MEDI-CAPS UNIVERSITY

Knowledge is Power

Department of Electronics Engineering

CURRICULUM AND SYLLABUS (2023-2027)

B. Tech. Electronics Engineering

Electronics Engineering

B. Tech. (EC) with specialization in Computer Technology

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 promote excellence of global standards in field of Electronics Engineering education and research to create technocrats who are innovative, entrepreneurial and successful to gratify the dynamic industrial demands and social needs

Mission of the Department:

- To deliver best quality education to the students to strengthen their capacity and escalate their skills to make them globally competitive Electronics Engineer.
- To offer ultra-modern research facilities and open interactive environment in the department that motivates faculty, staff and students with prospective to generate, analyze, apply and promulgate knowledge.
- To make collaboration with world class organization in education, research and industrial sectors for achieving eminence in teaching, research and consultancy practices.
- To provide the students with academic environment for promoting creativity, leadership, ethical quality and lifelong learning habits required for successful elongated career.
- To recruit skilful, experienced and specialist faculty members for building comprehensive academic environment expert faculty members and create an enthusiastic academic environment.

MEDI-CAPS UNIVERSITY

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B. Tech. in Electronics Engineering

Program Education Objectives (PEOs)

The Program Educational objectives of the Electronics Engineering undergraduate program are to:

PEO_{01} : To impart students the education of basic sciences, fundamentals involved in electronics and related engineering fields, and computer programming, in addition, specifically prepare them to design, analysis and synthesis of electronic circuits, software tools and equipment's.

PEO_{02} : To train students as expert to evaluate the real life technical problem and suggest solutions which are socially and economically viable.

PEO_{03} : To give the students' knowledge of professional, administrative, ethical practices to make them outshining and adaptable to combat any critical situation in global scenario.

PEO_{04} : To create a mindset among the faculty members to prepare and persuade students for research activity and scientific innovations to make continuous development in fields of Electronics engineering.

PEO_{05} : To build graduates to involve in higher education and lifelong learning, having interpersonal skill and effective communication ability, able to lead teams involved in diverse fields, having quality to act with integrity, and contented with ethical and social values.

PROGRAMME OUTCOMES (POs)

Engineering graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **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.

PO3. **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.

PO4. **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.

PO5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **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.

PO7. **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.

PO8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **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.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Program Specific Outcomes of the Electronics Engineering undergraduate program are:

PSO_1. Validate skill in software programming and hardware design as expected in field of electronics and communication engineering.

PSO_2. Prove their capacity to do advance study and research related with electronics and communication subjects such as embedded system, wireless communication, VLSL design, signal processing etc.

PSO_3. Gain industrial exposure by completing long term internship in industry and making of project in collaboration with industry.

PSO_4. Attain soft skill such as verbal and written communication, teamwork, adaptability, leadership, critical observation, and problem solving.

Medi-Caps University Indore (M.P.)

DEPARTMENT OF ELECTRONICS ENGINEERING

Choice Based Credit System- Scheme of B. Tech EC (2023 Batch) with specialization in Computer Technology

SEMESTER I

Sr. No.	Course Code	Courses	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	EN3NG01	Environmental Science	2	0	0	2
8	EN3HS01	History of Science and Technology	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

SEMESTER II

Sr. No.	Course Code	Courses	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	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
8	EN3HS02	Communication Skills	2	0	2	3
		Total	**17**	**0**	**12**	**23**
		Total Contact Hours	**29**			

SEMESTER – III

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3BS02	Discrete Mathematics	3	0	0	3
2	EC3CO24	Computer System Architecture	3	0	0	3
3	EC3CO25	Analog Electronics	4	0	2	5
4	EC3CO05	Circuit Analysis and Synthesis	3	1	2	5
5	EC3CO07	Digital Electronics	3	0	2	4

6	EC3ELXX	Program Elective I	2	0	2	3
7	EN3NG09	Soft Skills I	2	0	0	2
		Total	**20**	**1**	**8**	**25**
		Total Contact Hours	**29**			

SEMESTER – IV

Sr. No.	**Course Code**	**Courses**	L	T	P	Credit
1	EC3CO26	Digital Signal Processing	4	0	2	5
2	EC3CO27	Computer Peripherals and Interfacing	4	0	2	5
3	EC3CO28	Data Structures	3	0	2	4
4	EC3CO29	Theory of Computation	4	0	0	4
5	EC3ELXX	Program Elective II	3	0	0	3
6	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
8	EN3NG10	Soft Skill-II	2	0	0	2
		Total	**23**	**0**	**6**	**26**
		Total Contact Hours	**29**			

SEMESTER – V

Sr. No.	**Course Code**	**Courses**	L	T	P	Credit
1	EC3CO30	Communication Systems	4	0	2	5
2	EC3CO31	Operating Systems	4	0	0	4
3	EC3CO08	Engineering Electromagnetics	4	0	0	4
4	EC3CO10	Microprocessor and Interfacing	3	0	2	4
5	EC3E*XX	Program Elective III	3	0	0	3
6	OEXXXXX	Open Elective I	3	0	0	3
7	EC3ES01	Python Programming for Electronics Engg.	0	0	2	1
8	EN3NG06	Open Learning Courses	1	0	0	1
9	EN3NG05	Soft Skills III	2	0	0	2
		Total	**24**	**0**	**6**	**27**
		Total Contact Hours	**30**			

