periods: **12**

Unit–I Basics of Nanobiotechnology: Fundamentals terms in biotechnology, Biological building blocks: Sizes of building blocks and Nanostructures, Polypeptide nanowire and protein nanoparticles

Unit – II Building blocks of Nanobiotechnology: Nucleic Acids , DNA double nano wire, Genetic code and protein synthesis, Blue print of life, Genetic engineering

Unit-III Biological Nanostructures: Bio-mimetic with examples, Bio compatible Bio sensors, Examples of proteins, Vesicles, Bilayers and Multilayer films, Application of bio- nanotechnology, Bio nano machines, Molecular modeling.

Unit – IV Applications to NEMS and Nano devices: Nano bio-sensors and biomedical applications, Nano materials in drug delivery, Organic semiconductors, Biological neurons and their functions, Bio-chemical and quantum mechanical computers: DNA computers, Parallel processing, Bit and 'Q' bit, Quantum parallelism.

Unit –V Nanobiotechnology for Health: Nanoscale processes in the environment, Nano technology for immune system, Clinical imaging, Nano robots, Nano Fibres for Tissue Engineering.

Textbooks:

1. Bio Nano Technology by Good Sell, Wiley
2. Introduction to Nanotechnology by Charles. P.Poole Jr and Frank J. Owens, Wiley .
3.Nano Technology, A gentle introduction to the next big idea by Mark Ranter and Daniel Ranter, Pearson education
4 Nanotechnology – science, innovation and opportunity by Lynn E Foster, Pearson education.

Reference books:

1. Encyclopedia of Nanotechnology by H.S.Nalwa, American Scientific Publishers
2. Encyclopaedia of Nanotechnology by M.Balakrishna Rao and K.Krishna Reddy (Vol I to X), Campus books.

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M. Tech III Sem.**
Subject: **MEMS & NEMS (Elect-III)**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

Branch: **E & TC**
Code: **547332 (28)**
Total Tutorial Periods: **12**

MEMS & NEMS

Unit 1 Micro & Nano Scale Systems: Introduction to design of MEMS and NEMS, Biological and biosystems analogy, Micro & Nano Electromechanical systems, applications, devices structures, MEMS & NEMS architectures.

Unit II MEMS & NEMS Fabrication: Basic Process, Microfabrication and micromachining of ICs, Microstructures, Microdevices, Bulk micromachining, Surface micromachining, High aspect ratio technology, MEMS motion microdevices- Classifier and synthesis

Unit III Modeling of MEMS & NEMS: Modeling, Analysis, Simulation, Model Developments, Lumped parameter mathematical modeling, Direct-Current microtransducers, Induction micromachines, Synchronous microtransducers, Piezotransducers, EM radiation microdevices.

Unit IV Control of MEMS & NEMS: Introduction to control, Proportional Integral Derivative controls, Tracking control, Time-optimal control, Sliding mode control, Constrained control of nonlinear MEMS, Intelligent control.

Unit V Applications & Packaging of MEMS & NEMS: MEMS in industrial automotive applications, Photonic applications, Biological applications, RF MEMS, Packaging and reliability considerations.

Text Books:

1. MEMS & NEMS by S.E Leshevsky, CRC Press
2. An Introduction to Microelectromechanical Systems Engineering by N. Maluf & K. Williams, Artech House

Reference Books:

1. MEMS- Introduction & Fundamentals by M.G EL. Hak, CRC Press
2. MEMS Mechanical Structures by S. Beeby, G. Ensell, M. Kraft, N. White, Artech House
   RF MEMS Switches by A.Q Liu, Springer

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Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M. Tech III Sem.**
Subject: **Nanocomposites :- Structure Properties & Performance (Elect-III)**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

Branch: **E & TC**
Code: **547333 (28)**
Total Tutorial Periods: **12**

UNIT I
Introduction to composites- Various types Macro composites MMC, PMC, CMC, Blends, Need and importance,Particulates and Fillers, 3-D Nanosilica particles, 2-D Nanotubes, 1-D Nanoclay, Properties of Virgin Materials, Need to modify, Mechanical properties, Electrical properties, Chemical properties, Physical properties.

