Department of Electrical Engineering

CURRICULUM AND SYLLABUS

(2023-2027)

B.Tech. Electrical Engineering

Electrical Engineering

B.Tech. (EE)

CURRICULUM AND SYLLABUS

Vision Statement of University

Be an internationally acclaimed University recognised for its excellent teaching, research, innovation, outreach and creating top class technocrats and professionals who can serve the mankind as multi skilled global citizen.

Mission Statement of University

- Establish state-of-the-art facilities for world class education and research.
- Conduct scholarly research and creative endeavours that impact quality of life.
- Attract quality staff and students to cater for diverse needs and preferences and widen participation.
- Build a foundation for students to be successful at all levels through high-quality, innovative programs.
- Collaborate with institute, industry, and society to address current issues through research and align curriculum.
- Involve in societal outreach programs to identify concerns and provide sustainable ethical solutions.
- Encourage life-long learning and team-based problem solving through an enabling environment.

Vision of the Department:

To become centre of excellence in technical education and research to bring innovation and entrepreneurship ethically in the advance fields of electrical and allied engineering to bring intellectual, social, industrial contemporary requirements and innovation to improve performance, productivity and environmental sustainability through lifelong learning.

Mission of the Department:

1. To produce globally competent and skilled electrical engineers by providing exceptional quality education.
2. To develop collaborative and state-of-art research environment to design, interpret, implement and disseminate knowledge in broader horizons.
3. To develop collaborations with educational institutions, R&D organizations, alumni, and industries for distinction in research, teaching and consultancy proceedings in electrical and allied engineering.
4. To provide an academic ambiance of ethical, excellence, environment friendly and lifelong learning to the students of electrical and allied engineering for contribution in energy efficient systems.
5. To attract experienced, highly qualified and expert faculty for an inclusive educational environment.

Department of Electrical Engineering

Program Education Objectives (PEOs)

PEO$_{01}$	To provide students with the knowledge of Mathematics, Basic Engineering principles and Computing, Basic Sciences and Electrical and allied Engineering in particular so as to develop necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.
PEO$_{02}$	To prepare students as competent to analyze and provide economically feasible and socially acceptable solutions of real-life technical problems in industry, research and academics related to power, information, science, business and public policy.
PEO$_{03}$	To prepare students to excel in professionalism and adoptability at the global level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.
PEO$_{04}$	To indoctrinate an attitude to prepare and encourage students to undergo research work as well as to involve in scientific innovations for sustainable development in Electrical and allied Engineering.
PEO$_{05}$	To prepare graduates to communicate effectively, adopt lifelong learning, pursue higher education and act with Integrity and have inter-personal skills needed to engage in, lead and nurture diverse teams, with commitment to their ethical and social responsibilities.

Department of Electrical Engineering

PROGRAMME OUTCOMES (POs)

PO_{01} **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problem.

PO_{02} **Problem analysis:** Identify, formulate, review, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO_{03} **Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO_{04} **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO_{05} **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO_{06} **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO_{07} **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO_{08} **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO_{09} **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO_{10} **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able

to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Department of Electrical Engineering

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO01	Graduates will be able to apply the fundamental knowledge of mathematics, science and engineering to formulate, design and analyze and investigate complex power system problems in electrical and allied engineering horizons.
PSO02	Graduates will be industry ready to design, develop and implement electrical and electronics and allied interdisciplinary projects to meet the contemporary demands of industry and provide solutions to the current real time problems related to electric drive systems.
PSO03	Graduates will be aware of the impact of professional engineering solutions in societal, energy efficiency, environmental context, professional ethics and able to demonstrate soft skill proficiency for sustainable global development.
PSO04	Graduates will be able to apply the appropriate techniques and knowledge of modern engineering hardware and software tools in electrical and allied engineering domain to engage in life-long learning and to successfully adapt in multi-disciplinary environment.

MEDI-CAPS UNIVERSITY

Electrical Engineering Department

Scheme For B.Tech. Batch 2023

SEMESTER-I

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3BS11	Engineering Mathematics-I	3	0	0	3
2	EN3BS16	Engineering Physics	3	0	2	4
3	EN3ES17	Basic Electrical Engineering	3	0	2	4
4	EN3ES26	Engineering Graphics	2	0	2	3
5	EN3ES27	Basic Programming with C	2	0	2	3
6	EN3ES30	Basic Civil Engineering & Mechanics	3	0	2	4
7	EN3HS01	History of Science and Technology	2	0	0	2
8	EN3NG01	Environmental Science	2	0	0	2
Total			**20**	**0**	**10**	**25**
Total Contact Hours			**30**			

SEMESTER II

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3BS12	Engineering Mathematics-II	3	0	0	3
2	EN3BS14	Engineering Chemistry	2	0	2	3
3	EN3ES16	Basic Electronics Engineering	3	0	2	4
4	EN3ES18	Basic Mechanical Engineering	3	0	2	4
5	EN3ES28	Advanced Programming with C	2	0	2	3
6	EN3ES29	Engineering Workshop	0	0	2	1
7	EN3HS10	Communication Skills	2	0	2	3
8	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
Total			**17**	**0**	**12**	**23**
Total Contact Hours			**29**			

SEMESTER III

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
2	EE3BS02	Discrete Mathematics	3	0	0	3
3	EE3CO57	Analog & Digital Circuits	3	0	2	4
4	EE3CO49	Electrical Circuit Analysis	3	0	2	4
5	EE3CO58	Object Oriented Programming	3	0	2	4
6	EE3CO59	Data Structures through C	3	0	2	4
7	EN3NG03	Soft Skills-I	2	0	0	2
Total			**20**	**0**	**8**	**24**
Total Contact Hours			**28**			

SEMESTER IV

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO60	Database Management Systems	3	1	2	5
2	EE3CO61	Operating Systems	3	0	2	4
3	EE3CO62	Computational Statistics	3	0	0	3
4	EE3CO63	Power System Engineering	3	1	0	4
5	EE3CO64	Theory of Computation	3	0	0	3
6	EE3CO53	Microprocessors & Microcontrollers	3	0	2	4
7	EE3ES05	Java Programming	0	0	2	1
8	EN3NG10	Soft Skills-II	2	0	0	2
Total			**20**	**2**	**8**	**26**
Total Contact Hours			**30**			

SEMESTER V

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO29	Electromagnetic Theory	3	0	0	3
2	EE3CO65	Information Theory and Data Communication	3	0	0	3
3	EE3CO34	Control Systems	3	0	0	3
4	EE3ITXX	Elective 1	3	0	0	3
5	EE3ITXX	Elective 2	3	0	0	3
6	EE3ES01	Python Programming	0	0	2	1
7	EN3NG05	Soft Skills -III	2	0	0	2
8	EE3PC08	Mini Project	0	0	4	2
9	OE000XX	Open Elective 1	3	0	0	3
Total			**20**	**0**	**6**	**23**
Total Contact Hours			**26**			

SEMESTER VI

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO66	Electrical Machines	3	0	2	4
2	EE3CO67	Computer System Architecture	3	0	0	3
3	EE3CO42	Power Electronics	3	0	2	4
4	EE3ITXX	Elective 3	3	0	0	3
5	EE3ITXX	Elective 4	3	0	0	3
6	EE3ES06	Web Programming	0	0	2	1
7	OE000XX	Open Elective 2	3	0	0	3
8	EN3NG08	Soft Skills-IV	2	0	0	2
Total			**20**	**0**	**6**	**23**
Total Contact Hours			**26**			

SEMESTER VII

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO68	Artificial Intelligence	3	0	0	3
2	EN3NG06	Open Learning Course	1	0	0	1
3	EE3PC03	Industrial Training	0	2	0	2
4	EE3PC06	Project -I	0	0	8	4
5	EE3ITXX	Elective 5	3	0	0	3
6	EE3ITXX	Elective 6	3	0	0	3
7	OE000XX	Open Elective 3	3	0	0	3
Total			**13**	**2**	**8**	**19**
Total Contact Hours			**23**			

SEMESTER VIII

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3PC07	Project -II	0	0	20	10
Total			0	0	20	**10**
Total Contact Hours			**20**			

Total Program Credits 173

Summary of Credits

S. No	Course Work	% Range	Value	Total Credits
1	Basic Sciences (BS)	10-15%	16-24	16
2	Engineering Sciences (ES)	15-20%	24-32	29
3	Humanities and Social Sciences (HS)	5-10%	8-16	8
4	Core (CO)	30-40%	48-64	62
5	Program Electives (EL)	10-15%	16-24	18
6	Open Electives (OE)	5-10%	8-16	9
7	Project Work, Seminar	10-15%	16-24	18
8	Non-Grading			13
Total				**173**

SEMESTER I

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3BS11	Engineering Mathematics-I	3	0	0	3
2	EN3BS16	Engineering Physics	3	0	2	4
3	EN3ES17	Basic Electrical Engineering	3	0	2	4
4	EN3ES26	Engineering Graphics	2	0	2	3
5	EN3ES27	Basic Programming with C	2	0	2	3
6	EN3ES30	Basic Civil Engineering & Mechanics	3	0	2	4
7	EN3HS01	History of Science and Technology	2	0	0	2
8	EN3NG01	Environmental Science	2	0	0	2
Total			**20**	**0**	**10**	**25**
Total Contact Hours			**30**			

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hours	Credit
EN3BS11	**Engineering Mathematics-I**	**3**	**0**	**0**	**3**	**3**

Course Learning Objectives (CLOs):

CLO01 To impart analytical ability of using concepts of matrices in various fields of engineering.

CLO02 To explain the concept of Differential Calculus.

CLO03 To discuss the concept of Integral Calculus and its applications.

CLO04 To impart analytical ability in solving Ordinary Differential Equations of first and Higher order.

CLO05 To impart basics of complex number and variables including concepts of analytical functions.

Unit I Matrices and Linear Systems

Rank and Nullity of a Matrix by reducing it into Echelon and Normal Forms, Solution of Simultaneous equations by elementary transformation methods, Consistency and Inconsistency of Equations, Eigen Values and Eigen Vectors.

Unit II Differential Calculus

Introduction to limit continuity, differentiability, Rolle's theorem, Mean value theorem, Taylors and Maclaurin's series expansions. Functions of Several variables, Partial differentiation, Euler's Theorem, Total Derivative, Maxima and Minima of function of two variables.

Unit III Integral Calculus

Definite Integral as a limit of sum and its application in summation of series, Beta and Gamma functions (Definitions, Relation between Beta and Gamma functions without proof, Duplication formula without proof). Multiple Integral (Double and Triple Integrals), Change the Order of Integration, Applications of Multiple Integral in Area, Volume.

Unit IV Ordinary Differential Equations

First order differential equations (Separable, Exact, Homogeneous, Linear), Linear differential Equations of second and higher order with constant coefficients**,** Homogeneous linear differential equations, Simultaneous linear differential equations**.**

Unit V Complex Variable

Basics of Complex number, Functions of complex variable: Analytic functions, Harmonic

Conjugate functions, Cauchy-Riemann Equations, Complex Line Integral, Cauchy's Theorem, Cauchy's Integral Formula.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
2. H.K. Dass, *Higher Engineering Mathematics*, *S. Chand & Company Pvt LTD., New Delhi*

References:

1. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. R.K. Jain and S.K. Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, New- Delhi.

Web Source:

1. http://nptel.ac.in/courses/111108066/
2. http://nptel.ac.in/courses/111104085/
3. https://swayam.gov.in/courses/public
4. http://nptel.ac.in/course.ph

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} To illustrate the tools of matrices in solving the system of simultaneous equations,

CO_{02} To investigate the tools of differential calculus to relevant fields of engineering and can implement the concept of several variables.

CO_{03} To relate the integral calculus to relevant fields of engineering and can translate the concept of multiple integrals in finding area of regions and volume of solids.

CO_{04} To solve Ordinary Differential Equations using different methods.

CO_{05} To relate the knowledge of complex number and categorize it in solving functions of several complex numbers.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3BS16	Engineering Physics	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} Understand the concept of Quantum Mechanics.

CLO_{02} Know about the optical phenomenon like Interference, diffraction, and polarization with their use in daily life.

CLO_{03} Learn and understand about the concept of nuclear size, shape, and its various properties.

CLO_{04} Understand the concept of crystal structure and its basics.

CLO_{05} Learn about the solid-state Physics and concept of the superconductivity.

CLO_{06} Gain Knowledge of about concepts and application of Laser and Optical fibre.

Unit-I Quantum mechanics

Limitations of Classical Mechanics, De-Broglie hypothesis for matter waves, Phase and group velocity, wave packet, Heisenberg's uncertainty principle, Compton scattering, wave function, Schrodinger's Time dependent and time independent wave equation, Particle in a box problem.

Unit-II Wave Optics

Interference: Fresnel's biprism experiment, Newton's ring experiment. Diffraction of light: Fraunhofer diffraction for single slit, Grating and its types, and Rayleigh criterion of Resolution. Polarization: General concept of Polarization, Huygens theory of double refraction, Engineering Applications of Polarization.

Unit-III Nuclear Physics

Nuclear Structure, Nuclear model: Liquid drop model, Semi- empirical mass formula (Qualitative study) , Shell model, Particle accelerators: LINAC, Cyclotron, Synchrotron (Qualitative study), Betatron. Geiger-Muller (GM) counter, Bainbridge Mass Spectrograph.

Unit-IV Solid State Physics

Crystal Physics: Unit cell, Crystal System, Types of Unit cell: Simple cubic, Face centred cubic, Body centred cubic Crystal, Number of atoms per unit cell, Packing fraction in different cubic lattices, Miller indices. Band theory of solids: Free Electron model, Band Model, Fermi level for Intrinsic and Extrinsic Semiconductors, Hall effect. Superconductivity: Zero resistance, persistent currents, superconducting transition temperature (Tc), Meissner effect,

Type-I and Type-II superconductors, Engineering applications of superconductivity.

Unit-V: Laser and Fiber Optics

Lasers: Properties of lasers, Spontaneous and Stimulated emission of radiation, Einstein's A & B coefficient, Population inversion, Components of Laser, Ruby Laser, He-Ne Laser, Engineering applications of lasers. Fiber Optics: Fundamental idea about optical fibre, propagation of light through optical fibre acceptance angle, numerical aperture, fractional refractive index change, Classification of fibre, V number, Engineering applications of fibre.

Textbooks:

1. A Text book of Optics, N. Subramanyam and Brij Lal, S. Chand , New Delhi, 2010 .
2. Engineering Physics, H. K. Malik and A. K. Singh, Tata McGraw Hill New Delhi, 2010
3. Concepts of Modern Physics A. Beiser, Tata McGraw Hill New Delhi.
4. Engineering Physics, Gaur and Gupta, Dhanpat Rai Publications.

References:

1. An Introduction to Lasers- Theory and Applications. Dr. M N. Avadhanulu, Dr. R. S. Hemne S. Chand Publications.
2. Optics, A. Ghatak: 4th Edition, Tata McGraw-Hill, New Delhi 2009.
3. An Introduction to Fiber Optics, Ghatak and Thiagarajan, Cambridge University Press.
4. Solid State Physics by Kittel, Wiley India
5. A Text book of Physics – N. Gupta & S.K. Tiwary, Dhanpat Rai & Co., Delhi
6. Quantum Mechanics by Ghatak & Loknathan, Macmillian India Ltd-new Delhi Revised Edition 2019.

List of Practical's List of suggestive core experiments (Any 10 experiments from the list of 15)

Quantum Mechanics

1. Determination of Planck's constant (h) using light emitting diode (LED) of various colors.
2. To study black body Radiation by PhET Simulation.

Wave Optics

3. To determine the radius of curvature of plano convex lens using Newton's ring experiment.
4. To determine wavelength of spectral lines of mercury vapor lamp with the help of grating an spectrometer.
5. To determine the specific optical rotation of sugar solution by biquartz polarimeter.
6. To determine the wavelength of given sodium vapor lamp using Fresnel's Biprism.

Nuclear Physics

7. To understand Rutherford scattering using PhET Simulation module.
8. Determining the specific charge of the electron **Solid State Physics**.
9. To study the Hall Effect experiment and calculate the charge carrier concentration (density) of given semiconductor diode.
10. To determine the energy band gap of semiconductor diode.
11. To study V-I characteristics of semiconductor diode and Zener diode.

Laser and Fiber Optics

12. To measure the beam divergence and beam waist of laser beam.
13. To measure the numerical aperture of an optical fiber by scanning method.
14. To find the thickness of thin wire using laser.
15. To establish a fiber optic analog link and study of bending loss in optical fiber.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} : Gain a solid understanding of the fundamental principles and postulates Of quantum mechanics.

CO_{02} : Understand the principle of Interference, diffraction, and polarization.

CO_{03} : Learn and understand about the concept of nuclear size, model and it's Various types of accelerators.

CO_{04} : Understand the electrical behaviour of electrons in solids using model.

CO_{05} : Acquire and analyse the knowledge of Crystal structure and Solid-state Physics.

CO_{06} : Understand the basic principles of various laser and optical fibres.

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES17	Basic Electrical Engineering	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO_{01}	To introduce fundamental concepts and analysis techniques in electrical engineering to students across all disciplines.
CLO_{02}	To introduce the students about domestic wiring, the functioning of various electrical apparatus and the safety measures. Emphasize the effects of electric shock and precautionary measures.
CLO_{03}	To impart basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.
CLO_{04}	To provide knowledge about the basic DC and AC electric circuits and magnetic circuits.
CLO_{05}	To introduce the concepts of power supply, UPS, SMPS, motors, transformers, and their applications.

Unit-I: DC circuit analysis

Elements and characteristics of electric circuits, ideal and practical sources, independent and dependent electrical sources, Ohm's law, source transformation, Kirchhoff's laws. Mesh analysis, nodal analysis, voltage and current division rules, star-delta conversions, Thevenin's and Norton's theorems.

Unit-II: AC Circuit Analysis

Generation of sinusoidal AC voltage, average and RMS values, concept of phasor, analysis of series RL, RC and RLC circuits, power triangle, power factor, series resonance and Q factor.
Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase quantities.

Unit-III: Electrical Machines

Definition, working principle and construction of transformer, construction & working principle of DC motor and three phase induction motor, single phase induction motor, application of rotating machines.

Unit-IV: Industrial Electrical Engineering

Power supply: linear power supply, switch mode power supply (SMPS), block diagram of UPS. Safety and protection: electric hazards and precautions, earthing, fuses, MCB, types of wires and cables, components of domestic wiring, electricity metering and billing.

Unit-V: Electrical Energy Systems and Utilization

Power generation to distribution through overhead lines and underground cables with single line diagram, block schematic representation of hydroelectric and thermal power plants.
Advantages of electrical heating, induction heating and its applications, dielectric heating and its applications, welding transformer.

Textbooks:

1. V.N. Mittal & Mittle, Basic Electrical Engineering, Tata McGraw - Hill
2. D.P. Kothari and I. J, Nagrath, Basic Electrical Engineering, Tata McGraw - Hill.
3. C. L. Wadhwa, Generation, Distribution and Utilization of Electrical Power, Wiley Eastern Ltd., New Delhi.

References:

1. Ashfaq Hussain, Electrical power systems, CBS, Publication
2. D. C. kulshreshtha, Basic Electrical Engineering, McGraw Hill Education.
3. Hemant Joshi, Residential, commercial and industrial electrical systems, Volume-1 (equipment and selection), Tata McGraw – Hill.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Demonstrate an understanding of the basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.

CO_{02} Demonstrate an understanding of basic concepts of analysis of simple DC and AC circuits used in electrical engineering.

CO_{03} Demonstrate an understanding of power supply, UPS, type of motors and their applications.

CO_{04} Demonstrate an understanding of basic concepts of transformers, power system components and their application in transmission and distribution of electric power system.

CO_{05} Demonstrate an understanding of the effects of electric shock and precautionary measures.

List of Experiments

1. To study various electric hazards and corresponding precautions.
2. To verify KCL and KVL.
3. To verify Thevenin's and Norton's theorem.
4. Determination of resistance, inductance, capacitance and power factor of R-L, R-C & R-L-C series circuits.
5. To measure active power, reactive power & apparent power of a single-phase AC circuit.
6. To verify relation between line and phase quantities in a three-phase system.
7. To determine ratio and polarity of single-phase transformer.
8. To study construction of DC machine and three-phase induction motor.
9. To find out fusing factor and plot characteristic of fuse.
10. Study of different components of domestic wiring.
11. Preparation of energy bill based on energy consumption of residence/ Institute.
12. To study welding transformer and its accessories.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EN3ES26	Engineering Graphics	2	0	2	4	3

Course Learning Objectives:

CLO1 To familiarize with the principle of orthographic projection, points and lines.

CLO2 To familiarize with the projection of 2D and 3D elements

CLO3 To familiarize with the projection, sectioning and development of solids.

CLO4 To familiarize with the AUTOCAD Drawing Software and its use.

CLO5 To familiarize with the advanced commands of AUTOCAD and their uses.

Unit –I

Orthographic Projection of Point and line

Introduction of orthographic projection: Reference planes, types of orthographic projections– First angle projections, Third angle projection.

Projections of points: Including points in all four quadrants

Projections of lines: Line parallel to reference plane, perpendicular to reference plane, inclined to one reference plane, inclined to both reference planes, traces of line.

Unit-II

Orthographic Projection of Planes and solids

Orthographic Projections of Planes: Projections of Planes in different Positions

Orthographic Projection of Solids: Classification of solid. Projections in simple and complex positions of the axis of the solid.