SEMESTER – VI

Sr. No.	**Course Code**	**Courses**	L	T	P	Credit
1	EC3CO20	VLSI Design	3	0	2	4
2	EC3CO32	Software Engineering	3	0	2	4
3	EC3CO33	Computer Networks	3	0	2	4
4	EC3E*XX	Program Elective IV	3	0	0	3
5	EC3E*XX	Program Elective V	3	0	0	3

6	OEXXXXX	Open Elective II	3	0	0	3
7	EC3PC09	Mini Project	0	0	4	2
8	EN3NG08	Soft Skills-IV	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

SEMESTER – VII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3E*XX	Program Elective VI	3	0	0	3
2	OEXXXXX	Open Elective III	3	0	0	3
3	EC3PC06	Project I	0	0	8	4
4	EC3PC03	Industrial Training	0	2	0	2
		Total	**6**	**2**	**8**	**12**
		Total Contact Hours	**16**			

SEMESTER VIII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3PC07	Project II	0	0	20	10
		Total	0	0	20	**10**
		Total Contact Hours	**20**			

Total Credits

Summary of Credits

S.NO	Course Work	Total Credits (CS)	Credits as per Modal scheme (176)
1	Basic Sciences (BS)	16	10-15% (16-24)
2	Engineering Sciences (ES)	27	15-20% (24-32)
3	Humanities and Social Sciences (HS)	8	5-10% (8-16)
4	Core Courses (CO)	64	30-40%(48-64)
5	Program Electives (EL)	18	10-15%(16-24)
6	Open Electives (OE)	9	5-10%(8-16)
7	Project Work, Seminar	18	10-15%(16-24)

8	Non Grading	13	(11-16)

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(e) Program Elective(EL)

S.No.	*Course Code*	*Course Title*	*L*	*T*	*P*	*Credit*
1	EC3CT01	Compiler Design	3	0	0	3
2	EC3CT02	Java Programming	2	0	2	3
3	EC3CT03	Design and Analysis of Algorithms	3	0	0	3
4	EC3CT04	Object Oriented Programming	3	0	0	3
5	EC3CT05	Cloud Computing	3	0	0	3
6	EC3CT06	Embedded Systems	3	0	0	3
7	EC3CT07	Computer Vision and Image Processing	3	0	0	3
8	EC3CT08	Database Management Systems	3	0	0	3
9	EC3CT09	Microprocessor Based Design	3	0	0	3
10	EC3CT10	Data Communication	3	0	0	3

Open Elective

S.No.	*Course Code*	*Course Title*	*L*	*T*	*P*	*Credit*
1	OE00051	R Programming	3	0	0	3
2	OE00016	Blockchain Architecture	3	0	0	3
3	OE000XX	Computer Vision	3	0	0	3
4	OE000XX	Statistical Techniques	3	0	0	3
5	OE000XX	Cyber Physical Systems	3	0	0	3
6	OE000XX	AI, Ethics and Society	3	0	0	3
7	OE000XX	Internet of Things	3	0	0	3
8	OE000XX	Data Communication	3	0	0	3
9	OE000XX	Control Systems	3	0	0	3

SEMESTER I

Sr. No.	Course Code	Courses	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	EN3NG01	Environmental Science	2	0	0	2
8	EN3HS01	History of Science and Technology	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):

CLO_{01} To impart analytical ability of using concepts of matrices in various fields of engineering.

CLO_{02} To explain the concept of Differential Calculus.

CLO_{03} To discuss the concept of Integral Calculus and its applications.

CLO_{04} To impart analytical ability in solving Ordinary Differential Equations of first and Higher order.

CLO_{05} 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 fiber.

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 fiber, propagation of light through optical fiber acceptance angle, numerical aperture, fractional refractive index change, Classification of fiber, V number, Engineering

applications of fiber.

Textbooks:

1. A Textbook 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. Engineering Physics, Gaur and Gupta, Dhanpat Rai Publications.
4. Concepts of Modern Physics A. Beiser, Tata McGraw Hill New Delhi.

Reference Books:

1. Optics, A. Ghatak: 4th Edition, Tata McGraw-Hill, New Delhi 2009.
2. Solid State Physics by Kittel, Wiley India
3. A Textbook of Physics – N. Gupta & S.K. Tiwary, Dhanpat Rai & Co., Delhi

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 Ph ET 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 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				
EN3ES26	Engineering Graphics	L	T	P	Hrs.	Credits
		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.

Reference Books:

- 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):

CLO_{01} Analyse Basics of Computers, programming environment and about different types of Programming languages.

CLO_{02} Application of various basic concepts required to create programs, use good problem-solving approach.

CLO_{03} Use different control structures for conditional programming.

CLO_{04} Use of Arrays and string in different problems and also to apply different operations on arrays and strings.

CLO_{05} 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.
a. For currency convertor
b. For temperature convertor
c. For weight convertor
d. For length convertor
e. For time convertor
f. 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):

CLO_1	To give the knowledge of various building and general construction materials such as bricks, stones, timber, cement, steel and concrete & their properties and application.
CLO_2	To provide basic understanding of the forces and its components, stresses, strains and the modulus of elasticity of the different construction materials.
CLO_3	To understand the components of the building such as beams, columns, foundations, slabs and different types of soils and their bearing capacities.
CLO_4	To provide basic knowledge about principles of surveying for a location, and its application in execution of engineering projects, various instruments used for surveying such as chains, tapes, compass, theodolite and auto level.
CLO_5	To understand various aspects of structural members and application of loads, shear force & bending moment in the field of civil engineering.

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.