UNIT II
Novel properties imbibed: Improved barrier properties, Fire resistance and strength, Different Polymer Nanocomposites, PU/Clay, Rubber-Clay Nanocomposites, Nanosilica, PET/Clay, PP Silica

UNIT III
Processing of Nanocomposites: Carbon nanotube-reinforced composites, Nylon 6 Nanocomposites, Clay-Based Nanocomposites, Thermoset Based Nanocomposites, Rheology of nanocomposites coatings

UNIT IV
Characterisation of Nanocomposites: Techniques to analyse and study, High Resolution Transmission Electron Micrography, Dynamic Mechanical Thermal Analysis, Differential Scanning calorimetry.

UNIT V
Potential Applications- Packaging, Biodegradable, Medical and Pharmaceutical coatings, Biodegradable technology,Biodegradable electronics, use of nanocomposites in coating.

Books and suggested readings
1. Nanocomposite Thin Films & Coatings: Processing, Properties & Performance by Sam Zhang & Nasar Ali, World Scientific
2. Polymer Nanocomposites by Yiu-Wing Mai & Zhongzhen Yu, CRC

Reference Books:
1. Polymer Nanocomposites: Synthesis, Characterization, and Modeling (Acs Symposium Series) by Ramanan Krishnamoorti (Editor) and Richard A. Vaia (Editor), An American Chemical Society Publication
2. Polymer-Layered Silicate and Silica Nanocomposites by Y.C. Ke and P. Stroeve, Elsevier Science
3. The excellent study material is available on the website http://www.nsti.org/Nanotech2005/workshops/polymer_nanotechnology.html

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Semester: **M. Tech III Sem.**
Branch: **E & TC**
Subject: **Nanocomputing (Elect-III)**
Code: **547334 (28)**
Total Theory Periods: **40**
Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT I
Basics of Nanocomputing : The development of Microelectronics and Nanostructure, The Complexity Problem, The challenge initiated by Nanoelectronics, Basics of Nanoelectronics, Electromagnetic Fields and Photons, Quantization of Action, Charge, and Flux, Electrons behaving as waves, Electrons in potential wells, Diffusion Process.

UNIT II
Biochemical and Quantum-Mechanical Computers : DNA Computer, Information Processing With Chemical reaction, Nanomachines, Parallel Processing, Quantum Computers, Bit and Qubit, Coherence and Entanglement, Quantum Parallelism.

UNIT III
Parallel Architectures for Nanosystems : Mono and Multiprocessor Systems, Some considerations to Parallel Processing, Influence of Delay Time, Power Dissipation, Architecture for processing in Nanosystems, Classic Systolic Arrays, Processor with large memory, Processor array with SIMD and PIP Architectures, Reconfigurable Computers, The Teramac Concept as a Prototype.

UNIT IV
Soft Computing And Nanoelectronics : Methods of Soft Computing, Fuzzy Systems, Evolutionary Algorithms, connectionistic Systems, Computationally Intelligent Systems, Characteristics of Neural Networks in Nanoelectronics, Local Processing, Distributed and Fault-tolerant Storage, Self-organization.

UNIT V
Nanosystems As Information Processing Machines : Nanosystems as Functional Machines, Information Processing as information Modification, System Design and its interfaces, Requirements of Nanosystems, Uncertainties, Removal of Uncertainties by Nanomachines, Uncertainties in Nanosystems, Uncertainties in the Development of Nanoelectronics.

Books and suggested readings
1. Nanoelectronics and Nanosystems From Transistors to Molecular and Quantum Devices by Goser et.a., Springer.
2. Nano Quantum and Molecular Computing : Inmplications to high level design and validation by Sandeep Shukla and R. Iris Bahar, Kluwer Academic Publisher.
3. Nano Systems by K E Drexler, Wiley.

Reference Books:
1. Nanotechnology : Basic Science and Emerging Technologies by Mick Wilson, Kamali Kannangara, Geoff smith, Overseas Press.
2. Nanocomputing : The Future of Computing, Tata MC Graw-Hill.
3. Fundamentals of Nanoelectronics by George W. Hanson Person Education.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Scheme of teaching and examination

M.Tech. (Nanotechnology) in the Department E&TC

4th Semester

S.N.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	E & TC	547421 (28)	Project + Seminar	6	-	34	300	-	200	500	23
Total				**6**	**-**	**34**	**300**	**-**	**200**	**500**	**23**

L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment

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Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (C.G.)