Unit-III

Section of solids and development of surfaces

Sections of Solids: Sectional views and true shape of the section.

Development of Surfaces: Prism, Pyramid, Cone and Cylinder.

Unit-IV

Introduction to Auto CAD and its basic commands

User Interface – Menu system – coordinate systems, axesTool bars (draw, modify, annotations, layers, Blocks etc.) Status bar (ortho, grid, snap, iso etc.), Utility commands.

Drawing Tools : Line, polyline, Circle, arc Rectangle, polygon Ellipse, Elliptical arc, spline Spline Edit, Xline, Ray, Points Measure, Divide , Donut, , hatch, Gradient, CAD, advantages and limitation of auto cad.

Unit-V

Some advance commands of auto cad and orthographic projection using auto cad

Advance commands: Annotations Dimensions, dimension setting Linear dimension, Aligned dimension, Angular dimensions, arc length, Radius Diameter, ordinates, jogged Base line dimension, Dim base Continuous dimension TEXT: Text style, single text, multi text

TOOLS Property: color, line type, Line weight, Match properties

LAYERS Create layers, Edit layers properties Layer control (hide, freeze, lock Layout lock, print lock)

Orthographic Projection using Auto CAD: Various Objects (Conversion of Pictorial Views to Orthographic Views)

Text Books:

- N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing House.
- D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd.
- P.S. Gill, Engineering Graphics, S.K. Kataria and Sons.
- Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.
- F. E. Giesecke, A. Mitchell & others, Principles of Engineering Graphics, Maxwell McMillan Publishing.
- K.C. John, Engineering Graphics for Degree, PHI Learning Pvt. Ltd.

References:

- Engineering Drawing- Basant Agarwal, TMH
- D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), Engineering Graphics with AutoCAD,PHI Learning Private Limited, New Delhi
- Venugopal (2010), Engineering Drawing and Graphics, 2nd edition, New Age Publications, New Delhi.
- Trymbaka Murthy (2007), Computer Aided Engineering Drawing, I.K. International Publishers,New Delhi.
- R.B. Choudary (2005), Engineering graphics with Auto CAD, Anuradha Publishers,New Delhi

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01}	Familiarize with different drawing equipment's and technical standards. Create and read an engineering drawing using standard views and have ability to Convert pictorial (3D) drawings to orthographic (2-D) drawings. Understand the projection of points, straight lines and have the ability to convert the practical problems in to projections
CO_{02}	To understand and apply concepts of the projection of simple planes & solids.
CO_{03}	Understand and apply the concepts of Projection, Sections and development of solids
CO_{04}	To understand basic commands of AUTOCAD and its use.
CO_{05}	Convert simple 2D orthographic projections into 3D isometric projections with the help of auto cad commands

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3ES27	Basic Programming with C	2	0	2	3

Course Learning Objectives (CLOs):

CLO01 Analyse Basics of Computers, programming environment and about different types of Programming languages.

CLO02 Application of various basic concepts required to create programs, use good problem-solving approach.

CLO03 Use different control structures for conditional programming.

CLO04 Use of Arrays and string in different problems and also to apply different operations on arrays and strings.

CLO05 Use the functions and procedures to solve different problems.

Unit-I Introduction to Computer and Problem-Solving Methodology

Computer System, Computing Environments, Software, Types of Software and Features of Software.

Design Tools (Algorithm, Flow-Chart, Pseudo-Code). Types and Generations of Programming Languages. Compiler, Interpreter, Linker, Loader, Execution of Program. Develop an Algorithm for Simple Problems.

Unit-II Basics of Language

Character set, Identifier, Keywords, Constants, Data Types, Preprocessor Directives, Variables and Declaration, White Space and Escape Sequence, Operators and Expressions, Type Conversions, Operator Precedence and Associativity, Expression Evaluation, Input and Output Functions. Computational Problems Solving Based on above Constructs.

Unit-III Control Statements

Selection (If, Else), Conditional Operator, Iteration (For, While, Do-While), Branching (Switch, Break, Continue, Goto), Nesting of Control Statements. Problem Solving Based on Control Statements.

Unit-IV Arrays and Strings

Defining an Array, One Dimensional Array, Two-Dimensional Array, Multi-Dimensional Array. Basic Array Operations and Matrix Manipulation Operations (Addition, Subtraction, and

Multiplication). Problem Solving Based on Array.

Strings Definition, String Operations and String Functions. Problem Solving Based on Strings.

Unit-V Functions

Introduction, Functions Declaration, Definition, Calling, Return Statement, Parameter Passing (By Value), Recursion, Library Functions. Problem Solving Based on Functions.

Text Books:

1. Herbert Schildt, C: The complete Reference, Fourth Edition, Mc-GrawHill.
2. R. Sethi, Programming Language Concepts and Constructs, Pearson Education.
3. V. Rajaraman, Computer Programming in 'C',PHI.
4. M. Sprankle, Programming and Problem Solving, Pearson Education.
5. R.G. Dromey, How to solve it by Computer, Pearson Education.
6. E. Balguruswamy, Programming in ANSI C by, Tata Mc-GrawHill.
7. Yashavant Kanetkar, Let Us C, BPB.
8. E.Balagurusamy, Fundamentals of Computers, TMH.

References:

1. Kernighan and Ritchie , The 'C' programming language, PHI
2. Programming With C, Schaum Series.
3. A. N. Kamthane, Programming with ANSI and Turbo C, Pearson Education.

Course Outcomes (COs):

After completion of this course the students shall be able to:

- **CO_{01}** Understand Basics of Computers and Programming languages.
- **CO_{02}** Understand basic concepts of C programming language required to create programs.
- **CO_{03}** Apply different types of control structures in problem solving.
- **CO_{04}** Use of Arrays and string in different problems and also to apply different operations on arrays and strings.
- **CO_{05}** Apply and use the functions and procedures to solve different problems.

List of Practical

1. Write a program to print hello user on output screen.
2. Write a program to perform arithmetic operation on two numbers.
3. Write a program to find sum of individual digits of any three digits number.
4. Write a program to print any three-digit number in reverse order.

5. Write a program to swap any two numbers using third variable and without using third variable.
6. Write a program to check given number is even or odd.
7. Write a program to check given char is vowel or consonant.
8. Write a program to check given number is positive or negative.
9. Write a program to check given year is leap year or not.
10. Write a program to check given number in range of 100-200 or not.
11. Write a program to check given number is palindrome or not.
12. Write a program to print grade of student on the basis of percentage:
    a. If per greater than or equal to 75 □ A grade
    b. If per between 60-75 □ B grade
    c. If per between 50-60 □ C grade
    d. If per between 40-50 □ D grade
    e. If per less than 40 □ Fail
13. Write a program for addition subtraction multiplication division using switch case.
14. Write a program to print table of any number.
15. Write a program to calculate factorial of any number.
16. Write a program to print series of alphabet.
17. Write a program to print Fibonacci series.
18. Write a program to check given number is perfect or not
19. Write a program to check given number is prime or not.
20. Write a program to check given number is Armstrong or not
21. Write a program to print number in word in between 1-5. Like (1 =one)
22. Write a program to check given char is vowel or consonant.
23. Write a program to print name of month according to number.

24. Write a program for convertor.
    - For currency convertor
    - For temperature convertor
    - For weight convertor
    - For length convertor
    - For time convertor
    - For energy convertor
25. Write a program to print series of number from 1-100 without using loop.
26. Write a program to find maximum & minimum number from array.
27. Write a program to check how many numbers is prime & not prime in a list
28. Write a program to check how many digits at each index of array.
29. Write a program to check (search) given number is present or not present in list.
30. Write a program to arrange (sort) array elements in ascending or descending order.
31. Write a program to print a 2*2 matrix.
32. Write a program to find sum of two matrix.
33. Write a program to find multiplication of two matrix.
34. Write a program of string functions.
35. Write a function to find sum of two numbers.
36. Write a function to calculate factorial of any number.
37. Write a function for call by value to find sum of two numbers.
38. Write a function to pass an integer array as an argument and find sum of array elements
39. Write a function to pass a char array as an argument and find length of string.
40. Write a recursive function to calculate factorial of any number.
41. Write a program to find the no of char no of word and no of lines from given text input.

Course Code	Course Name	Hours per Week			Total	Total
EN3ES30	Basic Civil Engineering & Mechanics	L	T	P	Hrs.	Credits
		3	0	2	5	4

Course Learning Objectives (CLOs):

CLO01 To understand the utility of various types of building materials.

CLO02 To determine the location of object on ground surface.

CLO03 To understand the location, construction detail and suitability of various building elements.

CLO04 To understand the effects of system of forces on rigid body in static conditions.

CLO05 Analysis of determinate structure (beam & truss).

Unit- I Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing.

Elements of Building Construction, Foundations conventional spread footings, RCC footings, floors, staircases – types and their suitability

Unit II Surveying & Levelling

Surveying-classification, general principles of surveying–Basic terms and definitions of chain, Chain survey, Compass survey and levelling.

Unit III Mapping & Sensing

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations.

Unit IV Forces & its applications

Graphical and Analytical Treatment of Concurrent and nonconcurrent Co- planner forces, Free Body Diagram, Force Diagram and Bow's notations.

Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems.

Unit-V Shear force and Bending moment

Introduction of shear force and bending moment and their sign conventions, Types of loads, Types of beams, Types of supports; Shear force and bending moment diagrams for simply supported, overhang and

cantilever beams subjected to any combination of point loads, uniformly distributed load, and point moment; Relationship between load, shear force and bending moment.

Textbooks

1.S.C. Rangwala, Building materials, Charotar Publishing House, Pvt. Limited.
2. S. Ramamrutham , BasicCivil Engineering and Engineering Mechanics, Dhanpat Rai.
3. K. K. Dwivedi & K.K. Shukla, Basic Civil Engineering & Engineering Mechanics, Dhanpat Rai & Co.2017 (Revised).

References:

I. K. V. B. Raju and P. T. Ravichandran, Basics of Civil Engineering, Ayyappa Publications, Chennai, 2012.
2. S. Gopi, Basic Civil Engineering, Pearson Publishers, 2009.
3. M. S. Palanichamy, Basic Civil Engineering, Tata McGraw Hill.

Course Outcomes (COs)

After completion of this course the students shall be able to:

CO1: Understand concepts and terminologies of building, Construction materials, surveying and mechanics.

CO2: Apply various methods for surveying and mechanics.

CO3: Determine the location, area and volume of ground.

CO4: Solve the problems of surveying and mechanics by using various methods.

CO5: Analyse the effects of system of forces on rigid bodies in static conditions.

List of Practicals:

1. To determine particle size distribution & fineness modulus of coarse and fine aggregates.
2. To determine standard consistency, Initial & Final Setting time of cement paste using Vicat's Apparatus.
3. To determine the workability of fresh concrete of given proportion by slump cone test.
4. To determine the Crushing Strength of Brick by using CTM.
5. To determine the Compressive Strength of Concrete Sample by CTM.
6. To determine the area of land by chain surveying.
7. To perform traverse surveying with prismatic compass check for local attraction and determine corrected bearing and to balance the traversing by Included Angle Method.
8. To perform levelling by height of Instrument & Rise and Fall method.
9. To find the support reactions of a given truss and verify analytically.
10. To perform Plane Table Surveying work by radiation method.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS01	History of Science and Technology	2	0	0	2

Course Learning Objectives (CLOs):

- **CLO_{01}** To know the historical perspective of science and technology in India, its roots and its role.
- **CLO_{02}** To know how research and development field is progressing in India.
- **CLO_{03}** To know what were the policies and plans are proposed after independence to be technologically sound.
- **CLO_{04}** To Know what were the developments done in major areas of science & technology.
- **CLO_{05}** To know the relationship between the technologies.

Unit-I Historical Perspective

Nature of science and technology, Roots of science and technology in India, Role of Science and Scientists in society, Science and Faith.

Unit-II Research and Development (R&D) in India

Science and Technology Education, Research activities and promotion of technology development, Technology mission, Programs aimed at technological self-reliance, activities of council of scientific and industrial research (CSIR).

Unit-III Policies and Plans after Independence

Nehru's vision of science for independent India, Science and technology developments in the new era, science and technology developments during the Five-Year Plan Periods and science and technology policy resolutions.

Unit-IV Science and Technological Developments in Major Areas

Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT services remote sensing applications, Launch Vehicle Technology. Ocean Development. Objectives of ocean development, marine research. Biotechnology - Applications of biotechnology in medicine, agriculture, food, and fuel. Energy – Research and development in the field of nonconventional energy resources, India's nuclear energy program.

Unit-V Nexus between Technologies

Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques, Appropriate technology, Technology assessment, Technological forecasting, Technological innovations and barriers of technological change.

Textbooks:

1. K. Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi.
2. M. Srinivasan, Management of Science and Technology (Problems & Prospects), East- West Press (P) Ltd., New Delhi.
3. G.R. Kohili, The Role and Impact of Science and Technology in the Development of India, Surjeet Publications.
4. Government of India, Five Year Plans, Planning Commission, New Delhi.
5. K.D. Sharma, and M.A. Qureshi, Science, Technology and Development, Sterling Publications (P) Ltd., New Delhi.

References:

1. Suvobrata Sarkar , History of Science, Technology, Environment, and Medicine in India, Published by Routledge India.
2. Sabareesh P.A. , A Brief History Of Science In India. Published by Garuda rakashan.
3. G. Kuppuram, K. Kumudamani, History of Science and Technology in India, Published by Sundeep Prakashan.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01}	Student will be aware about the ancient India & the existence of science & technology in that era & how it is reciprocated.
CO_{02}	Student will be aware about the upliftment done in the field of R & D after independence.
CO_{03}	Student will come to know about the plans and policies that brought about radical changes for the growth of science in India.
CO_{04}	Student will come to know about the major areas of the applied science and their existence. And can set the relationship between the technologies.
CO_{05}	Students will understand the need of technology transfer, its types and processes.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3NG01	Environmental Science	2	0	0	2

Course Learning Objectives (CLOs):

CLO_{01}	To impart knowledge of Environment and its basic components.
CLO_{02}	To build basic understanding of various effects of human activities to the environment.
CLO_{03}	To understand concepts of water pollution
CLO_{04}	To understand function of solid waste management
CLO_{05}	To learn concepts of disaster management

Unit-I Ecosystem and Biodiversity

Concept of Ecosystem, Food Chains, Food Webs, Energy flow in an ecosystem.
Biodiversity**:** Introduction, Types, Significance and Conservation.

Unit-II Air Pollution

Causes, Effects and Control of Air Pollution, Greenhouse Effect - Climate changes and Global warming, Ozone layer depletion, Acid Rain.
Case studies on recent cases of air pollution and management.

Unit-III Water Pollution

Causes, Effects and Control of Water Pollution, DO, BOD and COD, Water sampling, Municipal water treatment.

Unit-IV Solid Waste Management

Introduction, Types of solid waste, Harmful effects of solid waste, Methods to manage and modern techniques for solid waste management.

Unit-V Disaster Management

Concept of Disaster, Types of Disaster, Pre-disaster risk and vulnerability reduction, Post disaster recovery and rehabilitation.
Case studies on recent disasters and management.

Textbooks:

1. Preeti Jain, S.L.Garg, K.G.Garg, Energy, Environment, Ecology and Society, Variety Publication.

2. Surinder Deswal, Environmental Science, Dhanpat Rai & Co. publication.
3. R. Rajgopalan , Environmental Studies, Oxford IBH Publication.

References:

1. G. M. Masters, Introduction to Environmental Science and Engineering, Pearson Education Pvt. Ltd.
2. K. De, Environmental Chemistry, New Age International.
3. Daniel D. Chiras, Environmental Science, Jones & Bartlett Ltd.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Gain knowledge of Ecosystem & Biodiversity.
CO_{02}	Develop basic understanding of air pollution and its control method
CO_{03}	Develop basic understanding of water pollution and its control method
CO_{04}	Gain knowledge of Solid waste management and its importance.
CO_{05}	Gain knowledge of Disaster Management.

SEMESTER II

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3BS12	Engineering Mathematics-II	3	0	0	3
2	EN3BS14	Engineering Chemistry	2	0	2	3
3	EN3ES16	Basic Electronics Engineering	3	0	2	4
4	EN3ES18	Basic Mechanical Engineering	3	0	2	4
5	EN3ES28	Advanced Programming with C	2	0	2	3
6	EN3ES29	Engineering Workshop	0	0	2	1
7	EN3HS10	Communication Skills	2	0	2	3
8	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
Total			**17**	**0**	**12**	**23**
Total Contact Hours			**29**			

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hours	Credit
EN3BS12	Engineering Mathematics-II	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO_{01} To illustrate knowledge of Laplace Transform and investigate its application.

CLO_{02} To explain the concept of Fourier Series and Fourier Transform.

CLO_{03} To illustrate the concept of Partial Differential Equations.

CLO_{04} To impart the knowledge of Vector Calculus.

CLO_{05} To discuss numerical methods and to outline its application in solving algebraic, transcendental equations and system of linear equations.

Unit I Laplace Transform

Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Inverse Laplace transform and its properties, Convolution theorem, Applications of Laplace Transform to solve the Ordinary Differential Equation, Laplace transform of Unit step function and Impulse function.

Unit II Fourier Series and Fourier Transform

Introduction of Fourier series, Fourier series for Discontinuous functions, Fourier series for Even and Odd function, Half range series, Fourier Transform, Sine and Cosine Transform.

Unit III Partial Differential Equations

Definition, Formulation, Solution of Partial Differential Equations (By Direct Integration Method and Lagrange's Method), Non-Linear Partial Differential Equations of First order {Standard form I, II, III & IV), Charpit's method. Partial Differential Equations with Constant Coefficients (Higher Orders Homogeneous), Method of Separation of Variables.

Unit IV Vector Calculus

Scalar and Vector fields, Vector Differentiation, Laplacian operator, Gradient, Divergence and Curl, Line and surface integrals, Green's theorem, Gauss Divergence theorem, Stoke's theorem.

Unit V Numerical Analysis

Errors and Approximations, Solution of Algebraic and Transcendental Equations (Regula Falsi, Newton-Raphson and Iterative methods), Solution of Simultaneous linear equations by Gauss Elimination, Gauss Jordan, Jacobi's and Gauss-Siedel Iterative methods.

Textbooks:

1. B.S. Grewal, *Higher Engineering Mathematics*, Edition-43, Khanna Publishers, New Delhi.
2. H. K. Dass, *Higher Engineering Mathematics,S. Chand & Company Pvt LTD., New Delhi*

References:

1. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Shanti Narayan, A textbook of Vector Calculus, S. Chand & Co., New Delhi.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons 1999.

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1. nptel.ac.in/*courses*/*111103021*/15
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3. https://swayam.gov.in/courses/public
4. http://nptel.ac.in/course.php

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO1 To impact mathematical models involving ordinary and partial differential equations with given boundary condition which is helpful in all engineering and research work.

CO2 To examine the general mathematical concepts required for the field regarding Laplace and Fourier Transform.

CO3 To compare and contrast importance of partial differential equations in physical problems.

CO4 To prioritize derivatives of vector- point functions, gradient functions, evaluate integral of functions over curves, surfaces and domains in two and three dimensional.

CO5 To examine numerical techniques and investigate its application in solving algebraic and transcendental equations.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3BS14	Engineering Chemistry	2	0	2	3

Course Learning Objectives (CLOs):

CLO_{01}	To gain fundamental knowledge of the principles related to, so as to meet the challenging requirements of students in chemistry studies.
CLO_{02}	To attain awareness in students about current & new issues in the fields of chemistry.
CLO_{03}	To make students understand about the present needs without compromising on the ability of future generations to meet their own needs for proper engineering, relevant education efficient management of resources.
CLO_{04}	To increase curiosity and give them awareness about practical knowledge of various laboratory methods among the students regarding the course.

Unit-I Lubricants

Introduction, Classification of lubricants, Mechanism of lubrication, Properties and Testing of lubricating oils (Flash and Fire point, Cloud and Pour point, Viscosity and Viscosity Index, Neutralization number, Saponification Number, Steam Emulsification Number, Aniline Point, Iodine Value), Numerical problems based on testing methods.

Unit -II Polymer

Introduction and Classification of polymer, Preparation, Properties andUses of the following- Polythene, PVC, Teflon, Nylon 66, Bakelite, Silicone resin, Natural and Synthetic Rubber, Vulcanization of Rubber, Biopolymers, Biodegradable polymers.

Unit -III New Engineering Materials

Introduction, PropertiesandApplications of - Superconductors, Optical Fiber, Fullerenes, Graphene, Carbon nanotubes, Nanowires.

Unit -IV Instrumental Techniques in Chemical Analysis

Spectroscopy, Electromagnetic spectrum, Beer &Lambert's Law and its limitations, Principle, Instrumentation and Applications of-UV-Visible Spectroscopy, IR Spectroscopy, Gas Chromatography.

Unit- V Electrochemistry

Concept of Enthalpy, Entropy and Free energy, EMF, Applications of EMF measurements, Corrosion- Definition, Types, Causes and Protection from corrosion.

Text Books:

1. Preeti Jain, Anjali Soni, Jeetendra Bhawsar, A text book of Engineering Chemistry, 1st edition, Manthan Publication, 2016.
2. Preeti Jain, S L Garg, Engineering Chemisty, 4th edition, Variety Publication.
3. Shashi Chawla, Engineering Chemistry, 11th edition, Dhanpat RaiPublications.