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

CO_{01}	Students will be able to recognize the civil engineering works and conversant about different construction materials and their uses.
CO_{02}	Student will be able to differentiate force, pressure and stresses.
CO_{03}	Students will be able to know the different building component and its importance.
CO_{04}	Students will be conversant about vertical and horizontal variation of different terrains.
CO_{05}	Students will be able to apply the theoretical knowledge about structural elements in practical manner.

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).

Reference Books

1. 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.

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
EN3NG01	Environmental Science	2	0	0	2

Course Learning Objectives (CLOs):

CLO_1	To impart knowledge of Environment and its basic components.
CLO_2	To build basic understanding of various effects of human activities to the environment.
CLO_3	To understand concepts of water pollution
CLO_4	To understand function of solid waste management
CLO_5	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.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS01	History of Science and Technology	3	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.

SEMESTER II

Sr. No.	Course Code	Courses	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	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
8	EN3HS02	Communication Skills	2	0	2	3
		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.

Web Source:

1. nptel.ac.in/*courses*/*111103021*/15
2. nptel.ac.in/courses/111105035/22
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:

CO_{01}	To inspect and analyze themathematical models based on Laplace .
CO_{02}	To examine the general mathematical concepts required for the field regarding Fourier series and Fourier Transform.
CO_{03}	To compare and contrast importance of partial differential equations in physical problems.
CO_{04}	To prioritize derivatives of vector –point functions, gradient functions, evaluate integral of functions over curves, surfaces and domains in two and three dimensional.
CO_{05}	To examine concept of probability and examine the importance of probability in solving the real life problems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3BS14	Engineering Chemistry	2	0	2	4

Course Learning Objectives (CLOs):

CLO 1	To gain fundamental knowledge of the principles related to, so as to meet the challenging requirements of students in chemistry studies.	
CLO 2	To attain awareness in students about current & new issues in the fields of chemistry.	
CLO 3	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 4	To increase curiosity and give them awareness about practical knowledge of variouslaboratory 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-VisibleSpectroscopy, 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 Rai Publications.

References:

1. P. C. Jain, Monika Jain, Engineering Chemistry, Dhanpat Rai Publications.
2. S. S.Dara, A Text Book of Engineering Chemistry, S. Chand & Company.
3. N. Krishnamurthy,P. vallinayagam and D. Madhavan, "Engineering Chemistry", PHI.

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.Todeterminemoisturecontentingivensampleofcoalbyproximateanalysis.
2.Todeterminevolatilecontentingivensampleofcoalbyproximateanalysis.
3.Todetermineashcontentingivensampleofcoalbyproximateanalysis.
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	5

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):

CLO 1	To understand the properties of materials and their behavior with variation in temperature and Load. To understand different measuring instruments used in engineering applications.
CLO 2	To understand the basic laws of thermodynamics and their applications in engineering, refrigeration cycles and properties of refrigerants.
CLO 3	To understand Construction and Working of I. C. Engines.
CLO 4	To understand Construction and Working of Steam Generators
CLO 5	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.
3. 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	0	0	4	2

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 pogram 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.

Reference Books:

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			Total
		L	T	P	Credits
EN3NG06	Universal Human Values and Professional Ethics	2	0	0	0

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 -0/'[-789*-0o human relationship ;meaning of Nyaya and program for its fulfilment to ensure Ubhay-Tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding them earning 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-Astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society-Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)-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 holistic technologies, management models and production systems, Strategy for 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 study of economics as if people mattered, Blond & Briggs, Britain.
3. SussanGeorge,1976, Howthe Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, WilliamW. BehrensIII, 1972, Limits to Growth–Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. PL Dhar, RRGaur,1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. EGSeebauer&RobertL.Berry,2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
9. MGovindrajran,SNatrajan&V.S.SenthilKumar,EngineeringEthics(includingHumanValues),Eastern Economy Edition, Prentice Hall of India Ltd.
10. BP Banerjee,2005, Foundations of Ethics and Management, Excel Books. BLBajpai,2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008

Course Outcomes (COs):

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

CO_{01}	Students get knowledge about the process of value education.
CO_{02}	Understand human being as a co-existence

CO_{03} Understanding values in human -human relationship

CO_{04} Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space

CO_{05} Understanding Natural acceptance of human values

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
-

SEMESTER – III

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3BS02	Discrete Mathematics	3	0	0	3
2	EC3CO24	Computer System Architecture	3	0	0	3
3	EC3CO25	Analog Electronics	4	0	2	5
4	EC3CO05	Circuit Analysis and Synthesis	3	1	2	5
5	EC3CO07	Digital Electronics	3	0	2	4
6	EC3ELXX	Program Elective I	2	0	2	3
7	EN3NG09	Soft Skills I	2	0	0	2
		Total	**20**	**1**	**8**	**25**
		Total Contact Hours	**29**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EC3BS02	Discrete Mathematics	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01}	To understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.
CLO_{02}	To understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.
CLO_{03}	Equip the students with the knowledge of group theory and its application in computer science as coding theory.
CLO_{04}	To study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.
CLO_{05}	To develop the ability to solve the recurrence relations by using various methods.

Unit-I

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

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 &Quiane Mc Clusky method. Applications in computer Science.