Scheme of Teaching and Examination

M. Tech. (High Voltage Engineering) in the Department of Electrical Engineering

4th Semester

Sl. No.	Board of Study	Subject Code	Subject	Periods per Week		Scheme of Exam Theory/Practical				Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Electrical Engineering	5100421(024)	Dissertation + Seminar + Viva-Voce	6	-	34	300	-	200	500	23
Total				**6**	**-**	**34**	**300**	**-**	**200**	**500**	**23**

L-Lecture T-Tutorial P-Practical

CT-Class Test TA-Teacher Assessment ESE-End Semester Exam

Scheme of Marks Allotment

Semester	Total Marks	Grand Total
I	1000	3000
II	1000	
III	500	
IV	500	

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Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (C.G.)

Scheme of Teaching and Examination

M. Tech. (High Voltage Engineering) in the Department of Electrical Engineering

3rd Semester

S. No	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Electrical Engineering	5100311(024)	Insulation & Design of High Voltage Power Apparatus	3	1	-	100	20	20	140	4
2	Refer Table-III		Elective-III	3	1	-	100	20	20	140	4
3	Electrical Engineering	5100321(024)	Preliminary Project	-	-	28	100	-	100	200	14
4	Electrical Engineering	5100322(024)	Seminar	-	-	3	-	-	20	20	2
Total				**6**	**2**	**31**	**300**	**40**	**160**	**500**	**24**

Table – III

Elective – III			
Sl. No.	**Board of Study**	**Subject Code**	**Subject**
1	Electrical Engineering	5100331(024)	Distributed Generation & Micro Grid
2	Electrical Engineering	5100332(024)	Industrial Load Modeling & Control
3	Electrical Engineering	5100333(024)	Engineering Soft Computing
4	Electrical Engineering	5100334(024)	Energy Audit & Financial Management

L-Lecture T-Tutorial P-Practical

CT-Class Test TA-Teacher Assessment ESE-End Semester Exam

Note: (1) 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.

(2) Choice of elective course once made for an examination cannot be changed in future examinations

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.E. III
Specialization: High Voltage Engg.
Subject: Insulation & Design of High Voltage Power Appratus
Branch: Electrical Engineering
Total Theory Periods: 40
Subject Code: 5100311(024)
Total Marks in End Semester Exam. : 100
Total Tutorial Periods: 12
Minimum number of class test to be conducted: 02

UNIT-I: INSULATING MATERIALS UTILIZED IN POWER-SYSTEM EQUIPMENT

Insulating Materials, Characterization Of Insulation Condition, Deterioration And Failure of Insulating Materials, Electrical Breakdown And Operating Stresses, Insulation Applications, Insulation Design Requirements, Electric Stress Distributions In Insulation, Electric Stress Control.

UNIT-II: INSULATION DEFECTS IN POWER-SYSTEM EQUIPMENT

Suspension And Post Insulators, High-Voltage Bushings, High-Voltage Instrument Transformers, High-Voltage Power Capacitors, High-Voltage Surge Arresters, High-Voltage Circuit Breakers, Gas-Insulated Systems (GIS), High-Voltage Cables, Electrical Rotating Machines, Transformers And Reactors.

UNIT-III METHODS FOR INSULATION ASSESSMENT

Generation And Measurement Of Test High Voltages, Power-Frequency Voltages, High-Frequency Voltages, Very-Low-Frequency Voltages (Vlf), Direct Voltages, Hybrid Test Circuits, Lightning Impulse Voltages, Switching Surge Voltages, High-Voltage Equipment For On-Site Testing, Non-Destructive Electrical Measurements, Physical And Chemical Diagnostic Methods.

UNIT-IV: METHODS FOR INSULATION TESTING

Line And Substation Insulators, Overhead Line And Substation Hardware, Surge Arresters, Switchgear, Bushings, High-Voltage Instrument Transformers, High-Voltage Power Capacitors, High-Voltage Rotating Machines, High-Voltage Cables, Distribution And Power Transformers, Dielectric Testing Of HVDC Equipment.