References:

1. P C Jain, Monika Jain, Engineering Chemistry, Dhanpat RaiPublications.
2. S. S.Dara, A Text Book of Engineering Chemistry, S. Chand & Company.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	To Understand the lubricants, their mechanism and practically analyze the properties of lubricants.
CO_{02}	Will acquire betterment in lifestyle by understanding the need of bio polymers in the current scenario and replacing synthetic polymers with its bio-polymer substitute.
CO_{03}	Will get familiarised with new engineering materials and their commercial applications.
CO_{04}	Will get knowledge of using instrumental techniques and their applications for determination of chemical structure of any compound.
CO_{05}	Identify various types of corrosion and methods to protect the metallic structures from corrosive environment.

List of Practicals:
Volumetric Analysis:

1. To determine Hardness of given water sample by Complexometrictitration.
2. To determine total and mixed Alkalinity of given water sample using phenolphthalein and methyl orange asindicator.
3. To determine strength of unknown FAS solution by Redox titration using N-Phenyl anthranilic acid as internalindicator.
4. To determine strength of unknown $CuSO_4$ solution by Iodometric titration using Starch as internalindicator.
5. To determine Chloride content of water sample by Mohr's method (Argentometrictitration).

Fuel Testing:

1. To determine moisture content in given sample of coal by proximate analysis.
2. To determine volatile content in given sample of coal by proximate analysis.
3. To determine ash content in given sample of coal by proximate analysis.

4. To determine percentage carbon content of coal by proximate analysis.

Lubricant Testing:

1. To determine penetration number of grease by Cone Penetrometerapparatus.
2. To determine flash and fire point of given oil sample by Cleveland's open cup apparatus.
3. To determine flash point of given oil sample by Penskey Marten's close cup apparatus.
4. To determine flash point of given oil sample by Abel's Closecup apparatus.
5. To determine Steam emulsification number of givenlubricant.
6. To determine Aniline point of given oilsample.
7. To determine Cloud and Pour point of given lubricatingsample.
8. To study rate of change of viscosity with temperature of the given lubricating oil by meansof Redwood Viscometerno.1
9. To study rate of change of viscosity with temperature of the given lubricating oil by means of Redwood Viscometer no.2.

Electrochemistry:

Variation of cell potential in $Zn/Zn^{2+}//Cu^{2+}/Cu$ with change in concentration of electrolytes ($CuSO_4$ or $ZnSO_4$) at room temperature.

Kinetics:

Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3ES16	Basic Electronics Engineering	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To learn the basics of semiconductor materials and their usage in variety of PN junction diodes and applications of diodes

CLO_{02} To study transistor in different modes of configuration and basic biasing techniques, FET.

CLO_{03} To study of the fundamental concepts and various types of analog communication systems

CLO_{04} To study of the concept of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.

CLO_{05} To learn about basic Measurement & Instrument components.

Unit-I SEMICONDUCTOR DIODE

Semiconductor basics, PN Junction diode construction & working, Volt-amp characteristics, Diode current equation, Half wave rectifier, Full wave rectifier: Bridge and center tapped rectifier, Clipper and Clamper. Zener diode and zener diode-based voltage regulator, LED

Unit-II BIPOLAR JUNCTION TRANSISTOR

Construction and working of transistor, characteristics of transistor, transistor as an amplifier and switch, transistor configurations, transistor biasing and biasing methods, basic amplifier configurations, Basic principle and working of FET and MOSFET

Unit-III BASICS OF COMMUNICATION SYSTEMS

Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation: Amplitude, phase, frequency modulation, sampling theorem and pulse amplitude modulation.

Unit-IV DIGITAL SYSTEM

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1‘s and 2‘s complements, Codes – Binary, BCD, Excess 3, Gray, Boolean theorems, Minterms and Maxterms, Sum of products and products of sums, Karnaugh map Minimization, Logic gates: NOT, AND, OR, NAND, NOR, EX-OR and EX-NOR, half adder and full adder. Function and Structure of a Computer System, Von Neumann Architecture, and modern computers.

Unit-V ELECTRONICS MEASUREMENT

Introduction, Basics of Measurements, Ammeter, Voltmeter, multimeter, Signal Generators,

Cathode Ray Oscilloscope: Block diagram of CRO, Construction of CRT, Deflection sensitivity and various controls, Measurement of voltage, current frequency and phase angle using CRO

Textbooks:

1. Millman and Halkias: Integrated electronics, TMH.
2. D Roy Choudhury, Digital Electronics, Vol-I & II, TMH Publication.
3. A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai.
4. Simon Haykins, Communication System, John Willy.
5. Andrew S. Tanenbaum, Structured Computer Organization, Upper Saddle River.

References:

1. Sedra and Smith: Microelectronics, Oxford Press.
2. Millman and Taub, Pulse, Digital and Switching Waveforms, MGM.
3. A.Anand Kumar: Digital Circuits, PHI.
4. Salivahanan: Electronic Circuits Analysis and Design, TMH
5. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
6. B.P.Lathi, Modern Digital & Analog Communication System, TMH

Course Outcomes (COs):
After completion of this course the students shall be able to:

- **CO_{01}** Should have the knowledge of basic semiconductor materials and their usage in variety of PN junction diodes and applications of diodes
- **CO_{02}** Should be able to understand the concept operation of transistors and its configuration.
- **CO_{03}** Understand and identify the fundamental concepts and various components of analog communication systems
- **CO_{04}** Should have the knowledge of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.
- **CO_{05}** Should have understood the basics of Measurement & Instrument components.

List of Experiments:

1. To verify V-I characteristic of semiconductor & Zener diode.
2. To verify input and output waveform of half wave rectifier.
3. To verify input and output waveform of full wave rectifier.
4. To verify Input and output characteristic of BJT in CB and CE configurations.
5. Implementation of basic logic gates using Universal gates (NAND, NOR).
6. To verify half adder & full adder.
7. Study of computer system structure and main peripheral devices.
8. Study of Frequency Division Multiplexing with sinusoidal inputs / audio inputs.
9. Study of CRO and its demonstration kit.
10. Study of voltmeter and multimeter.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hours	Credits
EN3ES18	Basic Mechanical Engineering	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO01 To understand the properties of materials and their behavior with variation in temperature and Load. To understand different measuring instruments used in engineering applications.

CLO02 To understand the basic laws of thermodynamics and their applications in engineering, refrigeration cycles and properties of refrigerants.

CLO03 To understand Construction and Working of I. C. Engines.

CLO04 To understand Construction and Working of Steam Generators

CLO05 To understand the concepts of Centroid & Moment of Inertia and of plane areas and different theorems of moment of Inertia

Unit-I Materials & their mechanical properties
Classification of Engineering material and their mechanical properties, Composition of cast iron and carbon steels and their application. Stress-strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness, and fatigue testing of materials.

Unit-II Thermodynamics
Thermodynamic properties and systems, First of thermodynamics, thermal processes at constant pressure, volume. Second law of thermodynamic, enthalpy, entropy, heat engine, heat pump, refrigerator and their numerical.

Unit-III I.C. Engines
Description and working of four stroke petrol engines, two stroke petrol engines, four stroke diesel engines and two stroke diesel engines, and its efficiency relative merits and demerits.

Unit-IV Steam generators
Definition, Classification, general study of Cochran, Lancashire and Locomotive boilers, boilers mountings and accessories. Steam properties and boiler performance. Draught Classification, Calculation of Chimney height, boiler efficiency and numerical. Unit V: Centroid & Moment of Inertia Location of centroid and Moment of Inertia of plane areas, Perpendicular Axis and Parallel Axis theorems.

Unit V Centroid & Moment of Inertia
Location of centroid and Moment of Inertia of plane areas, Perpendicular Axis and Parallel Axis theorems.

Textbooks:

1. R.K. Rajput, Basic Mechanical Engineering, Laxmi Publication.
2. P.K. Nag, Engineering Thermodynamics, McGraw Hill.
3. R.K. Bansal, Engineering Mechanics, Laxmi publications.

References:

1. Anand K Bewoor, Vinay A Kulkarni, Ist edition, Metrology & Measurement, McGraw Hill.
2. Cengel and Boles, Thermodynamic, An Engineering Approach in S.I Unit, McGraw Hill.
   S.S. Bhavikatti and K.G.Rajashekarappa, Engineering Mechanics, New age international limited.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Students will be able to understand the engineering materials, their properties, Iron-Carbon Diagram and Stress-Strain Curve, Measuring Equipment's and Testing Machines.
CO_{02}	Student will be thorough with the basic laws of thermodynamics and their applications in engineering also know about Refrigeration cycles and properties of refrigerants.
CO_{03}	Students will be able to understand the construction and working of I.C. Engines .
CO_{04}	Students will be able to understand the construction and working of Steam Generators
CO_{05}	Students will be able to determine the Centroid & Moment of Inertia of areas/composite sections.

List of Experiments

1. Measurements using Vernier calliper & micrometer.
2. Measurements using dial gauges and combination set.
3. Measurements using slip gauges & sine-bar.
4. Tensile Testing of standard mild steel specimen on UTM.
5. To determine the hardness number by using Brinell Hardness Testing Machine.
6. Study of 2-stroke petrol and diesel engine.
7. Study of 4-stroke petrol and diesel engine.
8. Study of different type of boilers.
9. Study of different type of boilers mounting & accessories.
10. To find the centroid of different plane laminas.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3ES28	Advanced Programming with C	2	0	2	3

Course Learning Objectives (CLOs):

CLO$_{01}$ Understand Pointer variables. Declaring and dereferencing pointer variables. Pointer Arithmetic. Accessing arrays, strings through pointers.

CLO$_{02}$ Declaration and use structures, perform operations on structures, passing structures as function arguments. type defining structures.

CLO$_{03}$ Use Function declaration, function definition, function call, Passing arguments to a function, by value, by reference. Scope of variable names, creation of header files

CLO$_{04}$ Use calloc, malloc, realloc dynamic memory.

CLO$_{05}$ Apply Input-output using files in C, Opening, closing and reading from files. Programming for command line arguments.

CLO$_{06}$ Apply graphics functions to create pictorial representation and animations

Unit-I Pointers

Introduction to Pointers (Declaration and Initialization), Double Pointer, Pointers and Array, Pointers and Functions, Operations on Pointers.

Unit-II User Defined Data Types

Defining a Structure, Declaration of Structure Variables, Initialization of Structure Variables, Accessing Structure Members, Storage of Structures in Memory Array within a Structure, Array of Structure, Pointer Structure, Passing Structure to a Function, Structure within a Structure. Define Union, Structure versus Union, Working with Union, Initializing Union, Enumerated Data Type.

Unit-III Pre-processor and Memory Allocation

Pre-processor Directives, Macro and Macro Expansions, File Inclusions, Conditional Compilation, Stringification (#) and Token Passing Operator (##), Type Def, Command Line Argument, Dynamic Memory Allocation. malloc(), calloc(), realloc(), free(), Core Dump, Memory Leak, Dynamic 1D and 2D Arrays. Header Files and Their Creations.

Unit-IV File Handling

File Concept, File Pointer and File Handling Operations Using files in C, Buffer and Streams, Working with Text Files and Binary Files, File Operations using std. Library and System Calls, File Management I/O Functions, Random Access Files.

Unit-V Graphics Programming

C Header Files for handling graphics and initializing graphics mode, Understand Coordinate system, Function to Draw Lines,Circle, Arc, Ellipse, pieslice, sector, Rectangle, Bar, 3-D Bars & Polygon, Color Spraying: filling Ellipse, polygons and flooding the fills, Filling Styles and Patterns, Understand Animation, Function to create Animation, Traffic Light and Moving Car Simulation.

Text Books:

1. Herbert Schildt, C: The complete Reference, Fourth Edition, Mc-Graw Hill.
2. R. Sethi, Programming Language Concepts and Constructs, Pearson Education.
3. V. Rajaraman, Computer Programming in 'C', PHI.
4. M. Sprankle, Programming and Problem Solving, Pearson Education.
5. R.G. Dromey, How to solve it by Computer, Pearson Education.
6. E. Balguruswamy, Programming in ANSI C by, Tata Mc-Graw Hill.
7. Yashavant Kanetkar, Let Us C, BPB.
8. E. Balagurusamy, Fundamentals of Computers, TMH.
9. AL Stevens, C Database Development, MIS Press.

References:

1. Kernighan and Ritchie, The 'C' programming language, PHI.
2. Programming With C, Schaum Series.
3. A. N. Kamthane, Programming with ANSI and Turbo C, Pearson Education.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Apply Pointers, Pointer Arithmetic and Accessing arrays, strings through pointers.
CO_{02}	Use different user defined data types like structures, union and enum.
CO_{03}	Understand and Use of dynamic memory allocation and preprocessor directives.
CO_{04}	Use the concepts of file handing.
CO_{05}	Use Graphics programming to draw and use different shapes.

List of Practical

1. Program to create, initialize, assign and access a pointer variable.
2. Program to swap two numbers using pointers.

3. Program to change the value of constant integer using pointers.
4. Program to print a string using pointer.
5. Program to count vowels and consonants in a string using pointer.
6. Program to find sum of elements of array using pointer.
7. Program to swap two numbers using pointers.
8. Compare strings using pointer
9. Find smallest number in array using pointer.
10. Find largest element in array using pointer.
11. Find sum of all matrix elements using pointer.
12. Program to create a pointer array store elements in it and display.
13. Program to demonstrate function pointers.
14. Program to perform Addition Subtraction Multiplication Division using array of function pointers.
15. Program to display details of student two (Name, roll no, marks) using structure.
16. Program to display details of employee using array of structure.
17. Program to access member of structures using pointers.
18. Program for passing structure to a function.
19. Program for returning a structure from a function.
20. Program to display details of student two (Name, roll no, marks) with the help of union.
21. Program to demonstrate the memory allocation in structure and union.
22. Program to demonstrate malloc and calloc.
23. Program to allocate memory of array at run time.
24. Program to print the day of week.
25. Program to print month of a year.
26. Program to calculate area of circle using macro.
27. Program to calculate area of circle using macro function.
28. Program to create a header file and use it in a program.
29. Program to demonstrate file operation.
    a. Creating a new file
    b. Opening an existing file
    c. Closing a file
    d. Reading from and writing information to a file
30. Program to count number of words, number of character and number of lines from a given text file.
31. Program in C to delete a specific line from a file.
32. Write a program in C to append multiple lines at the end of a text file.
33. Write a program in C to copy a file in another name.
34. Write a program in C to merge two files and write it in a new file.

35. Write a program in C to encrypt a text file.
36. Write a program in C to decrypt a previously encrypted file.
37. Write a program in C to remove a file from the disk.
38. Write a program to draw a circle and fill blue color in it.
39. Write a program to draw a rectangle with diagonal and fill different colors in both halves.
40. Write a program to move a circle using suitable annimations.
41. Write a program to implement traffic signal.
42. Write a program to simulate a moving car. Draw car using simple shapes like line, circle and polygon.

Course Code	Course Name	Total Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES29	Engineering Workshop	0	0	2	2	1

Course Learning Objectives (CLOs):

CLO_{01} To familiar with Lathe, Drilling, Milling and shaping machines.

CLO_{02} The basic law of physics and their utilization in engineering.

CLO_{03} To understand different primary manufacturing process.

CLO_{04} To understand different metal joining process.

CLO_{05} To identify different tools used in basic manufacturing process.

Unit-I Introduction and Demonstration: - Introduction to various shops / sections and workshop layouts. Safety norms to be followed in a workshop.
Carpentry Shop: Introduction of Tools & operations, Types of woods & their applications, Types of Carpentry tools and their uses, Carpentry Joints, carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, types of woods and carpentry hardware.

Unit-II Fitting Shop: Introduction of Tools & operations, Types of Marking tools & their uses, Types of fitting cutting tool & their uses, fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping

Unit-III Foundry Shop: Pattern Making: Study of Pattern materials, pattern allowances and types of patterns. Core box and core print. Use and care of tools used for making wooden patterns.
Molding: Properties of good mould & Core sand, Composition of Green, Dry and Loam sand. Methods used to prepare simple green sand mould using single piece and split patterns.
Black Smithy Shop: Use of various smithy tools. Forging operations: Upsetting, drawing down, Fullering Swaging and Cutting down.

Unit-IV: Welding Shop: Study and use of tools used for Brazing, Soldering, Gas & Arc welding. Preparing Lap & Butt joints using gas and arc welding methods, Study of TIG & MIG welding processes. Safety precautions.

Unit V: Machine Shop: Study of machine tools in particular Lathe machine (different parts, different operations, study of cutting tools). Demonstration of different operations on Lathe machine, Practice of Facing, Plane Turning, step turning, taper turning, knurling, and parting. Demonstration and applications of drilling machine, Demonstration of CNC Machines

Textbooks:

1. B.S. Raghuwanshi, Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. R.S. Khurmi, Workshop Technology, S. Chand and Co.
3. S.K. Hajra Choudhary, A.K. Hajra Choudhary and Nirjhar Roy, Elements of Workshop Technology, vol. I Media promoters and Publishers Pvt. Ltd
4. R.K. Bansal, Engineering Mechanics, Laxmi publications.

References:

1. W. A.J. Chapman, Workshop Technology, 1998, Part -1, 1st South Asian Edition, Viva Book Pvt. Ltd.
2. P.N. Rao, 2009, Manufacturing Technology, Vol.1, 3rd Ed., Tata McGraw Hill Publishing Company.
3. Dr. S.K. Sinha , CNC programming — Golgotia publication.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the engineering materials, their properties, and their utilization in manufacturing tool and other equipment's.

CO_{02} Understand the primary manufacturing process.

CO_{03} Understand the basic operation involve in casting.

CO_{04} Understand the basic process of forging.

CO_{05} Basic knowledge of simple cutting, holding. Marking and striking tool.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS10	COMMUNICATION SKILLS	2	0	2	3

Course Learning Objectives (CLOs):

CLO_{01} To develop, enhance and demonstrate LSRW Skills.

CLO_{02} To enable students to acquire oral presentation skills.

CLO_{03} To prepare students to become more confident and active participants in all aspects of their undergraduate programs

CLO_{04} To enable students with good vocabulary, grammar and writing skills.

CLO5 To enable students to distinguish between general and technical communication and understand its importance

Unit-I

Grammar and Vocabulary Development: Applied Grammar and usage, Parts of Speech, Articles, Tenses, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Clauses, modals, Reported Speech: Direct and Indirect, Sentence Structure, Punctuations, common errors.

Unit-II

Using Dictionaries and Thesaurus, Synonyms, Antonyms, Homophones, One Word Substitution, Affixation: Prefixes & Suffixes, Basic Grammar & Vocabulary Practice, Synonyms, Antonyms, Analogies, Sentence Completion, Correctly Spelt Words, Idioms, Proverbs, and Derivation from root words, Jargon, Scientific Jargon, Vocabulary Practice.

Unit-III

Developing Reading and Listening Skills: Reading Comprehension, Process, Active & Passive Reading, Reading Speed Strategies, Benefits of effective reading, notemaking, note - taking, Reading comprehension of technical material and SQ3R reading technique. Listening Skills: Meaning, process hearing and listening, types, barriers, importance.

Unit-IV

Developing Writing Skills: Planning, Drafting & Editing, Writing with style, rightwords selection, writing effective sentences, developing logical paragraphs, art of condensation, précis, essay, technical definition and technical description. Formal and Informal Letters: Letter to the Editors, Municipal corporation, Bank Managers etc.

Unit-V

Speaking Skills Oral Presentation: Preparation, Delivery using Audio – Visual Aids with stress on body language and voice modulations. (Topics to be selected by the Instructor.) Phonetic Symbols, Pronunciations.

Text Books:

1. P.C,Wren and N.D.V. Prasada Rao, High School English Grammar & Composition, S Chand and Co Pvt Ltd.
2. S. Kumar and P. Lata, English for Effective Communication, Oxford UP, New Delhi.
3. A.J. Thompson and A. V. Martinet, A Practical English Grammar, Oxford UP, New Delhi.
4. U. S. Rai and S.M, Rai, Effective Communication, Himalaya Publishing House.

References:

1. A.C. Gimson, An introduction to the Pronunciation of English, ELBS.
2. S. Greenbaum, Thw Oxford English Grammer, Oxford University Press.
3. K.Mohan and M. Raman, Effective English Communication, Tata Mc-Graw Hill.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} The students will be able to enhance confidence in their ability to read, comprehend, organize, and retain written and oral information.

CO_{02} The students will be able to distinguish between general and technical communication and understand its importance

CO_{03} The students will be able to improve upon their language skills, communication skills, group discussion, and personality development and confidence level.

CO_{04} The students will be able to bridge the language gap which is vital to their success

CO_{05} Students will be able to communicate effectively.

List of Experiments (if applicable): List of Practicals:

- JAM
- Debates
- Role plays
- GDs
- Extempore
- Story writing
- Picture description
- Symposium
- Oral presentation
- Phonetics practice
- Book Reviews

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3NG02	Universal Human Values and Professional Ethics	2	0	0	2

Course Learning Objectives (CLOs):

CLO01: Understand the need for and importance of value education in society and its role in promoting harmony and holistic development.

CLO02: Explore the content and process of value education, including self-exploration, experiential validation, and the mechanism of self-exploration.

CLO03: Recognize the basic human aspirations of continuous happiness and prosperity and the requirements for their fulfilment, such as right understanding, relationships, and physical facilities.