Unit-III

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

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 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. Liu and Mohapatra, Elements of Discrete Mathematics, McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley, Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
4. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

References

1. Rings, Fields and Groups: An Introduction to Abstract Algebra (2nd Ed): Reg Allenby
2. First look at graph theory (1st Ed): John Clark & Derek Allan Holton, Allied Publishers
3. Elements of Discrete Mathematics (1st Ed): L CL Liu, McGraw-Hill
4. Discrete Computational Structures (2nd Ed): Robert R. Korfhage , Academic Press

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

CO_{01}	Understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.
CO_{02}	Understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.
CO_{03}	Equip the students with the knowledge of group theory and its application in computer science as coding theory.
CO_{04}	Study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.
CO_{05}	Develop the ability to solve the recurrence relations by using various methods.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EC3CO24	Computer Organization and Architecture	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01}	To understand the fundamental organizational and architectural issues of a digital computer.
CLO_{02}	To understand Classify and Compute Machine Performance.
CLO_{03}	Equip the students with the knowledge to analyse and compute the execution time for specific machine instructions.
CLO_{04}	To study the concepts of functional unit design.
CLO_{05}	To develop the ability to solve IO Devices Communication and Pipeline Design.

UNIT I

Fundamentals of Computer Architecture:

Evolution of Computers, Computer Classification, Measuring Computer Performance, von Neumann Machine Architecture, Functional Units and Components in Computer Organization, Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control.

UNIT II

Instruction Set Architecture

Representation of Positive and Negative Numbers, Binary Fixed- Point Representation, Floating Point Representation, , Addressing Modes, RISC and CISC Instruction set formats, RISC and CISC processor characteristics.

UNIT III

Pipelining and Parallel Processing

Basics of pipelining, Role of Cache memory, Pipeline performance, Data hazards, Instruction hazard.

UNIT IV

Parallel Processing

Parallel Processing- Basic Concept of program, process, thread, Superscalar operation concept, Vector and Array Processor, Introduction to Multi-core Architecture, Flynn Classification.

UNIT V

Memory Hierarchy Design

Memory Hierarchy, Internal Organization of Semiconductor Main Memory Chips, Virtual memory System, Cache Memories and Management, Classification of different memory, Classification of Shared Memory Systems

Textbooks:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill.
2. Nicholas Carter and Raj Kamal, Computer Architecture and Organization, Schaum's Outlines, Tata McGraw-Hill.
3. K. Hwang & F. A. Briggs, Computer Architecture and Parallel Processing, TMH

References:

1. K. A. Parthasarathy, A. Ramachandran, R. Purushothaman, Advanced Computer Architecture, Advanced Computer Architecture, Thomson Learning,
2. J. L. Hennessy, D. A. Patterson, Computer Architecture: A Quantitative Approach, Elsevier
3. D. Sima, T. Fountain & P. Kacsuk. Advanced Computer Architectures, Pearson Education

Course Outcomes (COs):

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

CO_{01}	Explain the basics of organizational and architectural issues of a digital computer and Classify and compute the performance of machines, Machine Instructions.
CO_{02}	Describe various data transfer techniques in digital computer and the I/O interfaces.
CO_{03}	Analyze the performance of various classes of Memories, build large memories using small memories for better performance and analyze arithmetic for ALU implementation
CO_{04}	Demonstrate an understanding of the design of the functional units of a digital computer system. To analyze the IO devices communication with processor
CO_{05}	Design a pipeline for consistent execution of L5 instructions with minimum hazards

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO25	Analog Electronics	4	0	2	5

Course Learning Objectives

CLO 1	To familiarize with the concept and properties of semiconductors and diodes.
CLO 2	To familiarize with the structure, operating mechanism and applications of BJT.
CLO 3	To familiarize with the modeling of BJT.
CLO 4	To familiarize with the structure, operating mechanism and applications of FET.
CLO 5	To familiarize with analysis and designing of amplifiers and oscillators.

UNIT-I SEMI-CONDUCTORS AND DIODES:
Conductor, semiconductors, and insulator- definition and energy band diagram, conduction mechanism in semiconductors, Intrinsic and extrinsic semiconductors, properties of semiconductors. PN junction diode formation, operation and V-I characteristics, ratings, diode resistance and diode junction capacitance,
Types of diodes- Zener, Photodiodes, Varactor diode, LED: operation and applications. Rectifiers, Clippers , Clampers, Regulated supply using zener diode.

UNIT-II BIPOLAR JUNCTION TRANSISTOR:
Definition, Construction, types, basic operation, current components, CB, CE and CC- configuration, input and output characteristics, Region of operations: active, cut-off and saturation region. BJT as an amplifier, Ebers-Moll model, Power dissipation in transistor (P d, max rating).
Transistor biasing: definition, importance, types, Bias Stabilization and Thermal Runaway. AC Model: h parameter model of BJT.

UNIT - III FIELD EFFECT TRANSISTORS
FET: Construction, n-channel and p-channel, transfer and drain characteristics, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET, operation, drain and transfer Characteristics, applications and ratings.

UNIT -IV AMPLIFIER AND OSCILLATORS:
Amplifier Types and Analysis: Introduction, Voltage amplifier, current amplifier, transconductance amplifier and trans resistance amplifier. Working of Class A, Class B, Class C and Push-Pull

amplifier, Two stage RC coupled amplifier working and frequency response, Feedback amplifiers , working , types and advantages. Oscillators- Criterion for oscillation, RC-phase shift oscillator and Wein bridge oscillator operation and applications.

UNIT-V OP-AMP and Timers:

OPAMP– definition, block diagram, operation, characteristics, applications, µA 741 pin diagram, CMRR and Slew rate. Op amp with feedback, Inverting and non-inverting configurations. Applications- linear and nonlinear applications like integrator, differentiator, summer, voltage follower, logarithmic amplifier, filters, and comparators.