UNIT-V: INSULATION CONDITION MONITORING TECHNIQUES

Sensors, Ultra-High-Frequency Sensors, Optical-Fibre Sensors, Directional Sensors For PD Measurements, Problems With Offline Condition Monitoring, Noise-Mitigation Techniques, Non-Electrical Online Condition Monitoring, Online Acoustic/Electric PD Location Methods For Transformers, Electrical Online Condition Monitoring.

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REFERENCES:

1. R.E. James and Q. Su, "Condition Assessment of High Voltage Insulation in Power System Equipment", The Institution of Engineering and Technology, London, 2008.
2. Shugg, W. Tillar, *Handbook of Electrical and Electronic Insulating Materials*, 2nd edn (Van Nostrand Reinhold, NY, 1995)
3. Vitkovich, D., *Field analysis: Experimental and Computational Methods* (D. Van Nostrand, New York, 1966)
4. Yoshida, S., and Naito, K., 'Survey of electrical and mechanical failures of insulators caused by ice and/or snow', CIGRE WG B2.03, *Electra*, October 2005;(222):22–26
5. Hains, A.J., 'Insulation performance under switched voltage waveforms', *Power Engineering Journal*, August 2000:158–63
6. Kuffel, E., Zaengl, W.S., and Kuffel, J., *High Voltage Engineering Fundamentals* (Newnes Press, Oxford, 2000)
7. CISPR 18-2: Admnt. 1, 1993, 'Radio interference characteristics of overhead lines and high-voltage equipment; Part 2: Methods of measurement and procedure for determining limits'
8. Schwab, A.J., *High Voltage Measurement Techniques* (MIT Press, Massachusetts, 1972)
9. Kreuger, F.H., *Partial Discharge Detection in High Voltage Equipment* (Butterworth, London, 1989)
10. Konig, G., and Feser, K., 'A new digital filter to reduce periodical noise in partial discharge easurements', presented at the 6th International Symposium on High Voltage Engineering, New Orleans, 28 August–1 September 1989, paper 43.10

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.E. IIIrd
Subject: Distributed Generation & Microgrid
Total Theory Periods: 40
Total Marks in End Semester Exam. : 100
Minimum number of class test to be conducted: 02

Specialization: High Voltage Engg.
Branch: Electrical Engineering
Subject Code: 5100331(024)
Total Tutorial Periods: 12

Unit-I:
Modern Power System: Generation - Transmission - Distribution - Loads - Introduction to Distributed
Generation (DG) - Technologies of DG - IEEE 1547- Solar photovoltaic generation - wind energy Wind power plants – Micro turbines - Fuel Cell - Storage Systems - batteries, fly-wheels, ultra capacitors - unit sizing of DGs - Case studies

Unit-II:
Penetration of DGs Units in Power Systems - Integration of DGs Units in Distribution Network - Modern Power Electronics for DGs Applications – multiple and single input dc-dc converters - ac-dc and dc-ac converters - Technical restrictions - Protection of DGs - Economics of DGs – Pricing and Financing framework for DG units - Optimal placement of DGs

Unit-III:
Introduction to Micrograds - AC and DC microgrids - Operational Framework of Microgrids - and islanding schemes - Distribution Management System (DMS) - Microgrid System Central Controller(MGCC) - Local Controllers (LC) - Economic, environmental and operational benefits of Microgrids in distribution network - Demand Response Management in Microgrids -Business Models and Pricing, Mechanism in Microgrids - Interconnection of Microgrids

Unit-IV:
Introduction to Smart Grids (SG) - Factors affecting the growth of SG - The global reality in the field of smart grids and transition into future grids - Smart Agents - Electronics and communications infrastructure in SG - ICT Technologies - smart meters - metering infrastructures – metering equipment - communication of metering equipment - Metering Data Management Systems (MDMS) - Application of SGs - Interconnections issues between SGs

Unit-V:
Introduction to restricting of Power Industry, Fundamentals of Economics, Philosophy of market Models, Monopoly model, single buyer model, whole sale competition model, ATC, TTC, TRM, CBM.