CLO04: Develop an understanding of harmony in oneself, including the coexistence of the sentient "I" and the material body, and the importance of balance and well-being.

CLO05: Gain insights into harmony in human-human relationships, including the values of trust, respect, and justice, and understand the importance of harmony in the family and society.

UNIT-I

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 self - exploration, Continuous Happiness and Prosperity-A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities-the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT-II

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'- Sukhand 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: Sanyamand Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-III

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 Nyayaand program for its fulfilment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding them eaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman ,Difference between respect and differentiation ;the other salient value in relationship, Understanding the harmony in the society(society being an extension of family):Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society-Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)-from family to world family!.

UNIT- IV

Understanding Harmony in the Nature and Existence-Whole existence as Co-existence

Understanding the harmony in the Nature, Inter connectedness and mutual fulfilment 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.

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, technologies and management models, Case studies of typical holistictechnologies,managementmodelsandproductionsystems,Strategyfor transition from the present state to Universal Human Order:
a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers,
b) At the level of society :as mutually enriching institutions and organizations.

TextBooks:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References:

1. IvanIllich,1974,Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA

2. E.F.Schumacher,1973, Smallis Beautiful: a sudy of economics as if people mattered, Blond & Briggs, Britain.
3. SussanGeorge,1976,HowtheOtherHalfDies,PenguinPress.Reprinted 1986, 1991
4. Donella H .Meadows, DennisL. Meadows,JorgenRanders, WilliamW. BehrensIII, 1972, Limits to Growth–Club of Rome's report, UniverseBooks.
5. ANagraj, 1998, JeevanVidyaEkParichay, DivyaPathSansthan, Amarkantak.
6. PLDhar, RRGaur,1990,Science and Humanism,Commonwealth Publishers.
7. A NTripathy, 2003, Human Values, New Age International Publishers. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantraShodh, Amravati.
8. EGSeebauer&RobertL.Berry,2000,FundamentalsofEthicsforScientists&Engineers , Oxford University Press
9. MGovindrajran,SNatrajan&V.S.SenthilKumar,EngineeringEthics (includingHumanValues), EasternEconomyEdition,PrenticeHallofIndia Ltd.
10. BP Banerjee,2005, Foundations of Ethics andManagement, Excel Books. BLBajpai,2004,IndianEthosandModernManagement,NewRoyal Book Co., Lucknow. Reprinted 2008.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO1: Ability to apply self-exploration techniques and experiential validation for personal growth and self-awareness.

CO2: Proficiency in recognizing and addressing the needs of the self and the body to achieve harmony and well-being.

CO3: Competence in fostering harmonious relationships based on trust, respect, and justice within the family and society.

CO4: Understanding the interconnection and mutual fulfillment among different orders of nature and the significance of coexistence in the larger existence.

CO5: Awareness of the implications of holistic understanding of harmony on professional ethics and the ability to apply ethical principles in professional settings to contribute to the development of a universal human order and sustainable practices.

SEMESTER III

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
2	EE3BS02	Discrete Mathematics	3	0	0	3
3	EE3CO57	Analog & Digital Circuits	3	0	2	4
4	EE3CO49	Electrical Circuit Analysis	3	0	2	4
5	EE3CO58	Object Oriented Programming	3	0	2	4
6	EE3CO59	Data Structures through C	3	0	2	4
7	EN3NG03	Soft Skills-I	2	0	0	2
Total			**20**	**0**	**8**	**24**
Total Contact Hours			**28**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To enable the students to study the basics of management and managerial operations.

CLO02 To study the concept, nature, function and emerging concept of HR and Marketing.

CLO03 To learn the basics of economics with respect to business cycle.

CLO04 To create an understanding over accounting principles.

CLO05 To study the financial management and investment decision making.

Unit-I

Concepts of Management: Definition, characteristics and importance of management; Management: Science or Art, Difference between Management and Administration, Levels of management, Functions of Management, Managerial Roles, Managerial skills and competencies; Decision Making: Definition, process and types; Decision making under certainty, uncertainty and risk; Cross cultural issues in management and challenges.

Unit-II

Fundamentals of Marketing and Human Resource Management: Introduction to Marketing: Definition, importance, function and scope of marketing, Core concepts of marketing, Marketing concepts and orientations, Marketing environment, Marketing-mix, Holistic marketing concept, Customer Relationship Management (CRM).

Introduction to Human Resource Management (HRM): Nature, Scope, Objectives and Functions; Role of HR manager, Process and need for Human Resource Planning, Human resource policies, Changing role of Human Resource in India, Globalization and its impact on Human Resource.

Unit-III

Fundamentals of Economics: Introduction to Economics: Definition, nature, scope and significance; Difference between micro and macro economics; Time value of money, Law of diminishing marginal utility; Theory of Demand and Supply, Price elasticity of demand; Meaning and types of costs, Law of variable proportions; Types of market structure; National income and related aggregates; Meaning and types of Inflation; Meaning and phases of business cycle.

Unit-IV

Basic Accounting Principles: Accounting Principles and Procedure, Double entry system, Journal, Ledger, Trail Balance, Cash Book; Preparation of Trading, Profit and Loss Account; Balance sheet; Cost Accounting: Introduction, Classification of costs, Methods and Techniques of costing, Cost sheet and preparation of cost sheet; Breakeven Analysis: Meaning and its application.

Unit-V

Fundamentals of Financial Management: Introduction of Business Finance: Meaning, Definition of Financial Management, Goals of Financial Management (Profit Maximization and Wealth Maximization), Modern approaches to Financial Management – (Investment Decision, Financing Decision and Dividend Policy Decisions).

Text Books:

1. R. D. Agarwal, "Organization and Management", McGraw Hill Education.
2. P. C. Tripathy and P. N. Reddy, "Fundamentals of Management, Economics and Accountancy", Tata McGraw Hill
3. Kotler Philip and Keller Kevin Lane, "Marketing Management", Pearson

Reference Books:

1. Peter F Drucker, "The Practice of Management", McGraw Hill
2. Harold Koontz, "Essentials for Management", Tata McGraw Hill
3. M Y Khan and P K Jain, "Management Accounting", Tata McGraw Hill

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO01 Understand management, managerial functions, managerial roles and expected competency. Gain knowledge about the contemporary challenges in the field of management.
CO02 Understand basics of HR and Marketing as a discipline.
CO03 Understand the concept of economics.
CO04 Learn accounting fundamentals, principles and applications.
CO05 Understand fundamentals of Financial Management and Modern approaches to Financial Management

Website Link

1. https://nptel.ac.in/courses/122108038/ (Management Concepts)
2. https://nptel.ac.in/courses/110104068/ (Marketing)
3. www.hrmguide.net (Human Resource Management)
4. http://economicsconcepts.com (Economics)
5. https://nptel.ac.in/courses/110101003/ (Accounting)
6. https://nptel.ac.in/courses/105103023/39 (Financial Management)

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EE3BS02	Discrete Mathematics	3	0	0	3

Course Learning Objectives (CLOs):

CLO 1 To discuss the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.

CLO 2 To explain Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Po-sets and their uses.

CLO 3 To adapt the knowledge of group theory and its application in computer science as coding theory.

CLO 4 To describe the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.

CLO 5 To develop the ability to solve the recurrence relations by using various methods.

Unit I: Sets, Relations and Functions

Sets, sub-sets & operations on sets, Finite and infinite sets, principle of inclusion and exclusion Relations & Properties of relations — equivalence relation, Functions: Definition, Classification of functions, Composition of functions, Growth of Functions, Pigeon hole principle.

Unit II: PO-Sets, Lattices and Boolean Algebra

Partial order relation, Poset, least upper bound, greatest lower bound, maximal and minimal elements of a poset — Definition & example of Boolean algebra — Lattices, Distributive laws in lattices — Complemented lattices — Propositional Calculus — Boolean functions, minimum & maximum terms, simplification of Boolean function with Karnaugh map & Quine Mc Clusky method. Applications in computer Science.

Unit III: Group Theory

Binary composition, algebraic structure, Semi group, Monoid, Groups, Abelian Group, properties of groups, Coset Decomposition, Subgroup, Cyclic Group, Normal subgroup, Rings and Fields (definition and standard results). Applications in Computer Science.

Unit IV: Graph theory

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. Application in Computer Science.

Unit V: Recurrence Relations and Combinatorics

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrence relation. Combinatorics: Introduction, Counting Techniques -Basic theorems on permutations & combinations. Applications in Computer Science.

TEXT BOOKS:

1. C.L Liu, D. P. Mohapatra, Elements of Discrete Mathematics, Mc Graw —Hill Education, Fourth edition (2008).

2. Kenneth H Rosen, Discrete Mathematics and its Applications, Mc Graw —Hill Education, Seventh edition (2016).

REFERENCE BOOKS:

1. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, Mc Graw —Hill Education , First edition (2001).

2. Narsingh Deo, Graph theory with Applications to Engineering and Computer Science, PHI India, Eastern Economy Edition (2006).

3. I. N. Herstein, Topics in Algebra, John Wiley & Sons, Second edition (2006).

Web Sources:

1. nptel.ac.in/courses/111107058/

2. nptel.ac.in/downloads/111104026/

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 To identify various sets and functions and implement their properties.

CO_2 To apply logical notations to define the fundamental mathematical concepts such as Boolean algebra and Boolean functions.

CO_3 To apply various mathematical theories and principles to compare relative efficiency of algorithms in real world.

CO_4 To construct the problems in computer science using graphs and trees.

CO_5 To apply recursive relationships to practical examples.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EE3CO57	Analog & Digital Circuits	3	0	2	4

Course Learning Objectives (CLOs):

CLO 1 To introduce components such as diodes, BJTs and FETs.

CLO 2 To know the applications of components.

CLO 3 To give understanding of various types of amplifier circuits.

CLO 4 To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.

CLO 5 To understand the concepts of combinational logic circuits and sequential circuits.

UNIT - I

Diodes and Applications: Junction diode characteristics: Open circuited p-n junction, p-n junction as a rectifier, V-I characteristics, effect of temperature, diode resistance, diffusion capacitance, diode switching times, breakdown diodes, Tunnel diodes, photo diode, LED.
Diode Applications - clipping circuits, comparators, Half wave rectifier, Full wave rectifier, rectifier with capacitor filter.

UNIT - II

BJTs: Transistor characteristics: The junction transistor, transistor as an amplifier, CB, CE, CC configurations, comparison of transistor configurations, the operating point, self-bias or Emitter bias, bias compensation, thermal runaway and stability, transistor at low frequencies, CE amplifier response, gain bandwidth product, Emitter follower, RC coupled amplifier, two cascaded CE and multi stage CE amplifiers.

UNIT - III

FETs and Digital Circuits: FETs: JFET, V-I characteristics, MOSFET, low frequency CS and CD amplifiers, CS and CD amplifiers.

Digital Circuits: Digital (binary) operations of a system, OR gate, AND gate, NOT, EXCLUSIVE OR gate, De Morgan Laws, NAND and NOR DTL gates, modified DTL gates, HTL and TTL gates, output stages, RTL and DCTL, CMOS, Comparison of logic families.

UNIT - IV

Combinational Logic Circuits: Basic Theorems and Properties of Boolean Algebra, Canonical and Standard Forms, Digital Logic Gates, The Map Method, Product-of-Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Exclusive-OR Function, Binary Adder - Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT - V

Sequential Logic Circuits: Sequential Circuits, Storage Elements: Latches and flip flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Shift Registers, Ripple Counters, Synchronous Counters, Random-Access Memory, Read-Only Memory.

Text Books:

1. Integrated Electronics: Analog and Digital Circuits and Systems, 2/e, Jaccob Millman, Christos Halkias and Chethan D. Parikh, Tata McGraw-Hill Education, India, 2010.

2. Digital Design, 5/e, Morris Mano and Michael D. Cilette, Pearson, 2011.

Reference Books: -

1. Electronic Devices and Circuits, Jimmy J Cathey, Schaum's outline series, 1988.

2. Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 Know the characteristics of various components.

CO_2 Design and analyze small signal amplifier circuits.

CO_3 Know about the logic families and realization of logic gates.

CO_4 Design and analyze combinational logic circuits.

CO_5 Design and analyze Sequential logic circuits.

List of Experiments

1. Full Wave Rectifier with & without filters
2. Common Emitter Amplifier Characteristics
3. Common Base Amplifier Characteristics
4. Common Source amplifier Characteristics
5. Measurement of h-parameters of transistor in CB, CE, CC configurations
6. Input and Output characteristics of FET in CS configuration
7. Realization of Boolean Expressions using Gates
8. Design and realization logic gates using universal gates
9. Generation of clock using NAND / NOR gates
10. Design a 4 – bit Adder / Subtractor
11. Design and realization a Synchronous and Asynchronous counter using flip-flops
12. Realization of logic gates using DTL, TTL, ECL, etc.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EE3CO49	Electrical Circuit Analysis	3	0	2	4

Course Learning Objectives (CLOs):

CLO 1 To gain knowledge of graph theory and coupled circuits.

CLO 2 Solving networks using different theorems.

CLO 3 To study Transients analysis of electrical circuits in time domain and to know about various passive filters.

CLO 4 To study different two port networks and different network functions.

CLO 5 To get idea of network synthesis.

Unit-I Graph Theory & Circuits

Network topology, concept of network graph, tree, tree branch & link, incidence matrix, cut set and tie set matrices, self and mutual inductance, analysis of magnetically coupled circuits, dot convention, co-efficient of coupling, Resonance: Band Width and Q-factor for parallel resonant circuits

Unit- II Network theorems for ac & dc circuits

Superpositions theorem, Reciprocity theorem, Compensation theorem, Maximum power transfer, and Millman's theorem, Tellegen"s theorem, problems with dependent & independent sources, Concept of duality and dual networks

Unit- III Transient analysis & Filters

Transient study in RL, RC & RLC networks by Laplace transform method with DC and AC excitation, Response to step, impulse and ramp inputs

Passive Filter: Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

Unit- IV Two port networks & network functions

Two port parameters – Z, Y, ABCD, hybrid parameters, their inverse & image parameters, relationship between parameters, interconnection of two ports networks. Condition of reciprocity and symmetry in two port parameter presentation

Concept of complex frequency, driving point and transfer functions for two port network, poles and zeros of network functions, Time domain behavior from pole-zero plot.

Unit- V Network Synthesis

Realizability concept, Hurwitz property, positive realness, properties of positive real functions, Synthesis of R-L, R-C and L-C driving point functions, Foster and Cauer forms

Text Books:

1. Mittal GK; Network Analysis; Khanna Publisher

2. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.

3. William D Stanley: Network Analysis with Applications, Pearson Education

4. Sukhija & Nagsarkar: Circuits & Networks: Analysis, Design and Synthesis, Oxford

5. Franklin Fa-Kun. Kuo: Network Analysis & Synthesis: John Wiley & Sons

Reference Books: -

1. M.E. Van Valkenburg, Network Analysis, (PHI)

2. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH

3. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 Analyse coupled circuits and various circuits using graph theory.

CO_2 Apply theorems for solutions of electrical networks.

CO_3 Analyse the transient condition of electrical networks and design the passive filters.

CO_4 Evaluate two-port network parameters and network functions.

CO_5 Synthesize one port network using Foster and Cauer forms.

List of Experiments

1. To verify Superposition theorem.

2. To verify Reciprocity theorem.

3. To verify Maximum Power Transfer theorem.

4. To verify Millmans theorem.

5. To verify Tellegens theorem.

6. To verify Compensation Theorem

7. To determine open circuit & short circuit parameters of a two-port network.

8. To determine the ABCD parameters of two port network.

9. To determine the h parameters of two port network.

10. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit

11. Frequency response of Low pass and High Pass Filters.

12. Frequency response of Band pass and Band Elimination Filters

13. Study of resonance in R-L-C parallel circuit using oscilloscope

14. Study of DC and AC Transients for R-L, R-C & R-L-C circuits using storage oscilloscope.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EE3CO58	Object Oriented Programming	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 To understand the class and objects.

CLO02 To understand the Problem-Solving approach.

CLO03 To understand the object-oriented concepts.

CLO04 To implement the concept of inheritance and polymorphism.

CLO05 To understand the concept of file handling.

Unit - I

Introduction to object oriented programming, Characteristics, Applications, difference between object oriented and procedure based programming, object oriented programming languages, Object oriented concepts: Abstraction, Encapsulation, Polymorphism, Inheritance and Information Hiding.

Unit - II

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclass

Unit - III

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

Unit - IV

Inheritance and Polymorphism, Types of polymorphism, Static and dynamic polymorphism, Operator and Method overloading, Inherited methods, Redefined methods, the protected interface, Abstract methods and classes, Public and protected properties, Private operations, Disinheritance, Multiple inheritance.

Unit - V

Template Classes and Functions, Container Classes, Container types, typical functions and iterator methods, Heterogeneous containers, Persistent objects, stream, and files, Object oriented programming languages.

Text Books:

1. E. Balaguruswami, "Object Oriented Programming in C++", TMH.

2. Object oriented programming in C++ by Robert Lafore: Galgotia

3. Richard Johnsonbaugh, Martin Ka1in,Object oreiented programming in C++, Pearson; 2nd edition

Reference Books:

1. David Parsons; Object oriented programming with C++; BPB publication

2. Scott W Amber, The Object Primer , 3/e, Cambridge 2004.

3. Timothy Budd, Object Oriented Programming, 3/e, Pearson Education 2002.

4. Reema Thareja ,Object Oriented Programming With C++, 2018,Oxford University Press.

5. A. K. Sharma, Object-Oriented Programming with C++, Pearson India, 2014

NPTEL Reference:

https://nptel.ac.in/courses/106/105/106105151/

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Students will be able to understand Real World objects.

CO_{02} Student will familiar with problem solving technique and approach.

CO_{03} Student will be able to understand all the concept of OOPM

CO_{04} Students will be able to decompose the real world problem into step by step solution by applying domain knowledge.

CO_{05} Should be able to understand the tools to write the code.

List of Experiments:

1. Write a program to find out the largest number using a function.

2. Write a program to find the area of circle, rectangle and triangle using function overloading.

3. Write a program to implement complex numbers using operator overloading and type conversion.

4. Write a program using class and object to print bio-data of the students.

5. Write a program which defines a class with constructor and destructor which will count the number of objects created and destroyed.

6. Write a program to implement single and multiple inheritances taking students as the sample base class.

7. Write a program to add two private data members using the friend function.

8. Write a program using dynamic memory allocation to perform 2x2 matrix addition and subtraction.

9. Write a program to create a stack using a virtual function.

10. Write a program that stores five student records in a file.

11. Write a program to get the IP address of the system.

12. Write a program to shut down the computer system.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EE3CO59	Data Structures Through C	3	0	2	4

Course Learning Objectives (CLOs):

CLO 1 Operations on linear data structures and their applications.

CLO 2 The various operations on linked lists.

CLO 3 The basic concepts of Trees, Traversal methods and operations.

CLO 4 Concepts of implementing graphs and its relevant algorithms.

CLO 5 Sorting and searching algorithms.

Unit-I: Linear Data Structures: Arrays, Stacks and Queues

Data Structures -Operations-Abstract Data Types-Complexity of Algorithms-Time and Space-Arrays-Representation of Arrays-Linear Arrays-Insertion–Deletion and Traversal of a Linear Array-Array as an Abstract Data Type-Multi-Dimensional Arrays-Strings-String Operations-Storing Strings-String as an Abstract Data Type.

Stack -Array Representation of Stack-Stack Abstract Data Type-Applications of Stacks: Prefix-Infix and Postfix Arithmetic Expressions-Conversion-Evaluation of Postfix Expressions-Recursion-Towers of Hanoi-Queues-Definition-Array Representation of Queue-The Queue Abstract Data Type-Circular Queues-Dequeues-Priority Queues.

Unit-II: Linked Lists

Pointers-Pointer Arrays-Linked Lists-Node Representation-Single Linked List-Traversing and Searching a Single Linked List-Insertion into and Deletion from a Single Linked List-Header Linked Lists-Circularly Linked Lists-Doubly Linked Lists-Linked Stacks and Queues-Polynomials-Polynomial Representation-Sparse Matrices.

Unit-III: Trees

Terminology-Representation of Trees-Binary Trees-Properties of Binary Trees-Binary Tree Representations-Binary Tree Traversal-Preorder-In-order and Post-order Traversal-Threads-Thread Binary Trees-Balanced Binary Trees-Heaps-Max Heap-Insertion into and Deletion from a Max Heap-Binary Search Trees-Searching-Insertion and Deletion from a Binary Search Tree-Height of Binary Search Tree, m-way Search Trees, B-Trees.

Unit-IV: Graphs

Graph Theory Terminology-Graph Representation-Graph Operations-Depth First Search- Breadth First Search-Connected Components-Spanning Trees-Biconnected Components- Minimum Cost Spanning Trees-Kruskal's Algorithm-Prism's Algorithm-Shortest Paths- Transitive Closure-All-Pairs Shortest Path-Warshall's Algorithm.

Unit-V: Searching and Sorting

Searching -Linear Search-Binary Search-Fibonacci Search-Hashing-Sorting-Definition- Bubble Sort-Insertion sort-Selection Sort-Quick Sort-Merging-Merge Sort-Iterative and Recursive Merge Sort-Shell Sort-Radix Sort-Heap Sort.

Text Books:

1. Fundamentals of Data Structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press Pvt. Ltd.

2. Data Structures with C, Seymour Lipschutz, Schaum's Outlines, Tata McGraw Hill

Reference Books:

1. Data structures: A Pseudo code Approach with C, 2nd edition, R.F.Gilberg & B.A.Forouzan, Cengage Learning.

2. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.