Timers– Block diagram, pin diagram of 555, duty cycle, Astable and monostable multivibrators using 555.

Textbooks

1. Millman and Halkias: Integrated electronics, TMH.
2. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
3. Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Learning Pvt. Ltd.

REFERENCES:

1. Sedra and Smith: Microelectronics, Oxford Press.
2. Anil K. Maini, Varsha Agarwal: Electronic Devices and Circuits, Wiley Publications.
3. Donald A Neamen: Electronic Circuits Analysis and Design, TMH
5. Salivahanan: Electronic Circuits Analysis and Design, TMH
6. Mottershead: Electronic Devices and Circuits an introduction, PHI
7. Kumar and Jain: Electronic Devices and Circuits, PHI.
8. David A. Bell Electronic Devices and Circuits Oxford University press.

Course Outcomes (COs):

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

CO_{01}	Explain the characteristics of semiconductors, operation, and applications of semiconductor devices like diode
CO_{02}	Explain the structure, operating mechanism, and applications of BJT.
CO_{03}	Explain the structure, operating mechanism, and applications of FET and MOSFET
CO_{04}	Analyze, model and design devices like amplifiers and oscillators.
CO_{05}	Explain the operating mechanism of operational amplifier, its working and opamp based circuits.

LIST OF PRACTICALS:

1. To determine and analyse the V-I characteristics of PN Junction diode and Zener diode.
2. To realize and analyse different clipper and clamper circuits.
3. To determine input and output characteristics of transistor amplifiers in CE, CB &CC configurations.
4. To determine the frequency response of single stage and two stage transistor CE amplifier, direct coupled and RC coupled amplifier.
5. To determine Drain and Transfer Characteristics of Enhancement and Depletion type MOSFET.
6. Design and realize op amp based three input summer and subtractor circuits.
7. Design inverting and non-inverting amplifiers of adjustable gain values using op-amp.
8. Design Schmitt trigger using op-amp.
9. Realize Wein Bridge and RC Phase Shift Oscillator circuits.
10. Desing an astable multivibrator if specific duty cycle using opamp.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO05	Circuit Analysis and Synthesis	3	1	2	5

Course Learning Objectives

CLO_{01}	To familiarize with the concept of analyzing an electric circuit. Properties of various components.
CLO_{02}	To familiarize with the transient and steady state behavior of electric networks.
CLO_{03}	To familiarize with Laplace, transform and its applications in circuit analysis.
CLO_{04}	To familiarize with the two-port structure of electrical circuit and various modelling equations.
CLO_{05}	To familiarize with basic properties of realizable networks and synthesis tools.

UNIT -I INTRODUCTION TO CIRCUIT THEORY

Graphs, Tree, Tree branches and links, cut sets, and tie set schedules. Basic circuit element R,L,C elements, Ideal and Practical voltage and current sources, controlled& uncontrolled sources, source transformation, Star and delta conversion, KCL and KVL analysis, Nodal & mesh analysis of circuits containing resistors and independent and dependent sources. Dot convention, coupling coefficient, tuned circuits, series& parallel resonance.

UNIT- II TRANSIENT ANALYSIS AND CIRCUIT THEOREMS

Response of RL,RC and RLC circuits for unit step, ramp, and impulse function. Transients in RL,RC and RLC circuits, initial and final conditions, time constants and steady state analysis.

Linearity of a Circuit and Superposition Theorem, Thevenin's Theorem and Norton's Theorem - Determination of Equivalents for Circuits with Dependent Sources ,Reciprocity Theorem , Maximum Power Transfer Theorem , Millman's Theorem, Tellegen's theorem ,Substitution Theorem, Compensation Theorem.

UNIT -III LAPLACE TRANSFORM

Laplace Transform, Properties of Laplace transform, Initial value and Final Value Theorem, Solution of integral and differential equations using Laplace Transform, Time domain analysis of LTI network using Laplace transform, Waveform Synthesis, LT of Complex waveforms. Concept of Transfer function, Relation between impulse response and system function.

UNIT- IV TWO PORT NETWORK

Two Port Network Analysis: Introduction, z parameters, y- parameters, hybrid parameter, ABCD parameters, condition of reciprocity and symmetry in two port parameter presentation. Interrelationship between parameters of two port networks. Expression of input and output impedance in terms of two port parameter, ladder network, equivalent T and π section representation in parametric form.

UNIT-V NETWORK SYNTHESIS

Synthesis of Passive Networks, Concept of Stability of a System from Pole Zero Concept, Necessary condition of Stability of a Network Function, Hurwitz Polynomial, Properties of Hurwitz Polynomials, Positive Real Function, Concept of Network Synthesis, Reactive Network, Driving Point Immitance of LC Network, LC Network Synthesis, Foster and Cauer form, RC and RL Network Synthesis By Foster and Cauer form.

TEXT BOOKS:

1. Network Analysis :- By M.E Van Valkenburg PHI Publication
2. Engineering Circuit Analysis : - By W H Hayt, J E Kemmerly, S M Durbin 6th Edition TMH Publication
3. Network Analysis & Synthesis By Franklin S. KUO, Wiley Publication
4. Fundamentals of Electric Circuits By Matthew N.O. Sadiku,McGraw-Hill International

REFERENCE BOOKS:

1. Roy Choudhary D; Network and systems; New Age Pub.
2. Sudhakar Circuit Network Analysis & Synth (TMH).
3. S P Ghosh, A K Chakraborty Network Analysis & Synth. (MGH).