References:

1. N. Hatziargyriou, Microgrids: Architectures and Control, Wiley-IEEE Press, 1st Edition, 2014
2. J. N. Twidell&A. D. Weir, Renewable Energy Sources, University press,Cambridge, 2001
3. James Larminie, Andrew Dicks ,Fuel Cell Systems, John Weily& Sons Ltd, 2000
4. J. F. Manwell, J. G. McGowan, A. L. Rogers,Wind Energy Explained, John Weily& Sons Ltd2009
5. Loi Lei Lai, Tze Fun Chan, Distributed Generation- Induction and Permanent Magnet Generators,IEEE Press, John Wiley & Sons, Ltd., England. 2007.
6. AmirnaserYezdani, and Reza Iravani, Voltage Source Converters in Power Systems: Modeling,Control and Applications, IEEE John Wiley Publications, 2009.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.E. IIIrd
Subject: Energy Auditing and Financial Management
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum number of class test to be conducted: 02

Specialization: High Voltage Engg.
Branch: Electrical Engineering
Subject Code: 5100334(024)
Total Tutorial Periods: 12

UNIT-I ENERGY MANAGEMENT

Energy Management, Need For Energy Management, Basics For Energy Managers, Designing And Starting An Energy Management Program, Management Of The Program, Planning, Audit Planning, Educational Planning, Educational Planning, Energy Accounting, Energy Monitoring, Targeting And Reporting

UNIT-II ENERGY AUDITING

Introduction, Energy Auditing Services, Basic Components Of An Energy Audit, Specialized Audit Tools, Industrial Audits, Commercial Audits, Residential Audits, Indoor Air Quality.

UNIT-III ECONOMIC ANALYSIS

Introduction, Costs, Simple Payback Period Cost Analysis, Time Value Of Money, Discounted Cash Flow Analysis, Basics And Single Sum Analyses, Uniform Series, Cost Analysis Methodology Using Discounted Cash Flows, Cost Effectiveness Measures Using Discounted Cash Flows, Life Cycle Costing, Lcc Decision Making, Taxes And Depreciation, Inflation, Energy Financing Options.

UNIT-IV ELECTRIC ENERGY MANAGEMENT

MOTOR: Introduction, Motors And Adjustable Speed Drives, High Efficiency Motors, Motor Load Factors, Rewinding Electric Motors, Motor Drives And Controls, Other Factors In Motor System Efficiency, Utility Rebates For Motors And Drives, Steps For Process Improvement.

LIGHTING: Components Of The Lighting System, Determining Lighting Needs, Maintaining The Lighting System, The Lighting Survey, Regulatory/Safety Issues, Lighting Checklist, New Technologies And Approaches,

UNIT-V ENERGY TRADING AND RISK MANAGEMENT

Introduction, Commodity, Contract, Market Economics, Defining the types of risks faced by Energy Companies, Introduction to the trading organization, Valuation of contracts, Markets, their trading instruments and related risks.

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REFERENCES:

1. Barney L. Capehart, Wayne C. Turner, And William J. Kennedy," Guide To Energy Management", Seventh Edition, The Fairmont Press, Inc., 2011
2. Wayne C Turner," Energy Management Handbook" **Sixth Edition,** Library Of Congress Cataloging-In-Publication Data, 2006
3. Energy Management: W.R. Murphy, G.Mckay (Butterworths)
4. Energy Management Principles: C.B.Smith (Pergamon Press).
5. Y P Abbi And Shashank Jain, '*Handbook On Energy Audit And Environment Management*', Teri, 2006
6. Reay D.A, Industrial Energy Conservation, 1stedition, Pergamon Press, 1977
7. Giovanni Petrecca, '*Industrial Energy Management: Principles And Applications*', The Kluwer International Series -207,1999
8. Energy Trading and Risk Management, Iris Marie Mack, Wiley Finance Series.

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.E. IIIrd
Subject: Industrial Load Modeling & Control
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum number of class test to be conducted: 02

Specialization: High Voltage Engg.
Branch: Electrical Engineering
Subject Code: 5100332(024)
Total Tutorial Periods: 12

UNIT – I
Electric Energy Scenario-Demand Side Management-Industrial Load Management; Load Curves - Load Shaping Objectives-Methodologies-Barriers; Classification of Industrial Loads-Continuous and Batch processes -Load Modeling; Electricity pricing – Dynamic and spot pricing –Models.

UNIT – II
Direct load control- Interruptible load control; Bottom up approach- scheduling- Formulation of load models- optimization and control algorithms - Case studies.

UNIT – III
Reactive power management in industries-controls-power quality impacts-application of filters.