3. Data Structures using C, A.M.Tanenbaum,Y. Langsam, M.J.Augenstein, Pearson.

4. Data structures and Program Design in C, 2nd edition, R.Kruse, C.L.Tondo and B.Leung, Pearson.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 data structures concepts with arrays, stacks, queues.

CO_2 linked lists for stacks, queues and for other applications.

CO_3 traversal methods in the Trees.

CO_4 various algorithms available for the graphs.

CO_5 sorting and searching in the data ret retrieval applications.

List of Experiments:

1. Implement operations on Strings.
2. Implement basic operations on Stacks.
3. Implement basic operations on Queue.

4. Implement basic operations on Circular Queue.

5. Implement multi stack in a single array.

6. Implement List data structure using i) array ii) singly linked list.

7. Implement basic operations on doubly linked list.

8. Implement basic operations (insertion, deletion, search, find min and find max) on Binary Search trees.

9. Implementation of Heaps.

10. Implementation of Breadth First Search Techniques.

11. Implementation of Depth First Search Techniques.

12. Implementation of Prim's algorithm.

13. Implementation of Kruskal's Algorithm.

14. Implementation of Linear search.

15. Implementation of Fibanocci search.

16. Implementation of Merge sort.

17. Implementation of Quick sort.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
EN3NG03	Soft Skills I	2	0	0	2	2

Course Learning Objectives (CLOs):

CLO_{01} Improving professional communication

CLO_{02} Knowing traits of personality and working on it

CLO_{03} Developing writing skills

CLO_{04} Cultivating art of formal presentation and public speaking

CLO_{05} Improving interview and group discussion skills and hence employability

Unit 1. Communication: Communication flow/channels, types of communication. principles of communication, barriers to Communication, Verbal/ Non Verbal Communication.

Unit 2. Confidence Building : Self evaluation and development, SWOT Analysis, overcoming hesitation and fear of facing public, exercises for confidence building, concepts and elements of emotional intelligence.

Unit 3. Business Correspondence – Business letters, formats, parts and layouts of business letters. sales letters: calling and sending quotation, placing orders, complaints, and adjustments. Writing agenda, preparing minutes.

Unit 4. Report Writing – Types of reports, formats, presenting diagrams, graphs, charts, tables. Technical description, writing abstract, summary, synopsis.

Unit 5. Formal Presentation- searching data, organising, presenting,. assimilating, submitting preparing slides, Organising and designing presentations.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_{01} Students will be able to interacat confidently at formal occasions

CO_{02} Students will be able to understand their personality and improve it

CO_{03} Students will be able to work on their writing skills

CO_{04} Students will get to write formally with perfaction

CO_{05} Students will be able to face interview confidently and will be able to know the qualities of participants taking part in GD

Text Books:

1. R C Sharma, Krishna Mohan. Business Correspondance and Report Writing. Mc Graw Hill Education .
2. M Ashraf Rizvi. Effective Technical Communication. Mc Graw Hill Education.

Reference Books:

1. Prof P N Kharu Dr Varinder Gandhi. Communication Skills in English. Laxmi Publications
2. Murphy, Hildebrandt, Thomas. Effective Business Communication. Mc Graw Hill Education
3. Paul V Anderson. Technical Communication. Cengage Learning.

Web Source:

http://study.com/academy/lession/communication-skills-definition-examples.html

https://books.google.co.in/books?

Open Learning Source:

https:/onlinecourses.nptel.ac.in

SEMESTER IV

Course Code	Course Name	L	T	P	Credit
EE3CO60	Database Management Systems	3	1	2	5
EE3CO61	Operating Systems	3	0	2	4
EE3CO62	Computational Statistics	3	0	0	3
EE3CO63	Power System Engineering	3	1	0	4
EE3CO64	Theory of Computation	3	0	0	3
EE3CO53	Microprocessors & Microcontrollers	3	0	2	4
EE3ES05	Java Programming	0	0	2	1
EN3NG10	Soft Skills-II	2	0	0	2
Total		**20**	**2**	**8**	**26**
Total Contact Hours		**30**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3CO60	Database Management Systems	3	1	2	5

Course Learning Objectives (CLOs):

CLO_{01} To Understand the Types of Data and Structured database, different methods of modelling, conceptual model like ER Model, Object Oriented Model.

CLO_{02} To understand the Relational Model, Relational Algebra and Relational Calculus.

CLO_{03} To Understand the Functional dependency, Keys, Normalization process.

CLO_{04} To Understand Database Transaction and its Properties

CLO_{05} To Understand the File organization, Query optimization, indexes, Fragmentation, Replication and Allocation Techniques.

Unit-I

Basic Concepts: Data Vs Information, Definition of Database, Advantages of Database Systems, Components of DBMS, DBMS Architecture and Data Independence, Data Modeling, Entity Relationship Model, Relational, Network, Hierarchical and Object Oriented Models. Data Modeling using Entity Relationship Model.

Unit-II

Relational Database: Relational Databases, Relational Algebra, Relational Algebra Operation, Tuple Relational Calculus, Domain Relational Calculus. Data Definition with SQL, Inserts, Delete and Update Statements in SQL, Views, Data Manipulation with SQL, PL/ SQL constructs: Triggers, Cursors

Unit-III

Database Design: Design Guidelines, Key concepts, Relational Database Design, Integrity Constraints, Domain Constraints, Referential Integrity, Functional Dependency, Normalization Using Functional Dependencies: Normal Forms, First, Second and Third Normal Forms. Boyce Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Decomposition in 2NF, 3NF and BCNF.

Unit-IV

Database Transactions Processing: Introduction to Transaction Processing, Transaction Concepts, Desirable Properties of Transactions, Schedules, Concepts of Recoverability and Serializability, Concurrency Control: Introduction, Locking Protocols.

Unit-V

Query Processing and Optimization, File Organization and Indexes, Hashing Techniques, B tree, B+ tree etc. Introduction to Advanced Databases: Distributed Databases, Distributed Database Concepts, Data Fragmentation, Replication and Allocation Techniques

Text Books:

1. Henry F Korth, Abraham Silbershatz, "Database System Concepts", McGraw Hill
2. Elmasri and Navathe, "Fundamentals of Database System", Pearson Education Asia
3. C.J. Date, "An Introduction to Database Systems", Pearson Education Asia.

Reference Books:

1. B.C. Desai, "An Introduction to Database Systems", Galgotia Publications
2. F.R. Mcfadden, J.Hoffer and M.Prescott, "Modern Database Management", Addison Wesley
3. Atul Kahate," Introduction to Database Management Systems", Pearson Education India.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Students will be able to identify the major entities of miniworld and relationships between them, familiar with conceptual design of databases.

CO_{02} Students will be able to model the database and will be able to convert the Conceptualmodel into Relational model.

CO_{03} Students will be able to normalize the relations, remove the redundancy and inconsistency in the database.

CO_{04} Students will be able to design the transaction in such a way that it never takes the database in an inconsistent state

CO_{05} Students will be familiar with various types of indexing, searching and file organization techniques.

List of Experiments:

1. Designing an E-R model.
2. Solving basic SQL assignment (DDL and DML commands).
3. Applying unique and referential integrity constraints using SQL.
4. Applying Like predicate, Group By, Having Clause using SQL.
5. Solving SQL assignment involving nested and join queries.
6. Demonstrate views and triggers using SQL.
7. Demonstrate PL/SQL block constructions.
8. Minor Project on designing/developing a database application.
9. Case study of any contemporary DBMS

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3CO61	Operating Systems	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 To learn the fundamentals of Language processing activities, Macros, Operating Systems.

CLO02 To learn the mechanisms of OS to handle processes and threads and their communication.

CLO03 To understand CPU Scheduling in OS.

CLO04 Understanding Deadlocks: Prevention, Avoidance, Detection and recovery from deadlock.

CLO05 To learn the mechanisms involved in memory management in OS.

Unit-I

Introduction Language Processors, Language Processing Activities and Language Processors Development Tools, Assemblers, Compiler, Macros and Macro Processors, Linkers, Introduction to OS. Operating System Functions, Evaluation of O.S., Different Types of O.S.: Batch, Multi-Programmed, Time-Sharing, Real-Time, Distributed, Parallel.

Unit-II

Process: Concept of Processes, Process Scheduling, Operations on Processes, Cooperating Processes, Inter- Process Communication. Precedence Graphs, Critical Section Problem, Semaphores, Threads.

CPU Scheduling: Scheduling Criteria, Preemptive & Non-Preemptive Scheduling, Scheduling Algorithms, Algorithm Evaluation, Multi-Processor Scheduling. Deadlock: Deadlock Problem, Deadlock Characterization, Deadlock Prevention, Dead Lock Avoidance, Deadlock Detection, Recovery from Deadlock, Methods for Deadlock Handling.

Unit-III

Memory Management: Concepts of Memory management, logical and physical address space, swapping, Fixed and Dynamic Partitions, Best Fit, First Fit and Worst Fit Allocation, Paging, Segmentation, and Paging Combined with Segmentation.

Unit-IV

Concepts of Virtual Memory, Cache Memory Organization, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation, Role of Operating System in Security, Security Breaches, System Protection, and Password Management.

Unit-V

Disk Scheduling, File Concepts, File Manager, File Organization, Access Methods, Allocation Methods, Free Space Managements, Directory Systems, File Protection, File Organization & Access Mechanism, File Sharing Implement Issue, File Management in Linux, Introduction To Distributed Systems.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne Operating Systems Concepts, Wiley Publications.
2. Andrew S. Tanenbaum, Modern Operating Systems, Pearson Education Asia.
3. H. M. Deitel, P. J. Deitel, D. R. Choffnes, "Operating System", Pearson

Reference Books:

1. Terrence Chan, UNIX System Programming Using C++, Prentice Hall India.
2. W. Richard Stevens, Advanced Programming in UNIX Environment, Pearson Education.
3. William Stallings, Operating Systems, Pearson Education Asia.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Students will understand the history of the operating system. Students will be able to understand design issues associated with operating systems.

CO_{02} Students will understand process management concepts including scheduling, synchronization, and deadlocks

CO_{03} Students will be able to understand concepts of memory management including virtual memory.

CO_{04} Students will understand issues related to file system interface and implementation, disk management.

CO_{05} Students will be familiar with various types of operating systems including LINUX/ UNIX and its services.

NPTEL Reference:

1. http://nptel.ac.in/courses/106108101/
2. http://nptel.ac.in/courses/106106144/

List of Experiments:

1. Write a program to demonstrate system call or procedure.
2. Write a program to demonstrate process communications methods.
3. Write a program to demonstrate process synchronization methods.
4. Simulate all the CPU scheduling algorithms.
5. Write a program to demonstrate Deadlock detection and prevention methods.
6. Write a program to demonstrate disk scheduling algorithms.
7. Write a program to demonstrate paging and swapping techniques.
8. Write a program to demonstrate thread and multithread.
9. Case Study on Unix, Linux (any latest variant), Windows (latest version) which must essentially contain its features like scheduler, file management strategy, process and memory management techniques.
10. Study on Android and IOS with its features.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3CO62	Computational Statistics	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To illustrate with the basic knowledge of measure of central tendency and dispersion.

CLO_{02} Elaborate the concept of random variables and distributions.

CLO_{03} Apply the knowledge of different distribution to find mean and variance.

CLO_{04} To prioritize the concept of correlation, regression and curve fitting.

CLO_{05} To illustrate with the concept of testing of hypothesis and its applications.

UNIT-I

Summarizing Data using Statistical Measures:

Descriptive Statistics – Measure of central tendency - Mean: Arithmetic mean, Geometric mean and Harmonic mean with its Mathematical properties, Properties of mean, Median and mode, Relationship among mean, median and mode, Measure of dispersion – standard deviation, Variance, Covariance and its properties, Coefficient of variation, Quartiles, Quartile deviation and Mean deviation.

UNIT-II

Theory of Random variables and Probability:

Random variables- Discrete and Continuous random variables, Mass and Density function (pmf, pdf), Cumulative Distribution function, Expectation of a random variables, Expectation of random variable in terms of variance, Introduction to probability theory, Trial and Event, law of probability theory, Introduction to Conditional probability.

Unit III: Probability Distribution:

Discrete Distribution: Binomial, Poisson distribution with mean variance, Moment generating function.

Continuous Distribution: Normal and Exponential Distribution with mean variance, Moment generating function.

UNIT-IV

Curve fitting, Correlation, Regression:

Curve fitting (Method of Least Square), linear and nonlinear curves, Correlation, Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation Coefficient, Linear Regression, Regression coefficients, Properties of regression curve.

UNIT – V

Testing of Hypothesis and Analysis of variance:

Introduction to testing of hypothesis, Statistical assumptions, Level of significance, Confidence level, Type I Error, Type II error, Critical value, Power of the test, sampling distribution, Chi-Square test, small sample test – t test for one and two sample mean, F test, Fisher Z test of population variance, Introduction to one way and two way analysis of variance (ANOVA).

Text Books:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons Publication.
2. Probability and Statistics, Ravichandran, Wiley India.

Reference Books:

1. Sheldon M. Ross, "Introduction to Probability Models", Elsevier Publication, Academic Press, UK
2. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier Publication, Academic Press, UK

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understanding the basic concept of central tendency, dispersion, and probability distribution for discrete and continuous random variable and remembering the formula for correlation, regression and testing of hypothesis.

CO_{02} Apply the theoretical methods for testing and comparison of the sample and population for mean, variance, standard deviation.

CO_{03} Analyze and organize the statistical data to examine the facts under view.

CO_{04} Evaluate the mean, median, mode on the basis of observation and compare it with the theoretical distribution and evaluate the relation between the different variates on the basis of correlation, regression.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EE3CO63	Power System Engineering	3	1	0	4

Course Learning Objectives (CLOs):

CLO 1 To know the concepts of inductance and capacitance of line conductors and classification and performance of overhead transmission lines.

CLO 2 To classify the overhead line insulators, underground cables and to compare various power plants with related terms.

CLO 3 To learn the different load flow methods and understand the optimal dispatch of generation.

CLO 4 To understand the load frequency control and power system stability.

CLO 5 To gain the knowledge of various faults, relays and circuit breakers working and protective schemes of different components.

UNIT - I

Transmission Line Performance:

Resistance, Inductance and capacitance of transmission line, L and C calculation for 1-ϕ and 3-ϕ, GMR and GMD, ground capacitance, transposition of line, composite and bundle conductors, overhead system conductor materials. Short, medium & long transmission line. Nominal T, nominal π, equivalent T and π models, ABCD constants, Estimation of regulation & efficiency, surge impedance loading. Mechanical design: Line supports, Types of steel towers, sag & tension calculation, effect of wind & ice loading, string chart, sag template, vibration and vibration dampers, Corona effect.

UNIT - II

Energy sources, Insulators and Cables:

Comparison of hydroelectric, thermal and nuclear power plants, structure and components of power system, load curves, demand factor, diversity factor, utilization factor, connected load, maximum demand, load factor, load duration curve, load types, economics of power generation, depreciation, tariff. Insulators, types of insulators, voltage distribution over insulator string, string efficiency, methods of improving string efficiency. Cable classification, capacitance, heating and thermal resistance of cables.

UNIT - III

Power Flow Studies and Economic Operations:

Algorithms of Ybus and Zbus matrix Formation, Numerical Problems. Power flow equations, Gauss-Seidel Method, Newton Raphson Method, Decoupled and Fast Decoupled methods. Optimal operation of

Generators in Thermal power stations, Heat rate and Cost Curves, Input–output characteristics, Optimum generation allocation with line losses neglected and considered, Loss Coefficients, General transmission line loss formula.

UNIT - IV

Load Frequency Control and Power System stability:

Modelling of steam turbine, Generator, speed governing, Definitions of Control area: Single and two area control system, Block diagram representations, Steady state and Dynamic response , controlled and uncontrolled cases. Tie-line bias control.

Power System Stability: Steady-state, dynamic and transient stability, swing equation, power angle curve, loss of synchronism in a single-machine infinite bus system for three-phase fault, solution of swing equations using step by step methods, equal area criterion, methods of improving stability.

UNIT - V

Faults and Protection:

Three Phase Short Circuit Currents - Short circuit MVA, symmetrical components, Sequence impedances and Sequence networks, LG– LL– LLG and LLL faults. Circuit Breakers: Principle, Restriking phenomenon, RRRV, Vacuum, Oil and SF6 circuit breakers. Relays: Principle, DMT and IDMT types, over current and under voltage, Distance and Directional relays. Generator Protection, Transformer Protection: CT's ratio, Buchholz relay. Over current Protection schemes: PSM, TMS, Numerical. Carrier current and three zone distance relay using impedance relays. Protection of bus bars by using Differential protection. Over voltage Protection against lightning – Valve type and zinc oxide lighting arresters.

Text Books:

1. B. R. Gupta, Generation of Electrical Energy, S. Chand Publication.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International Publishing Co. Ltd.
3. I. J. Nagrath and D. P. Kothari, "Modern Power System Analysis", Tata McGraw Hill
4. Badri Ram and D.N Viswakarma, Power System Protection and Switchgear, Tata McGraw Hill Publications - 2nd edition - 2011.
5. I.J.Nagrath & D .P.Kothari, Modern Power system Analysis, Tata McGraw–Hill Publishing Company - 3rd edition - 2007.

Reference Books:

1. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education.

2. P. Kundur, Power system stability and control, McGraw Hill Inc.

3. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education.

4. Allen J Wood, Bruce F Wollen Berg, “Power Generation - Operation and Control”, 3rd Edition - Wiley Publication 2014.

5. Power System Analysis by Hadi Saadat – – Tata McGraw–Hill 3rd edition - 2010.

6. Sunil S. Rao, Switchgear & protection, Khanna Publication.

7. Ravindra P. Singh, Switchgear & Power System Protection, PHI Learning.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 Define and derive expressions of inductance and capacitance for overhead lines, also analyze various transmission lines.

CO_2 Compare various conventional power plants and differentiate various overhead line insulators and underground cables.

CO_3 Apply the load flow solution to a power system using different methods and compute optimal load scheduling of Generators.

CO_4 Analyze the effect of Load Frequency Control for different area systems and stability concepts of a power system.

CO_5 Classify and analyze various faults and protective schemes using different relays and circuit breakers for different systems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3CO64	Theory of Computation	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand foundations of computation including automata theory.

CLO02 To construct models of regular expressions and languages.

CLO03 To design and simplify Context Free Grammar.

CLO04 To design and understand Push Down Automata.

CLO05 To understand Turing machines and their capability and to understand Undecidability and NP class problems.

Unit-I

Finite Automata and Regular Languages: Motivation for Studying Theory of Computation, Notion of Formal Languages and Grammars, Regular Expressions and Regular Languages, Closure Properties of Regular Languages, Introduction of Automata Theory: Examples of Automata Machines, Finite Automata with Output: Mealy and Moore Machines, Applications.

Unit-II

Nondeterminism and Minimization: Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic Finite Automata Machines, Conversion of NDFA to DFA, Minimization of Automata Machines, Regular Expression, Arden's Theorem. Meaning of Union, Intersection, Concatenation and Closure, 2 Way DFA, Pumping Lemma for Regular Languages.

Unit-III

Grammars and Context-Free Languages: Grammars and Chomsky Hierarchy: Types of Grammar, Context Sensitive Grammar, and Context Free Grammar, Regular Grammar. Derivation Trees, Ambiguity in Grammar, Simplification of Context Free Grammar, Conversion of Grammar to Automata Machine and Vice Versa, Chomsky Hierarchy of Grammar, Killing Null and Unit Productions. Chomsky Normal Form and Greibach Normal Form.

Unit-IV

Pushdown Automata: Push Down Automata: Example of Push Down Automata (PDA), Applications of PDA Deterministic and Non-deterministic PDA, and Conversion of PDA into Context Free Grammar and Vice Versa, CFG Equivalent to PDA

Unit-V

Turing Machines and Computability: Turing Machine: Techniques for Construction. Universal Turing Machine Multitape, Multihead and Multidimensional Turing Machine, N-P Complete Problems. Decidability and Recursively Enumerable Languages, Decidability, Decidable Languages, Undecidable Languages, Halting Problem of Turing Machine.

Text Books:

1. Peter Linz, An Introduction to Formal Languages and Automata, Jones &Bartlett Learning, Canada.
2. John C. Martin, Introduction to Languages and the Theory of Computation, Tata McGrawHill.

Reference Books:

1. J.E. Hopcroft, Rajeev Motwani and J.D.Ullman, Introduction to Automata, Languages and Computation, Pearson Education, Asia.
2. Daniel I.A. Cohen, Introduction to Computer Theory, John Wiley.
3. H.R. Lewis and C.H.Papadimitriou, Elements of the Theory of Computation, Prentice Hall Inc.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO01 Construct automata theory using Finite Automata.

CO02 Write regular expressions for any pattern.

CO03 Design context free grammar and simplify CFG

CO04 Construct Push Down Automata equivalent to CFGs.

CO05 Design Turing machine for computational functions.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO53	Microprocessors & Microcontrollers	3	0	2	4

Course Learning Objectives (CLOs):

CLO 1 To understand the organization and architecture of Microprocessor

CLO 2 To understand addressing modes to access memory

CLO 3 To understand 8051 micro controller architecture

CLO 4 To understand the programming principles for 8086 and 8051

CLO 5 To understand the interfacing of Microprocessor with I/O as well as other devices

CLO 6 To understand how to develop cyber physical systems

UNIT - I

Introduction to Microprocessor Architecture

Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086– Introduction to 80286 - 80386 – 80486, Pentium series (brief description about architectural advancements only).