WEB

1. http://www.nptelvideos.in/2012/11/networks-signals-and-systems.html

Course Outcomes (COs):

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

CO_{01}	Explain the properties of electrical components and working of electric networks.
CO_{02}	Analyse the discrete signals in frequency domain using DFT, FFT and other algorithms.
CO_{03}	Analyse Laplace Transform, Properties of Laplace transform.
CO_{04}	Analyse and model the two port networks.
CO_{05}	Explain the Concept of Stability of a System from Pole Zero Concept.

LIST OF PRACTICALS

1. To measure and calculate currents and voltages for a given resistive circuit and verify KCL

and KVL.

2. To verify superposition theorem experimentally for a given resistive circuit consisting two independent sources .
3. To verify Thevenin's theorem and Norton's theorem experimentally for a given circuit.
4. To verify maximum power transfer theorem experimentally for a given circuit.
5. To verify reciprocity theorem experimentally for a given circuit.
6. To measure and calculate Z-parameters for a given two-port system.
7. To measure and calculate Y-parameters for a given two-port system.
8. To measure and calculate h-parameters for a given two-port system.
9. To measure and calculate ABCD-parameters for a given two-port system. To measure and calculate RC time constant for a given RC circuit.
10. To measure and calculate RL time constant for a given RL circuit.
11. To Find Frequency Response of RLC Series Circuit RLC parallel Circuit and determine resonance and 3-dB frequencies.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO07	Digital Electronics	3	0	2	4

Course Learning Objectives

$CLO_{0\,1}$	To familiarize with the concept of number systems, coding schemes, Boolean algebra.
$CLO_{0\,2}$	To familiarize with the Logic gates and concept of combinational logic design.
$CLO_{0\,3}$	To familiarize with the analysis and designing concepts of sequential circuits.
$CLO_{0\,4}$	To familiarize with the memory design.
$CLO_{0\,5}$	To familiarize with various logic families.

UNIT I NUMBER SYSTEM:
Introduction to binary numbers, data representation, binary, octal, hexadecimal number system and their conversion, Various coding schemes such as BCD codes, Excess-3 code, Gray code. Binary arithmetic, Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard forms, minimization techniques, Sum of products and Product of Sums Simplification, Karnaugh's map method, Quine Mecluskey method.

UNIT II LOGIC GATES AND COMBINATIONAL LOGIC:
Digital Logic Gates such as AND,OR, NAND,NOR, EX-OR,EX-NOR. Realization of Boolean functions using logic gates. Adders, substractors, BCD adder, magnitude comparator, decoders and encoders, multiplexers and demultiplexers, code converters. Analysis and design of combinational circuits. Implementation of combinational logic using multiplexers, decoders etc.

UNIT III SEQUENTIAL CIRCUITS:
Introduction, comparison of sequential and combinational circuits. Various types of flip-flops and their conversions, triggering of flip flops, timing issues, setup and hold times, registers, counters, ring, Johnson, asynchronous and synchronous. Finite state machines, Moore and Mealy, design of synchronous sequential circuits.

UNIT IV MEMORIES:
ROM, PLA and PAL. Memories: organisation and construction of RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM.

UNIT V LOGIC FAMILIES:

DTL, RTL, TTL, IIL, PMOS, NMOS and CMOS logic families, interfacing between TTL and MOS vice-versa.

Text Book:

1. D Roy Choudhury, Digital Electronics,Vol-I & II,TMH Publication.
2. M. Mano, Digital and Computer Design, Pearson Education.

REFERENCES:

1. Leach and Malvino, Digital Principles and Applications, TMH.
2. Millman and Taub, Pulse, Digital and Switching Waveforms, MGM.
3. A.Anand Kumar: Digital Circuits, PHI.
4. Salivahanam and Ari Vahagan: Digital Circuits and Design, Vikas Publishing House.

Course Outcomes (COs):

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

CO_{01}	Explain the binary, octal, hexadecimal number system and their conversion.
CO_{02}	Explain the Digital Logic Gates such as AND,OR, NAND,NOR, EX-OR,EX-NOR
CO_{03}	Analyse the concepts of sequential circuits.
CO_{04}	Analyse the organization and construction of RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM.
CO_{05}	Explain the various logic families, interfacing between TTL and MOS vice-versa.

LIST OF PRACTICALS :-

1. To test and study of operation of all logic gates for various IC's
2. Implementation of AND, OR, NOT, XOR and XNOR gates using universal gates.
3. Binary addition by half adder and full adder.
4. Binary substraction by half substractor and full substractor circuit.
5. Design of BCD to excess-3 code converter.
6. Realization of circuit for binary to gray conversion and vice-versa.
7. Verification of Demorgans' theorem.
8. Study of RS, JK, T and D flip flops
9. Realization of 4 bit binary counter.
10. Realization of 4-bit shift register.

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

Course Learning Objectives (CLOs):

CLO01	Improving professional communication
CLO02	Knowing traits of personality and working on it
CLO03	Developing writing skills
CLO04	Cultivating art of formal presentation and public speaking
CLO05	Improving interview and group discussion skills and hence employability

UNIT 1:

Body Language & Professionalism: Defining Body language, understanding of body language, Scope and Relevance of Body language in professional communication, Behavioural Connotations,

Interpersonal skills: Verbal and nonverbal communication, conflict handling, teamwork, empathy, listening, techniques for effective communication and overcoming social anxiety

Reporter: question-answer session, ability to ask rational questions and make diplomatic replies, group activities like press- meet, celebrity interview

UNIT 2:

Team Building: Defining team working and its objectives, benefits of team building, main obstacles to effective team working, critical components required for a high-performance team, case study and role play reflecting the synergy of a team.