UNIT – IV
Cooling and heating loads- load profiling- Modeling- Cool storage-Types-Control strategies-Optimal operation-Problem formulation- Case studies.

UNIT – V
Captive power units- Operating and control strategies- Power Pooling- Operation models; Energy Banking- Industrial Cogeneration; Selection of Schemes Optimal Operating Strategies-Peak load saving-Constraints-Problem formulation- Case study; Integrated Load management for Industries.

TEXT BOOK
1. H. G. Stoll, 'Least cost Electricity Utility Planning', Wiley Inter science Publication, USA, 1989.

REFERENCES
1. I.J.Nagarath and D.P.Kothari, 'Modern Power System Engineering', Tata McGraw Hill publishers, New Delhi, 1995.
2. IEEE Bronze Book, 'Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities', IEEE Inc, USA.
3. ASHRAE Handbooks, 1997-2000, American Society of Heating, Refrigerating and Air conditioning Engineers Inc., Atlanta, GA.
4. Richard E. Putman, 'Industrial energy systems: analysis, optimization, and control', ASME Press, 2004

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Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.E. IIIrd
Subject: Engineering Soft Computing
Total Theory Periods: 40
Total Marks in End Semester Exam. : 100
Minimum number of class test to be conducted: 02

Specialization: High Voltage Engg.
Branch: Electrical Engineering
Subject Code: 5100333(024)
Total Tutorial Periods: 12

Unit I: Basic tools of soft Computing: Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non – linear Error surface and optimization.

Unit II: Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets; Basic set operations; Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference; Defuzzificaiton; Fuzzy logic control; Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition.

Unit III: Neural networks: Single layer networks, Perceptron; Activation functions; Adalinc- its training and capabilities, weights learning, Multilayer perceptrons; error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm, Kohenen self – organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS),

Unit IV: Evolutionary Computing: Genetic algorithms and Particle swarm optimization (PSO): Basic concepts, encoding, fitness function, reproduction. Differences of GA and traditional optimization methods. Basic evolutionary programming concepts Applications, hybrid evolutionary algorithms.

Unit V: Artificial Intelligence & Techniques, Regression Analysis, Separation & Clustering, steepest descent method Application of AI to High Voltage Engineering.

Text Books

1) F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design – Theory, Tools and Applications". Pearson Education. (Printed in India).

Reference Books

1) J. S. R. Jang. C. T. SUN and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd., New Delhi.
2) Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.
3) S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India.
4) V. Keeman, "Learning and Soft computing", Pearson Education, India.
5) R. C. Eberhart and Y. Shi, "Computational Intelligence Concepts to Implementation". Morgan Kaufmann Publishers (Indian Reprint)

Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai (CG)

Scheme of Teaching and Examination

Courses of Study and Scheme of Examination of M. Tech. (High Voltage Engineering)

Semester – I

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Electrical Engineering	5100111(024)	Mathematical Methods for Power Engineering	3	1	-	100	20	20	140	4
2	Electrical Engineering	5100112(024)	High Voltage Engineering & Measurement	3	1	-	100	20	20	140	4
3	Electrical Engineering	5100113(024)	Power System Protection	3	1	-	100	20	20	140	4
4	Electrical Engineering	5100114(024)	High Voltage AC/DC Transmission	3	1	-	100	20	20	140	4
5	Refer Table-I		Elective-I	3	1	-	100	20	20	140	4
6	Electrical Engineering	5100121(024)	High Voltage Engineering Lab-1	-	-	3	75	-	75	150	2
7	Electrical Engineering	5100122(024)	Power System Protection Lab	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

Table – I

Elective-I			
S. No.	**Board of Study**	**Subject Code**	**Subject**
1	Electrical Engineering	5100131(024)	Power Electronics for Renewable Sources
2	Electrical Engineering	5100132(024)	Physics for Dielectrics
3	Electrical Engineering	5100133(024)	Analysis of Electrical Machine
4	Electrical Engineering	5100134(024)	Power System Dynamics & Control

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note: 1. 1/4th of total strength of students subject to minimum of four students is required to offer an elective in the college in a Particular academic session.
2. Choice of elective course once made for an examination can be changed in future examinations

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Criterion 1

Curricular Planning and Implementation QlM 1.1.1