UNIT - II

Minimum and Maximum Mode Operations

Instruction sets of 8086 - Addressing modes – Assembler directives - General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.

UNIT - III

Microprocessors I/O interfacing

8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255– Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086.

Architecture and interfacing of 8251 USART – Architecture and interfacing of DMA controller (8257).

UNIT - IV

8051 Microcontroller

Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals- Instruction set.

UNIT - V

PIC Architecture

Block diagram of basic PIC 18 micro controller – registers I/O ports – Programming in C for PIC: Data types - I/O programming - logical operations - data conversion.

Text Books:

1. Ray and Burchandi - "Advanced Microprocessors and Interfacing" - Tata McGraw–Hill - 3rd edition - 2006.

2. Kenneth J Ayala - "The 8051 Microcontroller Architecture - Programming and Applications" - Thomson Publishers - 2nd Edition.

3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18 - -Muhammad Ali Mazidi - RolindD.Mckinay - Danny causey -Pearson Publisher 21st Impression.

Reference Books:

1. Microprocessors and Interfacing - Douglas V Hall - Mc–Graw Hill - 2nd Edition.

2. R.S. Kaler - "A Text book of Microprocessors and Micro Controllers" - I.K. International Publishing House Pvt. Ltd.

3. Ajay V. Deshmukh - "Microcontrollers – Theory and Applications" - Tata McGraw–Hill Companies –2005.

4. Ajit Pal - "Microcontrollers – Principles and Applications" - PHI Learning Pvt Ltd - 2011.

5. https://archive.nptel.ac.in/courses/108/105/108105102/

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors.

CO_2 Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors.

CO_3 Analyse the Microcontroller and interfacing capability.

CO_4 Describe the architecture and interfacing of 8051 controller.

CO_5 Know the concepts of PIC micro controller and its programming.

List of Experiments:

8086 Microprocessor Programs:

1. Arithmetic operations – Two 16-bit numbers and multibyte addition - subtraction - multiplication and division – Signed and unsigned arithmetic operations - ASCII – Arithmetic operations.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD - BCD to ASCII conversion.
3. Arrange the given array in ascending and descending order
4. Determine the factorial of a given number
5. By using string operation and Instruction prefix**:** Move block - Reverse string Sorting - Inserting - Deleting - Length of the string - String comparison.
6. Find the first and nth number of 'n' natural numbers of a Fibonacci series.
7. Find the number and sum of even and odd numbers of a given array
8. Find the sum of 'n' natural numbers and squares of 'n' natural numbers
9. Arithmetic operations on 8051
10. Conversion of decimal number to hexa equivalent and hexa equivalent to decimal number
11. Find the Sum of elements in an array and also identify the largest & smallest number of a given array using 8051.

Programs on Interfacing:

12. Interfacing 8255–PPI with 8086.
13. Stepper motor control using 8253/8255.
14. Reading and Writing on a parallel port using 8051
15. Timer in different modes using 8051
16. Serial communication implementation using 8051
17. Understanding three memory areas of 00 – FF Using 8051 external interrupts.
18. Traffic Light Controller using 8051.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3ES05	Java Programming	0	0	2	1

Course Learning Objectives (CLOs):

CLO01 To make the students understand the basic concepts and definitions of Java Programming Language.

CLO02 To make the students learn and apply the concepts of object-oriented programming language.

CLO03 To teach how to use in-built string functionalities and to write own string functions.

CLO04 To make the students learn the concepts of exception handling and multi-threading in java.

CLO05 To make the students learn the concepts of input and output in Java programming language.

Unit-I

Basics of JAVA: Overview of Java, History and Evolution of Java, Feature of Java, Difference between Java, C++ and C, Structure of Java Program, Basics of JDK, JRE and JVM, Installation of JDK, Simple Java Program, Compilation and Execution of Java Program. Elements of Java: Keywords, Data Types, Variable, Declaration and Initialization of a Variable, the Scope and Lifetime of Variable, Constants, Literals, Identifiers, Operators, types of Java Statements, Unicode System, Naming Convention, Comments, Arrays, type Conversion and Casting.

Unit-II

Dynamic Method Dispatch: Garbage Collection, Static and Dynamic Binding, Inheritance and its types, Interfaces.

Java Packages: Definition of Package, types of Package, Differentiate Package from Header File, Importing Package, Creating Package.

Unit-III

String in Java: Overview of String, Immutable String, String Comparison, String Concatenation, Substring, Methods of String Class, String Buffer Class, Creating Immutable Class to_String Method.

Unit-IV

Exception Handling: Defining Exception, types of Exception, Exception Class, Try and Catch block, Multiple Catch Blocks, Nested Try, Finally Block, Throw Keyword, Exception Propagation, Throws Keyword.
Multithreading: Overview of Thread, Thread Types, Life Cycle of a Thread, Creating Thread, Sleeping a Thread, Joining a Thread, Thread Priority, Daemon Thread.

Unit-V

I/O Handling: File Output Stream & File Input Stream, Buffered Output Stream & Buffered Input Stream, Input from Keyboard by Input Stream Reader, Input from Keyboard by Console, Input from Keyboard by Scanner, Print Stream Class.

Java Applets: Applet Basics, the Applet Class, Applet Architecture, Applet Initialization and Termination, the HTML APPLET Tag, Passing Parameters to Applets.

Introducing the AWT: Introduction to Windows, Graphics, and Text, AWT Classes, Window Fundamentals, Component, Container, Panel, Frame.

Text Books:

1. E. Balagurusamy, "Programming with Java A Primer", McGrawHill.
2. Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill.
3. Horstmann & Cornell, "Core Java 2" (Vol I & II), Pearson.

Reference Books:

1. Steven Holzner, JAVA 2 Black Book, Coriolis Group.
2. Sharanam Shah, "Core Java 8 for Beginners", Shroff Publisher.
3. Joshua Bloch, "Effective Java" Sun Microsystems.
4. Bert Bates and Kathy Sierra, Head First Java, O'Reilly.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} The student will be able to write and run basic programs in java.

CO_{02} The student will be able to relate real world problems to Object Oriented programming environment.

CO_{03} The students will be able to apply the concepts of reusability using the build-in string functions.

CO_{04} The students will be able to use exception handling in their programs and to apply the concepts of multithreading in java

CO_{05} The students will be able use input and output functionality, Applets and AWT in java programs.

List of Experiments:

1. Write a program that accepts two numbers from the user and print their sum.
2. Write a program to calculate addition of two numbers using prototyping of methods.
3. Program to demonstrate function overloading for calculation of average.
4. Program to demonstrate overloaded constructor for calculating box volume.
5. Program to show the details of students using the concept of inheritance.
6. Program to demonstrate package concept.
7. Program to demonstrate implementation of an interface which contains two methods declaration square and cube.
8. Program to demonstrate exception handling in case of division by zero error.
9. Program to demonstrate multithreading.
10. Program to display “Hello World” in web browser using applet.
11. Program to add user controls to applets.
12. Write a program to create an application using the concept of swing.

SEMESTER V

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO29	Electromagnetic Theory	3	0	0	3
2	EE3CO65	Information Theory and Data Communication	3	0	0	3
3	EE3CO34	Control Systems	3	0	0	3
4	EE3ITXX	Elective 1	3	0	0	3
5	EE3ITXX	Elective 2	3	0	0	3
6	EE3ES01	Python Programming	0	0	2	1
7	EN3NG05	Soft Skills -III	2	0	0	2
8	EE3PC08	Mini Project	0	0	4	2
9	OE000XX	Open Elective 1	3	0	0	3
Total			**20**	**0**	**6**	**23**
Total Contact Hours			**26**			

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EE3CO29	Electromagnetic Theory	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO_{01} Impart a basic knowledge of Co-ordinate systems in scalar and vectors form.

CLO_{02} Provide working knowledge for the analysis of different charge distributions, electric flux density and its applications in electrostatic field.

CLO_{03} Develop skill to understand magnetostatics field and its applications. Understanding self-inductance and mutual inductance.

CLO_{04} Relate the working of electrostatic and magnetostatics field. Understanding how to solve wave equation for time varying fields.

CLO_{05} Emphasize the effects of polarization, reflection of uniform plane waves, standing wave ratio, Brewster angle, total internal reflection, transmission line analogy.

Unit-I

Co-ordinate Geometry and Vector Calculus-Co-ordinate systems and co-ordinate geometry, line, surface and volume integrals, curl, divergence and gradient, divergence theorem and stokes' theorem, Laplacian for scalar and vectors, vector identities.

Unit-II

Electrostatics- Coulomb's law, field due to different charge distributions, electric flux density, dielectric constant, gauss's law and its applications, potential difference, potential field of a point charge and different charge distributions, potential gradient, dipole, capacitance between two isolated conductors, boundary conditions between two media, energy density in electrostatic field, Poisson's and Laplace equation, solution of Laplace equation, ohm's law and continuity of current.

Unit-III

Magnetostatics- Biot-savart's law, magnetic field intensity, magnetic flux density, permeability, ampere's circuital law, applications of ampere's law, solenoid and toroid, point form of ampere's circuital law, vector magnetic potential, magnetization, magnetic boundary conditions, magnetic circuit, self-inductance and mutual inductance.

Unit-IV

Time varying fields and maxwell's equations- Lorentz force equation, force on a moving charge, faraday's law, displacement current, modified ampere's law, maxwell's equations in point and integral forms for time varying fields, maxwell's equation for time harmonic field, wave equations in source free region, solution to wave equation, intrinsic impedance, poynting theorem, complex poynting vector. plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, skin depth.

Unit-V

Polarization and uniform plane waves- Linear, circular and elliptic polarization, reflection of uniform plane waves, plane waves at normal and oblique incidence, standing wave ratio, Brewster angle, total internal reflection, transmission line analogy.

Text Books:

1. Matthew Sadiku, Elements of Electromagnetics, Oxford University Press.
2. E.C. Jordan & K.G. Balmian: Electromagnetic wave and Radiating System, PHI.
3. S.P. Seth, Elements of Electromagnetic Fields, Dhanpat Rai Publication

Reference Books:

1. William H. Hayt, Engineering Electromagnetic, TMH
2. John D. Kraus, Electromagnetics, Mc. Graw Hill.
3. Joseph Edminister, Electromagnetics -Schaum's Outline Series, TMH.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	To Understand Basic terms and parameters of Co-ordinate systems in scalar and vectors form and how to use them in different fields of Electrical Engineering.
CO_{02}	To predict the behaviour of any electrical field effects and its application.
CO_{03}	Have knowledge of magnetic field and its applications in electrical field. Able to understand basics concepts of self-inductance and mutual inductance.
CO_{04}	To understand behaviour of any electrical and magnetic field effects in a combined form and able to solve wave equation for time varying fields.
CO_{05}	To be able to analyze polarization reflection and transmission line analogy.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO65	Information Theory and Data Communication	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} Design the channel performance using Information theory.

CLO_{02} To develop an understanding Binary Symmetric Channel.

CLO_{03} Apply linear block codes for encoding.

CLO_{04} To develop an understanding of Encoding and decoding of signals.

CLO_{05} To develop an understanding of Error Correction and detection.

Unit-I

Introduction of Information Theory, Measure of Information, Information Content of Message, Average Information Content of Symbols in Long Independent Sequences, Average Information Content of Symbols in Long Dependent Sequences, Markov Statistical Model for Information Sources.

Unit-II

Communication Channels, Discrete Communication channels Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies. Mutual Information, Channel Capacity, Channel Capacity of Binary Symmetric Channel, Binary Erasure Channel, Muroga's Theorem.

Unit-III

Communication Model Simplex, Half Duplex and Full Duplex Transmission. Time Domain and Frequency Domain Concepts, Analog & Digital Data and Signals, Transmission Impairments, Attenuation, Delay Distortion, Noise, Different types of Noise Channel Capacity, Shannon's Theorem. Sampling Theorem, Encoding Digital Data into Digital Signal, NRZ, Biphase, Multilevel Binary.

Unit-IV

Encoding Digital Data into Analog Signals, PCM, PM, DM Encoding Analog Data into Analog Signals, AM, FM, PM. Encoding Digital Data into Analog Signals, ASK, FSK, PSK. Multiplexing, TDM, FDM, WDM, Encoding Techniques, Spread Spectrum. The Concept of

Spread Spectrum – Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access (CDMA).

Unit-V

Errors, Types of Error, Single Bit Error, Burst Error, Vertical Redundancy Check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy Check (CRC), Error Detection, Parity Check, Forward Error Correction. Block Codes, Convolution Codes. Hamming Code, Check Sum.

Text Books

1. K. Sam Shanmugam,"Digital and Analog Communication Systems", John Wtley India
2. Simon Haykin, "Digital Communication", John Wtley India Pvt Ltd.
3. Behrouz A. Forouzan, "Data Communication and Networking", Tata McGraw Hill.
4. R P Singh and S D Sapre, "Communication Systems", TMH.
5. Prakash C. Gupta, "Data Communication and Computer Networks", PHI Learning.

References

1. Ranjan Bose, "ITC and Cryptography", TMH.
2. J. Das, S.K.Mullick, "P. K. Chatterjee",Principles of Digital Communication, Wiley, 1986-Technology & Engineering
3. Bernard Sklar, "Digital Communications- Fundamentals and Applications",Pearson Education.
4. HariBhat, Ganesh Rao, "Information Theory and Coding", Cengage.
5. Todd K Moon, "Error Correction Coding", Wiley Std. Edition.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Students will able to understand the channel performance using Information theory.

CO_{02} Students will able to understand Channel matrix and Binary Symmetric Channel.

CO_{03} Student will apply linear block codes for encoding.

CO_{04} Student will apply Encoding and decoding techniques.

CO_{05} Student will able to detect and correct errors.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EE3CO34	Control System	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO 1 To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function

CLO 2 To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers. To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.

CLO 3 To understand basic aspects of design and compensation of LTI systems using Bode diagrams.

CLO 4 To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.

CLO 5 To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability.

UNIT - I

Mathematical Modeling of Control Systems

Classification of control systems - open loop and closed loop control systems and their differences - Feedback characteristics - transfer function of linear system, differential equations of electrical networks- translational and rotational mechanical systems - transfer function of Armature voltage-controlled DC servo motor - block diagram algebra - signal flow graph – reduction using Mason's gain formula.

UNIT - II

Time Response Analysis and Controllers

Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) - proportional integral derivative (PID) systems.

Stability Assessment Techniques

The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.

UNIT - III

Frequency Response Analysis

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion- stability analysis using Bode plots (phase margin and gain margin).

UNIT - IV

Classical Control Design Techniques

Lag, lead, lag-lead compensators - physical realisation - design of compensators using Bode plots.

UNIT - V

State Space Analysis of Linear Time Invariant (LTI) Systems

Concepts of state - state variables and state model - state space representation of transfer function - diagonalization using linear transformation - solving the time invariant state equations - State Transition Matrix and its properties- concepts of controllability and observability.

Text Books:

1. Kotsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India

2. Benjamin C.Kuo, "Automatic control systems", Prentice Hall of India, 2nd Edition.

Reference Books:

1. M.Gopal, "Control Systems principles and design", Tata Mc Graw Hill Education Pvt Ltd., 4th Edition.

2. Norman S. Nise, "Control Systems Engineering", Wiley Publications, 7th edition

3. Manik Dhanesh N, "Control Systems" Cengage publications.

4. I.J.Nagarath and M.Gopal, "Control Systems Engineering" Newage International Publications, 5th Edition.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.

CO_2 Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and root locus method.

CO_3 Analyze the stability of LTI systems using frequency response methods.

CO_4 Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode diagrams.

CO_5 Represent physical systems as state models and determine the response. Understand the concepts of controllability and observability.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3ITXX	Soft Computing	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} Introduction to soft computing techniques, characteristics and their applications

CLO_{02} Understand the fundamentals of neural networks, learning rules.

CLO_{03} Different ANN training algorithms, their application areas.

CLO_{04} Fuzzy logic, working principles and its applications.

CLO_{05} To understand genetic algorithm and optimization problem solving

Unit-I

Concept of computing systems, Introduction to soft computing, characteristics, applications of soft computing techniques.

Unit-II

Neural Networks: Biological Neural Network, Different ANNs architectures, Fundamentals, Neural Network Architectures, Feedforward Networks, training techniques in different ANNs, Applications of ANN to solve real world's problems.

Unit-III

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.

Unit-IV

Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc, Solving single-objective optimization problems using GAs.

Unit-V

Hybrid Systems: Genetic Algorithm based Backpropagation Network, Fuzzy – Backpropagation, Fuzzy Logic Controlled Genetic Algorithms. Case studies.Case studies in Engineering

Text Books:

1. Sinha, N.K. and Gupta, M. M.: "Soft Computing and Intelligent Systems - Theory and Applications", Academic Press.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis, and Applications, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Prentice Hall of India.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

Reference Books:

1. Soft Computing, D. K. Pratihar, Narosa, 2008.
2. Jang, J-S. R., Sun,C-T, Mizutani, E.: "Neuro–Fuzzy and Soft Computing", Prentice Hall of India.
3. Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, Nikola K. Kasabov, MIT Press

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Students will be able to understand soft computing techniques and applications

CO_{02} Students will be familiar with neural network learning.

CO_{03} Students will be able to understand working knowledge of Fuzzy logic and reasoning in the presence of incomplete and/or uncertain information

CO_{04} Students will be able to understand to apply genetic algorithms to optimization problems

CO_{05} Ability to understand the working of hybrid systems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3ITXX	Pattern Recognition	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To know about pattern recognition techniques, classifier and its types

CLO_{02} To understand basic principles of implementing pattern recognition parametric methods

CLO_{03} To gain Knowledge of dimensionality reduction methods and Non parametric algorithms

CLO_{04} To understand broad perspective of clustering and association algorithms

CLO_{05} To understand and apply knowledge of Pattern Recognition to solve Applications

Unit-I

Overview of Pattern Recognition, Supervised Learning, Bayes Decision Theory, Minimum Error Rate Classification, Classifiers, Decision Surfaces, Discriminant Function, Decision Trees, CART, Bayesian Belief Network.

Unit-II

Parameter Estimation Methods: Maximum Likelihood Estimation, Gaussian Case.
Bayesian Parameter Estimation: Gaussian Case, Gibbs Algorithm, Hidden Markov Models (HMMs).

Unit-III

Dimensionality Reduction: Problems of Dimensionality, Principal Component Analysis, Fisher Discriminant Analysis.
Non-Parametric Technique: Parzen Windows, K-Nearest Neighbour Estimation.

Unit-IV

Unsupervised Learning: Algorithms for Clustering, K-Means, Unsupervised Bayesian Learning, Criterion Functions for Clustering, Hierarchical, Partitional and Online Clustering Methods.

Unit-V

Support Vector Machines, Pattern Recognition Applications: Image analysis, Biometrics, Face and speech recognition, OCR.

Text Books:

1. Richard O. Duda, Peter E. Hart and D.G.Stork, Pattern Classification, Wiley.
2. Sergios Theodoridis and Konstantinos Koutroumbas, Pattern Recognition, Academic Press.
3. C.M. Bishop, Pattern Recognition and Machine Learning, Springer

Reference Books:

1. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost, Pattern Recognition and Image Analysis, PHI Learning.
3. T.M. Mitchell, Machine Learning, Mc-Graw Hill International.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Students will be able to apply the models to solve statical classification problem.

CO_{02} Student will be able to demonstrate parametric algorithms.

CO_{03} Student will be able to Attain the capability to reduce dimensions and apply non parametric methods of classification

CO_{04} Students will be able to Formulate and solve problems of unsupervised learning

CO_{05} Ability to apply knowledge in solving real life problems.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3ES01	Python Programming	0	0	2	1

Course Learning Objectives (CLOs):

CLO 1 To grasp the concept of data types including variables, arithmetic operators, expressions, and basic string operations.

CLO 2 To understand nested loops, the range function, and how to use break, continue, and pass statements effectively.

CLO 3 To gain proficiency in creating lists and performing basic list operations such as indexing, slicing, and using built-in functions.

CLO 4 Learn to create dictionaries and perform operations like accessing, modifying key-value pairs, using built-in functions, and dictionary methods.

CLO 5 To Gain knowledge about different types of files and how to create, read, write, and manipulate text and binary files.

Unit-I

Introduction to Python: Importance of Python, installing and working with python in windows, the concept of data types - variables, arithmetic operators and expressions, strings: creating and storing strings, basic string operations, accessing characters in string by index number, string slicing and joining, string methods, formatting strings,

Unit-II

Control flow: if statements, for and while loops, nested loops, range function, break and continue statements, pass statements.

Unit-III

Lists: Creating lists, basic list operations, indexing and slicing in lists, built-in functions used on lists, list methods, the del statement.

Unit-IV

Dictionaries: Creating dictionary, accessing, and modifying key, value pairs in dictionaries, built-in functions used on dictionaries, dictionary methods, the del statement.
Tuples and sets: creating tuples, basic tuple operations, indexing and slicing in tuples, built-in functions used on tuples, relation between tuples and lists, relation between tuples and dictionaries

Unit-V

Files: Types of files, creating and reading text data, file methods to read and write data, reading and writing binary files, the pickle module, reading and writing CSV files.