Picture Connector: group interactions, dialogue creation and stage presentation, pictorial representation of a story or idea

UNIT 3:

Time and work: Work with different efficiencies, Pipes and cisterns, Work equivalency, Division of wages

Goal Setting: Goal identification, process to achieve goal

UNIT 4:

Time Management: importance of time management, organization, and prioritization for time management

Tourism Pitch: presentation and promotion of tourist spot or city to convince the client (trainer) to visit the city

UNIT 5:

Shopping Role-play: framing dialogues and carrying impromptu conversation from day-to-day life scenarios like shopping scenario etc.

Team VS Wild: out of the box thinking, critical thinking to get the work done with limited resource.

Extempore and Public Speaking: Speaking on stage , techniques to manage stage fright , Delivering Introductory Speech, Informative Speech, Persuasive Speech, Special Occasion Speech.

Course Outcomes (COs):

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

CO_{01}	Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
CO_{02}	Effectively communicate through verbal/oral communication and improve the listening skills
CO_{03}	Write precise briefs or reports and technical documents
CO_{04}	Actively participate in group discussion / meetings / interviews and prepare & deliver presentations
CO_{05}	Become more effective individual through goal/target setting, self motivation and practicing creative thinking. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3CO26	Digital Signal Processing	4	0	2	5
2	EC3CO27	Computer Peripherals and Interfacing	4	0	2	5
3	EC3CO28	Data Structures	3	0	2	4
4	EC3CO29	Theory of Computation	4	0	0	4
5	EC3ELXX	Program Elective II	3	0	0	3
6	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
8	EN3NG10	Soft Skill-II	2	0	0	2
		Total	**23**	**0**	**6**	**26**
		Total Contact Hours	**29**			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO26	**Digital Signal Processing**	**3**	**1**	**2**	**5**

Course Learning Objectives:

CLO1 To familiarize with the principle of discrete signals and processing tools. CLO2 To familiarize with the digital filter design techniques.

CLO3 To familiarize with the implementation techniques of digital filters.

CLO4 To familiarize with concept of random signals.

CLO5 To familiarize with the concept of DSP processors.

Unit-I

Overview: Introduction to Signals and signal processing, classification of signals, elements of digital signal processing system, discretization of continuous time signals, Sampling and reconstruction, aliasing. Spectral analysis of discrete signals DFS and DTFT , mechanism, properties.

Unit-II Orthogonal Transforms: Mechanism, properties and applications of DFT, implementing linear time invariant systems using DFT, circular convolution, linear convolution using DFT; FFT algorithms: Decimation in time, decimation in frequency; Radix- 2, Radix -4 FFT algorithms, Goertzel algorithm, Chirp Z, DCT

Unit-III DISCRETE TIME SYSTEM:

Introduction, Properties of discrete time systems, Impulse response and convolution sum, FIR and IIR systems, Discrete systems described by difference equation, solution of difference equation, System functions of discrete LTI systems, Freq. response of rational system functions, Minimum/Maximum phase systems, systems with linear phase.

Basic Structures of IIR Systems, lattice and lattice-ladder structures, Transposed forms, Direct and cascade form Structures for FIR Systems, Linear Phase FIR structure,

Unit-IV Digital Filter design techniques:

Design of digital IIR filters: Impulse invariant, and bilinear transformation techniques for Butterworth and Chebyshev filters; Design of FIR filters: linear phase in FIR filters, Windowing (Rectangular, Bartlett, Hann, Hamming etc), frequency sampling filter design, optimum. approximations of FIR filters. Quantization, round-off and overflow errors in Digital Filters,

Unit-V DSP Processor: Features and architectures of DSP processor, Fixed point processor, Floating point processor, pipelining, Multiplier-accumulator (MAC) hardware, applications of DSP processor, Introduction to Texas instrument series TMS320C67XX(13 and 48).

Text Books:

1. A.V. Oppenheim and R. W. Schafer, Digital Signal Processing, Prentice Hall.
2. L. R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall.
3. J.G. Proakis, and D.G. Manolakis, Digital Signal Processing, PHI.

Reference Books

1. Andreas Antoniou, Digital Filters, Analysis, Design and Applications, McGraw Hill.
2. S. K. Mitra, Digital Signal Processing: A computer based approach, Tata McGraw Hill.

Experiment List

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT-Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc)

Note: Above mentioned experiments are required to be performed on MATLAB environment as well as on DSP Processor Kit (TMS320C6713).

Course Outcomes (COs):

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

CO01	Explain the concept of discrete signals
CO02	Analyse the discrete signals in frequency domain using DFT, FFT and other algorithms.
CO03	Analyse and implement digital filters using different structures.
CO04	Analyse and model the randomness phenomenon.
CO05	Explain the architecture and applications DSP processors.

Course Code	**Course Name**	Hours per Week			**Total**
		L	**T**	**P**	**Credits**
EC3CO27	Computer Peripherals and Interfacing	4	0	2	5

Course Learning Objectives:

CLO1 To understand the Functionality of Computer Peripherals: tools.

CLO2 To familiarize Peripheral Interface Standards and Protocols.

CLO3 To familiarize with the implementation Practical Peripheral Interfacing Techniques.

CLO4 To Examine Advanced Peripheral Interfacing Concepts.