Text-Books

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning., 2011.
2. Reema Thareja , Python programming using problem solving approach, Oxford university press.
3. Vamsi Kurama, Python Programming: A Modern Approach, Pearson.

Reference Books:

1. Gowrishankar. S. and Veena A, Introduction to Python Programming, CRC Press.
2. Y. Daniel Liang Introduction to Programming Using Python, Pearson.
3. W. Mark J Guzdial, Introduction to Computing and programming in Python, Pearson India

List of Experiments:

1. Write a program to demonstrate different number data types in python.
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substringfrom a given string.
4. Write a python script to print the current date in following format “Sunday Dec 3002:26:23 IST 2022.”
5. Write a python program to create and append lists in python.
6. Write a python program to remove lists in python.
7. Write a program to demonstrate working with tuples in python.
8. Write a program to demonstrate working with dictionaries in python.
9. Write a python program to find largest of three numbers.
10. Write a python program to convert temperature to and from Celsius to Fahrenheit.
11. Write a python program to construct the triangular star pattern using nested forloop.
12. Write a python program to print prim numbers less than 20.
13. Write a python program to find factorial of a number using recursion.
14. Write a python program to that accepts length of three sides of a triangle as inputs.The program should indicate whether or not the triangle is a right-angled triangle (use Pythagoras theorem).
15. Write a python program to define a module to find Fibonacci Numbers and importthe module to another program.
16. Write a python program to define a module and import a specific function in that module to another program.
17. Write a script named copyfile.py. This script should prompt the user for the namesof two text files. The contents of the first the second file.
18. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

19. Write a Python class to convert an integer to a roman numeral.
20. Write a Program to find factorial of the entered number.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO_1 Demonstrate a thorough understanding of fundamental data types such as integers, floats, strings, and booleans, along with proficiency in arithmetic operators and expressions.

CO_2 Understand and effectively utilize nested loops to handle more complex iteration requirements, enhancing their ability to solve intricate problems.

CO_3 Create and manipulate lists, including basic operations, indexing, slicing, and using built-in functions and methods.

CO_4 Comprehend the relationship between tuples and dictionaries, understanding their roles in different data storage and manipulation scenarios.

CO_5 Proficient in using the pickle module for serialization and deserialization, as well as reading and writing CSV files.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EN3NG09	Soft Skills-III	2	0	0	2

Unit-I

Curriculum Vitae: - Importance of Building a Curriculum Vitae: Why a CV is a crucial professional document. - Elements of Curriculum Vitae: Key components to include in a CV. - Model Curriculum Vitae: Analysing exemplary CVs. - Common Errors: Identifying and avoiding frequent mistakes. - Designing a Personalized Curriculum Vitae: Tailoring a CV to individual strengths and experiences.

Unit-II

Communication Skills: - Elements of Effective Communication. - Verbal and Non-verbal Communication. - Barriers to Effective Communication. - Presentation Skills. - Overcoming the Fear of Presentation. - Conversation Etiquette. - Art of Small Talk. **Building Communication Skills: -** Oral Communication. - Active Listening. - Engaging Speaking Skills. - Barriers to Communication. - Non-verbal Communication.

Unit-III

Group Discussion: - Need for and Importance of Group Discussion. - Skills Required for Effective GDs. - Do's and Don'ts ofGDs.-TypesofGDsTopics:-DomainSpecific.-Abstract.-Current Affairs. - Social Issues. - Techniques to Generate Points in a Group Discussion: Strategies to contribute effectively. - Roles in Group Discussion.

Unit-IV

Attitude Building: - Understanding the core concept of attitude.-DifferencebetweenAttitude and Behaviour. -Importance of Attitude in an Interview. -Personality Traits an Engineer Should Have. - Matching Profession to Your Personality: **Personal and Social Branding: -** Introduction to Self-branding. - Resume Building.-Video CV and Profiles. - Creating an Impressive Elevator Pitch. - Platforms for Branding. - Using Social Media Platforms Constructively.

Unit-V

Interview Techniques and Mock Interviews: - Common Interview Questions. - STAR Technique.-MockInterviews:Simulatedinterviewstopracticeandreceivefeedback.-Follow-up Etiquette: Sending thank you notes and inquiries post-interview.
Networking and Mentorship: - Importance of Networking: Building professional relationships forgrowth.-NetworkingPlatformsandEvents:Findingopportunitiestoconnectwithprofessionals.-SeekingMentorship:Identifyingpotentialmentorsandbuildingamentor-mentee relationship. - Giving Back: Becoming a mentor to others and sharing knowledge.

Textbooks:

1. Dr. Kalyana Chakravarthi and Elango K., Soft Skills for Managers, Wiley India.

Reference Books:

1. Gopalaswamy Ramesh And Mahadevan Ramesh,The Ace of Soft Skills: Attitude, Communication and Etiquette For Success, Pearson

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3PC08	Mini Project	0	0	4	2

Type of course: Undergraduate

Prerequisite: Basic Knowledge of Electrical & Electronics Engineering.

Rationale: This is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by development of small scale electrical or electronics circuits/systems.

Objectives:

•To develop their own innovative prototype of ideas.
• To train the students in preparing mini project, reports and examination.

The students in a group of maximum 3 works on a topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project along with report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

Guidelines:

1. Students should select a problem which addresses some basic home, office or other real life applications.
2. The electrical or electronic circuit for the selected problem should have at least 20 to 25 components.
3. Students should understand testing of various components.
4. Soldering of components should be carried out by students.
5. Students should develop a necessary PCB for the circuit.
6. Students should see that final circuit submitted by them is in working condition. 7. 5-10 pages report to be submitted by students.
8. Group of maximum three students can be permitted to work on a single mini project.
9. The mini project must have hardware part. The software part is optional.
10. Department may arrange demonstration with poster presentation of all mini projects developed by the students at the end of semester.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
OE000XX	Agile Development	3	0	0	3	3

Unit I

Understanding Agile: Introduction to Agile Project Management, Agile Manifesto, Agile Principles.

Agile Benefits: Product Development and Customers, Development Teams etc.

Unit II

Agile Frameworks: Agile Approaches, Reviewing the Big Three, Lean, Extreme Programming and Scrum. Putting Agile in Action, Environment, Behaviors- Agile Roles, New Values, Team Philosophy.

Unit III

Working in Agile: Planning in Agile, Product Vision, Creating the Product Roadmap, Refining Requirement and Estimates, Release Planning and Sprint Planning.

Unit IV

Managing in Agile: Managing Scope and Procurement, Managing Time and Cost, Team Dynamics and Communication, Managing Quality and Risk

Unit V

Ensuring Agile Success: Building a Foundation Commitment, Choosing the Right Project Team Members Development Team, Scrum Master etc. Being a Change Agent, Key Benefits and Key Resources for Agile Project Management.

Text Books:

1. Mark C. Layton, Agile Project Management for Dummies, Wiley Publishers
2. Jim Robert Highsmith, Agile Project Management Creating Innovative Products, Pearson Education
3. Hitzler, Markus, Rudolph, Foundations of Semantic Web Technologies, Chapman & Hall/CRC
4. Allemang, Hendler, Semantic Web for the working Ontologist, Elsevier Pub

Reference Books:

1. Charles G. Cobb, Making Sense of Agile Project Management: Balancing Control and Agility, Wiley
2. Mike Cohn, Agile Estimating and Planning, Pearson
3. Liz Sedley and Rachel Davies, Agile Coaching, The Pragmetic Bookshelf

SEMESTER VI

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO66	Electrical Machines	3	0	2	4
2	EE3CO67	Computer System Architecture	3	0	0	3
3	EE3CO42	Power Electronics	3	0	2	4
4	EE3ITXX	Elective 3	3	0	0	3
5	EE3ITXX	Elective 4	3	0	0	3
6	EE3ES06	Web Programming	0	0	2	1
7	OE000XX	Open Elective 2	3	0	0	3
8	EN3NG08	Soft Skills-IV	2	0	0	2
Total			**20**	**0**	**6**	**23**
Total Contact Hours			**26**			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO66	Electrical Machines	3	0	2	4

Course Learning Objectives (CLOs):

CLO 1: To study transformer construction, operation, various tests, efficiency and voltage regulation

CLO 2: To study about DC machines, operation, performance, controlling, characteristics and applications.

CLO 3: To study induction motor operation, performance, efficiency and speed regulation and applications

CLO 4: To study of synchronous generator operation, performance, regulation, characteristics and applications

CLO 5: To study of synchronous motor operation, performance, characteristics and applications

UNIT-I

Transformers: Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, open circuit and short circuit tests, polarity test, autotransformers, three-phase transformer connections, back-to-back test (sumpner test), Scott connection, parallel operation. cooling, conservator and breather

UNIT-II

D.C. Machines: Operating principle, generator & motor action, construction, types of excitations, emf & torque equations, power stages & efficiency. Commutation & Armature Reaction, characteristics & application of d.c generators and motors, starting & speed control of d.c motors, electric braking, Swinburn's test, Hopkinson test

UNIT-III

Induction Motor: Three-phase induction motors. Principle of operation, construction, types. Rotating magnetic field, emf equation of an AC Machine, torque developed in an induction motor, equivalent circuit model, torque-speed characteristics, starting & speed control. Losses and efficiency, No load and block rotor test, PF control, cogging and crawling, induction generator

UNIT-IV

Synchronous generator-: Construction, types & operating principle of synchronous generator, A.C armature windings, emf equation, equivalent circuit, phasor diagrams, voltage regulation, mmf method, Zpf method, parallel operation, synchronization, Power Angle characteristics, armature reaction, effect of field excitation change.

Salient pole machine: Two reaction theory equivalent circuit model and phasor diagram, determination of X_d and X_q by slip test, regulation, power angle characteristic, synchronizing alternator with bus-bar, synchronizing power, parallel operation and load sharing, effect of varying excitation, hunting & damper winding

UNIT-V

Synchronous motor: Construction, principle, starting, hunting, damper windings, motor under load power and torque, effect of excitation effect of armature reaction, power factor adjustment v curves, inverted v curves, synchronous motors as power factor correcting device, efficiency and losses, Single phase synchronous motors-hysteresis motor, stepper motor.

TEXT BOOK:-

1. "Electric Machinery", S. K. Bhattacharya, Tata McGraw Hill
2. "Electric Machinery", P.S.Bimbhra, Khanna Publishers
3. "Electric Machines", Nagrath and Kothari, Tata McGraw-Hill.

REFERENCE BOOKS:-

1. Electric Machinery and Transformer, Guru, Hiziroglu, Oxford University press.
2. E. Fitzeral C. Kingsley & S.D. Umans, "Electric Machinery", Tata McGraw Hill.
3. Basic Electric Machines, Vincent Deltoro, Prentice Hall.

Course Outcomes (COs):

After the completion of the course the student should be able to:

CO 1: understand about transformer construction, operation, various tests, efficiency and voltage regulation and able to calculate different parameters.

CO 2: learn about dc machines, operation, performance, controlling, characteristics and applications.

CO 3: understand induction motor operation, performance applications and determine efficiency, speed regulation.

CO 4: understand synchronous generator operation, performance, regulation, characteristics and applications

CO 5: analyze synchronous motor operation, performance, characteristics and applications

LABORATORY (EXPANDABLE):

1. To perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit.
2. To perform back-to-back (Sumpner's) test on transformer.
3. To plot magnetization characteristic of a separately excited DC generator
4. To perform load test on DC series and shunt motor
5. To perform Swinburn's test on a DC machine and find out its efficiency under full load condition.
6. To perform No-load and block rotor test on a 3-phase IM and determine its equivalent circuit.
7. To perform load test on a 3-phase IM and plot its performance characteristics.
8. To perform speed control of three phase induction motor.
9. To perform OCC and SCC test on an alternator and determine its regulation.
10. To determine regulation of alternator using mmf and zpf methods.
11. To plot V and inverted V curves for a synchronous motor
12. To find Xd and Xq of salient pole synchronous machine by slip test

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3CO67	Computer System Architecture	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} How computer work, basic principles, fundamental of computer architecture, instructions and technologies.

CLO_{02} Understand the ALU unit and their operation, Comprehend, stack organization and control unit.

CLO_{03} Understand Memory mapping concepts and technique and can differentiate between types of memory in computer system.

CLO_{04} How processor communicates with peripheral devices and performs read write operation and understand input output subsystems.

CLO_{05} How computer perform parallel processing and Understand the concepts of supercomputer, array processor, vector processor.

Unit-I

Basic architecture and organisation of computers, von neumann model, registers and storage, bus and memory transfer, common bus system, register transfer language, machine instructions, instruction cycles, instruction set architectures, instruction formats

Unit-II

Arithmetic logic units control, design of alu and data path, direct and indirect address, addressing modes; stack organization, controller design; hardwired and micro programmed control

Unit-III

Information representation, fixed and floating point representation (ieee 754), computer arithmetic and their implementation; fixed-point arithmetic: addition, subtraction, multiplication and division, memory hierarchy, cache memory and memory hierarchy, address mapping, virtual memory and memory management unit.

Unit-IV: I/O subsystems: input/output devices, interfacing with io devices, programmed io, concept of handshaking, polled and interrupt driven i/o, dma data transfer

Unit-V

Parallel processing, pipeline processing, instruction and arithmetic pipeline, pipeline hazards and their resolution, vector processing, array processors, risc, cisc.

Text Book:

1. Mano, M.M., Computer System Architecture, Prentice Hall of India
2. Stallings William, Computer Organization and Architecture, Prentice Hall of India
3. Hayes, J.P., Computer Architecture and Organization, McGraw,Hill

Reference Books:

1. V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic, Computer Organization, McGraw, Hill series
2. David Patterson and John Hennessey, Computer Organization and Design, Elsevier.
3. Vincent P. Heuring and Harry F. Jordan, Computer Systems Design and Architecture, Pearson

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01}	Student will understand Basic structure of computer system, arithmetic operations, and Demonstrate design of basic computer.
CO_{02}	Students will know how to design various electronic circuits and able to perform computer arithmetic operations.
CO_{03}	Students will be able to understand control unit, memory unit, I/O unit and apply the memory hierarchy design, memory access time formula, performance improvement techniques.
CO_{04}	Student will know the concept of memory management, interleaving and mapping, DMA controller.
CO_{05}	Student will distinguish the concept of pipeline, super computer, array processor and their structure.

Course Code	Course Name	Hours per week			Total
		L	T	P	Credits
EE3CO42	Power Electronics	3	0	2	4

Course Learning Objectives (CLOs):

CLO 1 To know the characteristics of various power semiconductor devices.

CLO 2 To learn the operation of single phase full–wave converters and perform harmonic analysis of input current.

CLO 3 To learn the operation of three phase full–wave converters and AC/AC converters.

CLO 4 To learn the operation of different types of DC-DC converters.

CLO 5 To learn the operation of PWM inverters for voltage control and harmonic mitigation.

UNIT – I

Power Semi-Conductor Devices

Silicon controlled rectifier (SCR) – Two transistor analogy - Static and Dynamic characteristics – Turn on and Turn off Methods - Triggering Methods (R, RC and UJT) – Snubber circuit design. Static and Dynamic Characteristics of Power MOSFET and Power IGBT– Gate Driver Circuits for Power MOSFET and IGBT - Numerical problems.

UNIT – II

Single-phase AC-DC Converters

Single-phase half-wave controlled rectifiers - R and RL loads with and without freewheeling diode - Single-phase fully controlled mid-point and bridge converter with R load, RL load and RLE load - Continuous and Discontinuous conduction - Effect of source inductance in Single-phase fully controlled bridge rectifier – Expression for output voltages – Single-phase Semi-Converter with R load-RL load and RLE load – Continuous and Discontinuous conduction - Harmonic Analysis – Dual converter and its mode of operation - Numerical Problems.

UNIT – III

Three-phase AC-DC Converters & AC – AC Converters

Three-phase half-wave Rectifier with R and RL load - Three-phase fully controlled rectifier with R and RL load - Three-phase semi converter with R and RL load - Expression for Output Voltage - Harmonic Analysis - Three-phase Dual Converters - Numerical Problems.

Single-phase AC-AC power control by phase control with R and RL loads - Expression for rms output voltage – Single-phase step down and step up Cycloconverter - Numerical Problems.

UNIT – IV

DC–DC Converters

Operation of Basic Chopper – Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple – control techniques – Introduction to PWM control -Numerical Problems.

UNIT – V

DC–AC Converters

Introduction - Single-phase half-bridge and full-bridge inverters with R and RL loads – Phase Displacement Control – PWM with bipolar voltage switching, PWM with unipolar voltage switching - Three-phase square wave inverters - 1200 conduction and 1800 conduction modes of operation - Sinusoidal Pulse Width Modulation - Current Source Inverter (CSI) - Numerical Problems.

Text-Books:

1. Power Electronics: Converters, Applications and Design by Ned Mohan, Tore M Undeland, William P Robbins, John Wiley & Sons.

2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

3. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009.

Reference Books:

1. Elements of Power Electronics–Philip T.Krein. Oxford University Press; Second edition
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics: by Daniel W.Hart, Mc Graw Hill.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_1 Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT.

CO_2 Analyse the operation of phase-controlled rectifiers.

CO_3 Analyse the operation of three-phase full–wave converters, AC Voltage Controllers and Cycloconverters.

CO_4 Examine the operation and design of different types of DC-DC converters.

CO_5 Analyse the operation of PWM inverters for voltage control and harmonic mitigation.

List of Experiments

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. R, RC & UJT firing circuits for SCR.
3. SCR Commutation circuits.
4. Single phase half wave rectifier with R, RL, RLE load and freewheeling diode.
5. Single -Phase semi converter with R, RL & RLE loads and freewheeling diode.
6. Single -Phase fully controlled converter with R, RL & RLE loads and freewheeling diode.
7. Single-phase dual converter in circulating current & non circulating current mode of operation.
8. Three -Phase semi converter with R, RL & RLE loads and freewheeling diode.
9. Three -Phase fully controlled converter with R, RL & RLE loads and freewheeling diode.
10. Single -Phase AC Voltage Controller with R & RL loads.
11. Three -Phase AC Voltage Controller with R & RL loads.
12. Single -Phase step-down Cycloconverter with R & RL loads.
13. Single -Phase step-up Cycloconverter with R & RL loads.
14. Boost converter in Continuous Conduction Mode operation.
15. Buck converter in Continuous Conduction Mode operation
16. Buck-Boost converter in Continuous Conduction Mode operation
17. Single -Phase square wave bridge inverter with R & RL Loads.
18. Single - Phase PWM inverter.
19. Three-phase bridge inverter with 120^0 and 180^0 conduction mode.
20. BLDC motor speed control
21. Multilevel inverter (3 level)

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EE3ITXX	Natural Language Processing	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO_{01} Understand natural language processing and to learn how to apply basic algorithms in this field.
CLO_{02} Describe the formal language and their representation using grammars.
CLO_{03} POS tagging and context free grammar for English language.
CLO_{04} Understanding semantics and pragmatics of English language for processing.
CLO_{05} Writing programs in Python to carry out natural language processing.

Unit I
Introduction: Human Languages, Main Approach of NLP, Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Formal Language and Natural Language, Regular Expression and Automata.

Unit II
Morphology: Text Pre-processing, Tokenization, Feature Extraction from text, Inflectional and Derivational, Finite State Morphological Parsing, Finite State Transducer
Part of Speech Tagging: Rule Based, Stochastic POS, Transformation Based Tagging.

Unit III
Speech Processing: Speech and Phonetics, Vocal Organ, Phonological Rules and Transducer, Probabilistic Models, Spelling Error, Bayesian Method to Spelling, Minimum Edit Distance, Bayesian Method of Pronunciation Variation.

Unit IV
N-Grams: Simple N-Gram, Perplexity, Smoothing, Backoff, Entropy, Parsing, Statistical Parsing, Probabilistic Parsing, Treebank.

Unit V
Application: Sentiment Analysis, Spelling Correction, Word Sense Disambiguation, Machine Translation, Text Classification, Question Answering System.

Text Books

1. Daniel Jurafsky & James H.Martin, Speech and Language Processing, Pearson Education.
2. James Allen, Natural Language Understanding, Pearson Education.
3. Jacob Eisenstein, Introduction to Natural Language Processing, MIT Press.

References

1. Christopher D. Manning and Hinrich Schutze, Foundation of statistical Natural Language Processing, MIT Press.
2. Mary Dee Harris, Introduction to Natural Language Processing, Reston.
3. Akshar Bharati, Vineet Chaitanya and Rajeev Sangal, Natural Language Processing: A Paninian Perspective, Prentice-Hall of India

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Student will Understand the interactive computer graphics architecture and Fundaments of NLP Objects with algorithm

CO_{02} Students will get Knowledge of the formal language and their representation using grammars.

CO_{03} Students will be able Broad perspective of modern POS tagging and context free grammar for English language

CO_{04} To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.

CO_{05} To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3ITXX	Machine Learning	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} Understand the problems where machine learning can be used effectively
CLO_{02} Understand various classification techniques and where it can be used
CLO_{03} Understand the unsupervised learning including clustering algorithms
CLO_{04} Understanding various neural network and tools for implementation
CLO_{05} Understanding advance machine learning methods including deep learning

Unit-I

Introduction to Machine Learning, Applications, Classification; Supervised Learning: Linear Regression: Cost Function, Gradient Descent; Logistic Regression, Nearest-Neighbors, Gaussian Function.

Unit-II

Overfitting and Underfitting, Regularization, Bias and Variance, Decision Trees, Naïve Bayes; Support Vector Machines, Kernel Methods.

Unit-III

Unsupervised Learning: Clustering: K-means, Dimensionality Reduction: PCA, Matrix Factorization and Matrix Completion, Ranking, Recommender System.

Unit-IV

Introduction to Neural Network, Perceptron, Feed Forward, Back Propogation, Recurrent Neural Network. Introduction to Python Machine Learning Libraries: Keras, Tensor Flow and Theano.

Unit-V

Evaluating Machine Learning Algorithms and Model Selection, Ensemble Methods: Boosting, Bagging, Random Forests, Deep Learning, Semi-Supervised Learning, Reinforcement Learning.

Text Books:

1. Tom Mitchell, “Machine Learning”, McGraw Hill.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer (freely available online)

Reference Books:

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.
2. Hal Daumé III, A Course in Machine Learning.
3. Sebastian Raschka,Vahid Mirjalili, Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow, Packt Publishing.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	To introduce machine learning with some of its problems and its types like classification
CO_{02}	To provide detailed knowledge about classification technique under supervised learning
CO_{03}	To explore different unsupervised learning algorithms to solve any problem and its application
CO_{04}	To study various neural network models and tools for implementing it
CO_{05}	To study advanced types of machine learning, and evaluation of models.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3ES06	Web Programming	0	0	2	1

Course Learning Objectives (CLOs):

CLO_{01} How computer client-server work, basic principles, fundamental of web server architecture, world wide web and protocols.

CLO_{02} Understand the web design web browser and cache, linking and publishing website.

CLO_{03} Understand HyperText Markup Language, history, structure, tables and Application programming interface.

CLO_{04} How CSS add to html pages, need, syntax, structure, Bootstrap and Javascript introduction.

CLO_{05} Understand JavaScript,objects, function, loops , arrays, event handling and JSON.

Unit-I

Basics of WWW, HTTP Protocol, Client Server Architecture, Introduction to Web Server Installation and Configuration.

Unit-II

Concepts of Effective Web Design, Web Design Issues Including Browser, Bandwidth and Cache, Display Resolution, Look and Feel of the Website, Page Layout and Linking, User Centric Design, Sitemap, Planning and Publishing Website, Designing Effective Navigation

Unit-III

Structure of HTML Page, HTML tags for Data Formatting, Tables, Links, Images, meta tags, Frames, html form tags, media, APIs, HTML 5tags and Validation.

Unit-IV

Need for CSS, Syntax and Structure, CSS Rules for Backgrounds, Colours and Properties, Manipulating Texts, Fonts, Borders and Boxes, Margins, Padding Lists, CSS Positioning. Animations, Tool-Tips, Style Images, Variables, Media Queries, Wildcard Selectors (*, ^ and $) in CSS, Working with Gradients, Pseudo Class, Pseudo elements, Basic of Frameworks like Bootstrap.

Syntax of JavaScript, Execution of JavaScript, Internal, Embedded and External Javascript

Unit-V

JavaScript : Variables, Arrays, Functions, Conditions, Loops, Pop up Boxes, JavaScript Objects and DOM, JavaScript Inbuilt Functions, JavaScript Validations and Regular Expressions, Event Handling with JavaScript, Callbacks in Javascript, Function as Arguments in JavaScript, Introduction to JSON

Text Books:

1. Web Design The Complete Reference, Thomas Powell, Tata McGraw Hill
2. HTML5 Step by Step, Faithe Wempen, Microsoft Press
3. Head First HTML programming, Eric Freeman, O'Reilly.

Reference Books:

1. JavaScript 2.0: The Complete Reference, Thomas Powell and Fritz Schneider, Tata McGraw Hill
2. Web Design, Joel Sklar, Cengage Learning
3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Student will understand Basic structure of client server architecture and principal of WWW.

CO_{02} Students will know how to design web pages, web layouts, navigations and publishing a website on internet.

CO_{03} Students will be able to understand basic tags of HTML, HTML5 and use of validations on HTML page.

CO_{04} Student will know the concept of CSS, Bootstrap and basics of Javascript.

CO_{05} Student will distinguish the concept of Javascript and JSON.

List of Experiments:

Practical No	Details
1	**Use of Basic Tags**
a	Design a web page using Different Text Formatting Tags.
b	Design a web page with links to Different Pages and Allow Navigation between web pages.
c	Design a web page Demonstrating all Style Sheet Types
2	**Image Maps, Tables, Forms and Media**
a	Design a web page with Imagemaps.
b	Design a web page with a form that uses all types of controls.
c	Design a web page demonstrating different semantics
d	Design a web page with different tables. Design a webpages using table so that the content appears well placed.
e	Design a web page embedding with multimedia features.
3	**Java Script**
a	. Using JavaScript design, a web page that prints factorial/Fibonacci series/any given series.
b	Design a form and validate all the controls placed on the form using Java Script
c	Write a JavaScript program to display all the prime numbers between 1 and 100.
d	Write a JavaScript program to accept a number from the user and display the sum of its digits.
e	Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
f	Write a java script program to design simple calculator.

4	**Control and looping statements and Java Script references**
a	Design a web page demonstrating different conditional statements.
b	Design a web page demonstrating different looping statements
c	Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp).

List of e-Learning Resources:

1. HTML:

a. https://developer.mozilla.org/en-US/docs/Web/HTML

b. https://www.w3schools.com/html/

c. https://www.tutorialspoint.com/html/index.htm

2. CSS:

a. https://developer.mozilla.org/en-US/docs/Web/CSS

b. https://www.manning.com/books/css-in-depth

c. https://www.w3schools.com/css/

d. https://www.tutorialspoint.com/css/index.htm

3. Java Script:

a. https://javascript.info/

b. https://github.com/getify/You-Dont-Know-JS

c. https://www.w3schools.com/js/

d. https://www.tutorialspoint.com/javascript/index.html

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE000XX	Blockchain Architecture	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} Students with understand the fundamental concepts of Blockchain

CLO_{02} They will be able to understand the difference between Crypto currency and Blockchain

CLO_{03} They will able to understand of various Consensus algorithms

CLO_{04} Students will apply their technical knowledge and skills to develop and implement Blockchain

CLO_{05} Students will learn about various Applications and methods used for Blockchain

Unit-I

Cryptocurrency: History, Electronic Cash, Double Spending Problem, Bitcoin Protocols, Mining Strategy and Rewards, Types of Crypto Currency Wallets, Legal Aspects of Crypto Currency, Crypto Currency Exchanges.

Unit-II

Introduction to Blockchain: History of Blockchain, Hash Functions, SHA-256, Symmetric Cryptography, Asymmetric Cryptography, Keys & Digital signatures, Benefits and Limitation of Blockchain, Features of Blockchain.

Unit-III

Consensus: Nakamoto Consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy Utilization, Collision of Energy Utilization, Introduction to Ethereum.

Unit-IV

Blockchain Architectures: Blockchain Network, Merkle Patricia Tree, Soft & Hard Fork, Private and Public Blockchain, Tokenized Blockchain.

Unit-V

Blockchain Applications: Financial Sector, Medical Record Management System, Domain Name Service and Future of Blockchain, Case Study: Government on Blockchain. Introduction to Hashgraph and Tangle.

Text Books:

1. Andreas Antonopoulo, Mastering Bitcoin Unlocking Digital Cryptocurrencies, O'Reilly Publication.
2. Imran Bashir, Mastering Blockchain: Distributed Ledger Technology, Decentralization, Packt Publishing.
3. Phil Champagne, The Book of Satoshi: The Collected Writings of Bitcoin, LLC Newyork

Reference Books:

1. Wattenhofer, The Science of the Blockchain
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University.
3. Don Tapscott, Alex Tapscott , "Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World" , Penguin Publishing Group

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Students will understand the basic terminology used in Blockchain and Bitcoin.

CO_{02} Students will be able to explore Blockchain and classification of various cryptocurrency.

CO_{03} Students will learn about various Consensus algorithms.

CO_{04} Students will be able to understand basic Blockchain Architecture.

CO_{05} Students will be able to use and understand applications of Blockchain.

SEMESTER VII

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3CO68	Artificial Intelligence	3	0	0	3
2	EN3NG06	Open Learning Course	1	0	0	1
3	EE3PC03	Industrial Training	0	2	0	2
4	EE3PC06	Project -I	0	0	8	4
5	EE3ITXX	Elective 5	3	0	0	3
6	EE3ITXX	Elective 6	3	0	0	3
7	OE000XX	Open Elective 3	3	0	0	3
Total			**13**	**2**	**8**	**19**
Total Contact Hours			**23**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3CO68	Artificial Intelligence	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} Introduction to Intelligence and various AI search algorithms (uninformed)

CLO_{02} To understand Heuristics, informed search techniques, constraint satisfaction

CLO_{03} To understand different knowledge representations.

CLO_{04} Understanding classifier and reasoning

CLO_{05} To understand game playing techniques.

Unit-I

Introduction to Artificial Intelligence, Various Types of Production Systems, Characteristics of Production Systems, Study and Comparison of Breadth First Search and Depth First Search Techniques

Unit-II

Optimization Problems: Hill-Climbing Search Simulated Annealing Like Hill Climbing, Best First Search. A* Algorithm, AO* Algorithms etc, and Various Types of Control Strategies, Heuristic Functions, Constraint Satisfaction Problem

Unit-III

Knowledge Representation, Structures, Predicate Logic, Resolution, Refutation, Deduction, Theorem Proving, Inferencing, Semantic Networks, Scripts, Schemas, Frames, Conceptual Dependency

Unit-IV

Uncertain Knowledge and Reasoning, Forward and Backward Reasoning, Monotonic and Nonmonotonic Reasoning, Probabilistic Reasoning, Baye's Theorem, Decision Tree, Understanding, Common Sense, Planning

Unit-V

Game Playing Techniques like Minimax Procedure, Alpha-Beta Cut-Offs etc, Study of the Block World Problem in Robotics

Text Books:

1. Elaine Rich, Kevin Knight and Nair, Artificial Intelligence, TMH.
2. Peter and Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.
3. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education.

Reference Books:

1. Saroj Kausik, Artificial Intelligence, Cengage Learning.
2. Nils Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann.
3. David Poole, Alan Mackworth, Artificial Intelligence: Foundations for Computational Agents, Cambridge Univ. Press.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Students will be able to apply the strategies for solving AI problems.

CO_{02} Students will be able to demonstrate informed search algorithms.

CO_{03} Student will be able to Attain the capability to represent knowledge

CO_{04} Students will be able to Formulate and solve problems with uncertain information using classifier and perform reasoning

CO_{05} Ability to apply knowledge in Game Playing and robotics problems.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EE3PC03	**Industrial Training**	0	2	0	2	2

Industrial training is a training program that helps students to gain experience in the professional employment world at the Industry. This program is an essential component in the curriculum of Engineering Bachelor Degrees at Medi-Caps University. It is also essential in the stream to keep in pace with the expectations of industry. Broadly, the objectives of the course are as follows:

i. To motivate students to apply his knowledge to realistic and practical problems

ii. To encourage students to work in synergetic collaboration within teams

iii. To develop professional attitude and critical thinking

iv. To learn organizational functioning and decision making

v. To set a stage for future recruitments and placements for students by potential employers

Prerequisites: Nil

Minimum days of Training: 4 weeks

Training Locations: Industry- Student's have choice to go Industry/Company/Educational Institution of Repute of their preferences. Permission of the University is necessary before the commencement of training. In case of training is opted by the students from the options provided by University, Students will not be allowed to change.

Procedure:

i. Internal and external guide from the department and the industry/ institutions respectively will be finalised within a week of commencement of training. In case of training given in University campus only the internal guide is required.

ii. Daily log book must be maintained by the student, duly signed by the industry/ internal guide. This log book will be considered as attendance record. Student will report weekly to the departmental guide about the progress of training.

iii. Confidential report of the student's attitude and learning in the organization should be provided by the external guide to the internal guide through mail or sealed and signed hard copy.

iv. Student will submit Training completion certificate in the department before applying for xamination.

v. Well formatted summary of work and report is required to be submitted in the department as per the prescribed format.

vi. The student are required to give the Presentation during the semester in which they register for the industrial training course.

vii. Reports must be submitted during the presentation.

viii. During end semester examination a viva voce along with written examination will be conducted. Evaluation will be based on 60 marks internal and 40 marks external total 100 (60+40).

ix. Only industries registered and active with Ministry of Corporate Affairs will be accepted as industry for valuation of industry training.

x. Professor incharge Training/HOD must verify the company details from www.mca.gov.in before granting the permission.

Note: For the session 2019-20 those who are already permitted before 31st May, 2019 to a company which is not registered with Ministry of corporate affairs will be acceptable. After this date no permission will be granted for such companies.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3PC06	Project-I	0	0	8	4

A project encourages students to learn new techniques and technology which will be required in their professional place / industry and gain experience in the professional employment world. This program is an essential component in the curriculum of Engineering Bachelor Degrees at Medi-Caps University.

This course is also essential to keep in pace with the advancements and expectations of industry. The development life cycle of any project is essential component of learning in this course. Broadly, the objectives of the course may be defined as follows:

i. To implement his knowledge to realistic and practical problems
ii. To encourage students to work in synergetic collaboration within teams
    a. To develop professional attitude and critical thinking
iii. To learn organizational ethics and work culture
iv. To apply his skills in the actual development scenario

Prerequisites: Nil

Procedure: Project Completion Stages

Project Analysis and design Plan

Stages	Concern	Timeline
Topic Selection	• Interest in a domain • Interest in technology • Research interest • Availability of resources • Time feasibility • Course / Skill sufficiency	

Finalizing the Choice	• Finalize Title • Finalize supervisor	1st week
Pre-Project Planning	• Synopsis • Estimations – Time and Features	2nd week
Analysis	• Software Requirement Specification • Presentation I	4th week
Design	• Software Design Specification • Presentation II	8th week
Implementation	Presentation – III	14th week
	Dissertation – I Report + Viva – Voce	End Sem exam (Evaluation by External examiner must)

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EE3ITXX	Graph Theory	3	0	0	3	3

Unit I

Introduction: Graphs- Introduction, Isomorphism, Sub Graphs, Walks, Paths, Circuits, Connectedness, Components, Euler Graphs, Hamiltonian Paths and Circuits, Trees- Properties of Trees, Distance and Centers in Tree, Rooted and Binary Trees. Special Classes of Graphs: Bipartite Graphs, Line Graphs, Chordal Graphs.

Unit II

Spanning Trees: Fundamental Circuits, Spanning Trees in a Weighted Graph, Cut Sets: Properties of Cut Set, All Cut Sets, Fundamental Circuits and Cut Sets, Connectivity and Separability, Network Flows, 1-Isomorphism, 2-Isomorphism, Combinational and Geometric
Graphs, Planer Graphs, Different Representation of a Planer Graph.

Unit III

Chromatic Number, Chromatic Partitioning, Chromatic Polynomial, Matching, Covering, Greedy Coloring Algorithm, Four Color Problem, Directed Graphs -Types of Directed Graphs, Digraphs and Binary Relations, Directed Paths and Connectedness, Euler Graphs.

Unit IV

Fundamental Principles of Counting, Permutations and Combinations, Binomial Theorem, Combinations with Repetition, Combinatorial Numbers, Principle of Inclusion and Exclusion, Derangement.

Unit V

Generating Functions, Partitions of Integers, Exponential Generating Function, Summation Operator, Recurrence Relations, First Order and Second Order, Non-homogeneous Recurrence Relations, Method of Generating Functions.

Text Books:

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.
2. Grimaldi R.P. “Discrete and Combinatorial Mathematics: An Applied Introduction”, Addison Wesley, 1994.
3. Clark J. And Holton D.A, “A First Look at Graph Theory”, Allied Publishers, 1995.

Reference Books:

Mott J.L., Kandel A. And Baker T.P. “Discrete Mathematics for Computer Scientists and Mathematicians”, Prentice Hall of India, 1996.
Liu C.L., “Elements of Discrete Mathematics”, Mc Graw Hill, 1985.
Rosen K.H., “Discrete Mathematics and Its Applications”, Mc Graw Hill, 2007.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3ITXX	Information Security	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization

CLO02 Analyze the cyber security needs of an organization

CLO03 Understand key terms and concepts in Cryptography and Learn to apply Cyber Security with Public key encryption and Hash function.

CLO04 Develop cyber security strategies and policies

CLO05 Understand principles of web security and to guarantee a secure network by monitoring

Unit-I

Introduction to Information Security: Security Attacks, Security Services, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

Unit-II

Block Cipher Principles, Data Encryption Standard (DES), Differential and Linear Cryptanalysis, Modular Arithmetic, Euclidean Algorithm, Advanced Encryption Standard (AES)

Unit-III

Public key cryptography: Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Unit-IV

Message Authentication and Hash Functions: Message Authentication codes, Secure Hash Algorithm, HMAC, Digital Signature, Authentication Protocol, Digital Signature Standards.

Unit-V

Authentication Applications: Kerberos, X.509 Authentication service, Pretty Good Privacy, S/MIME, IP Security, Firewalls.

Text Books:

1. Stallings William, “Cryptography and Network Security”, Pearson Education
2. William Stallings and Lawrie Brown, Larry Brown, “Computer Security”: Principles and Practice, Pearson
3. Atul Kahate, “Cryptography and Network Security”, TMH

Reference Books:

1. Matt Bishop, “Introduction to Computer Security”, Addison-Wesley
2. Buchmann J. A., “Introduction to Cryptography”, Springer Verlag
3. Schneier Bruce, “Applied Cryptography”, John Wiley and Sons

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Analyse and evaluate the information security needs of an organization

CO_{02} Determine and analyse software vulnerabilities and security solutions to reduce the risk of exploitation.

CO_{03} Design and develop a security architecture for an organization.

CO_{04} Measure the performance and troubleshoot information security systems.

CO_{05} Design operational information security strategies and policies

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE000XX	R Programming	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand importance of R Programming. Choosing right language for right application.

CLO02 To be aware of future of Data Science in IT industry and getting started with R Programming.

CLO03 To understand Data Structures in R

CLO04 To understand basic fundamentals like Objects, Classes, Functions in R

CLO05 To work with Data Sets, Plotting and Graphics.

CLO06 To become proficient in writing a fundamental program and perform Data Analytics with R.

Unit-I

R basics Introduction: Basic features of R, advantages of using R, Limitations, R resources, Arithmetic and objects, Math, Variables, and Strings, Vectors and Factors, Vector operations.

Unit-II

Data structures in R Data types, Arrays, Tables, Matrices: operations, Lists: operations, Data frames: creation, factors, reading.

Unit-III

R programming fundamentals Conditions and loops, Functions in R, Objects and Classes, Recursion, Debugging

Unit-IV

Working with data in R Reading CSV and Excel Files, Reading text files, Writing and saving data objects to file in R, Reading in larger, Datasets, Exporting data. Interface to outside world.

Unit-V

String & Dates in R, Graphics String operations in R, Regular Expressions, Dates in R, Time in R, Graphics: one dimension plot, legends, function plot, box plot.

Text Books:

1. Andrie de Vries, Joris Meys, R Programming for Dummies, Wiley Publications.

2. Roger D. Peng, R Programming for Data Science, Leanpub.
3. Kun Ren, Learning R Programming, Packt Publishing

Reference Books:

1. Emmanuel Paradis, R For Beginners, CRAN Publications.
2. Michael J. Crawley, The R Book, Wiley Publications.
3. Rob kabacoff , R in Action , Manning Publications

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Decide the programming languages for different applications like Machine Learning, Data Science etc.

CO_{02} Student will familiar with Basics of R Programming.

CO_{03} Student will be able to understand the fundamentals and Data Structures used in R Programming.

CO_{04} Students will be able to understand working with the Data Sets, Training algorithms and plotting.

CO_{05} Will be able enough to write programs of Data Analytics and Machine Learning.

SEMESTER VIII

S. No	Course Code	Course Name	L	T	P	Credit
1	EE3PC07	Project -II	0	0	20	10
Total			0	0	20	**10**
Total Contact Hours			**20**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EE3PC07	Project -II	0	0	20	10

Project Implementation Plan

Finalizing the Choice for New Project/ Continuation of Old Project	• Finalize Title • Finalize supervisor • Presentation I	1st week
Implementation	• Interfaces • Databases • Full Implementation • Presentation II	6th week
Testing and Deployment	• Test Cases • Test Reporting • Presentation III	10th week
Report in Format (Spiral Binding)	• Evaluation by supervisor and 2 additional teachers	
Final Presentation	• Presentation IV • Assessment by Departmental Project Evaluation Committee	14th week At least one paper must be presented in an International Conference or Publication in referred Journal.
Final Report Binding	• Assessment by Departmental Project Evaluation Committee with one external member. At least three members including External Member will make the Quorum. • Viva – Voce	End semester Examination

1. For external projects there will be an external guide in addition to the allotted guide from the department.

2. The schedule of meeting with the supervisor shall be depending on the nature of project execution.

3. Interdisciplinary projects will have guided from concerned departments duly approved by the Dean (Engineering).

4. The project conducted in the location of the industries with more than 10 crores Turn Over will be accepted for valuation of project. Professor in charge Training / HoDs must verify the company details from www.mca.gov.in before accepting the report for valuation. It is not mandatory have publications for these students for the evaluation of project.

5. For Project– I Total marks is 200 (80+ 120).

Project-II Total marks 500 (200+300).