CLO5 To familiarize with the concept of Peripheral Interfacing in Real-World Scenarios

Unit I: Introduction Hardware Basics: Basic terms, concepts, and functions of system modules (System board, firmware, storage devices, monitor, boot process, ports). CMOS and BIOS, Overview of system components, Knowing mother board of PC, Identifying types of motherboard, Understanding BUS architecture. Switch Mode Power Supply: Circuit diagrams and pin assignments, working of SMPS Input and load requirements, connecting a PC and peripherals to power supply. Power Supply Maintenance: Cautions about opening power supply, over voltage and over current protection.

UNIT II:

Monitors: Display basics, Display adapter cards, VGA and super VGA, failure, trouble shooting and elimination, color monitors basic color theory, faults in color section. Monitor adjustments, size, brightness, focus etc., **Keyboards:** Study of keyboards, Interconnection to PC, Common faults and diagnostics, Parallel port, serial port, Joy stick, light pen. **Mouse**: Types and installation of mouse **Printers:** Types of printers (DMP, INKJET, LASER), Construction & Working of DMP, INKJET, LASER Printers, Connecting printers to computers.

UNIT III:

Memories: Reading memory error messages, adding RAM, Tips on installing memory chips, Static and handling precautions. **Disk structure**: Cylinders, heads, platters, tracks and sectors, structure of a disk. **Cluster Performance**: Access time, seek time, latency period, data transfer rates, and interleave factors, hard disk controllers. Types of interface controller and drives. **Hard disk software installation**: Physical formatting, partitioning, high level formatting, Hard disk installation

UNIT IV:

Scanner: Working Principle and its types. CD-ROM drive:- CD drives mechanism installation of CD drive. Drive technologies: - CD-ROM: SCSI\CD-R, CD-RW, DVD-ROM. Working Principals, IDE controller card. **Modem:**, Fault Finding, Repairing, modem Circuit Diagram, Repairing MODEM.

UNIT V:

Troubleshooting Procedures and Preventative Maintenance:

Identifying Troubleshooting Tools, Hardware tools, Diagnostic software, The Art of Troubleshooting, Troubleshooting basics, troubleshooting by visual Inspection, Preventative Maintenance, Using Preventative Maintenance Tools, Materials and equipment, Software utilities, Maintaining Environmental Controls, Ventilation and airflow, Humidity and liquids, Dirt and dust EMI, Power, UPS, and suppressors, Completing Maintenance Tasks, Case and components, Power supplies.

Text Book:

1. CompTIA A+ Certification All-in-One Desk Reference for Dummies by Glen Clarke

Reference Books:

1. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B. Govindarajalu, Tata McGraw Hill
2. Pc Upgrade & Repair Bible , Wiley India.
3. PC Systems, Installation and Maintenance, Second Edition by R. P. Beales,
4. PC Upgrade & Repair Black Book by Ron Gilster.

Experiment List

1. Peripheral Introduction:Identify and categorize basic peripherals (keyboard, mouse, monitor, printer).
2. USB Exploration:Connect and test USB devices, exploring USB 2.0 and 3.0 standards.
3. Serial vs. Parallel Communication:Interface a microcontroller using both serial and parallel communication, comparing efficiency.
4. Input Device Interface:Connect sensors to a microcontroller, develop code to read and display input data.
5. Output Device Interface:Connect actuators to a microcontroller, develop code to control output devices.
6. Storage Device Connection:Interface a microcontroller with USB drives, develop read and write code.
7. Networking Device Setup:Set up a network using NICs, routers, and switches; test communication.
8. Interrupt-Driven I/O:Configure a microcontroller for interrupt-driven input and output; compare performance.
9. DMA Implementation:Interface a microcontroller with DMA capabilities; demonstrate efficient data transfers.
10. Device Driver Development:Write a simple device driver for a peripheral; test and debug its functionality.

Course Outcomes (COs):

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

CO_{01}	Identify and categorize various computer peripherals, distinguishing between input, output, and storage devices..
CO_{02}	Demonstrate Proficiency in Peripheral Interface Standards
CO_{03}	Apply Practical Peripheral Interfacing Techniques
CO_{04}	Troubleshoot and debug common issues encountered during peripheral interfacing, showcasing the ability to implement robust solutions
CO_{05}	Apply theoretical knowledge to practical, real-world scenarios by successfully interfacing peripherals with microcontrollers and computers..

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO28	Data Structure	3	0	2	4

Course Learning Objectives:

CLO1 To familiarize with the principle of linear data structure.

CLO2 To familiarize with the non linear data structure by trees representation and transversal.

CLO3 To familiarize with the Red-Black Trees, Splay Trees, Binary Heap, Leftist Heap.
Applications of Queues in computer field.

CLO4 To familiarize with sorting methods and applications of sorting in computer field.

CLO5 To familiarize with the concept of searching and indexing.

UNIT I Linear Data Structures:
Abstract Data Types - Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Arrays : Definitions, Representations and Examples – Stacks and Queues, Linked List, Linked List based implementations of Stack and Queues, Evaluation of Expressions – Linked list based polynomial addition. Applications of Linked List, Arrays and Queues in Computer field.

UNIT II Non-Linear Data Structures:
Trees: Binary Trees, Binary tree representation and traversals, Threaded binary trees, Binary tree representation of trees. Application of Trees: Set representation and Union; Find operations, Graph and its representations, Graph Traversals, Connected components.

UNIT III Search Structures And Priority Queues:
AVL Trees: Red-Black Trees, Splay Trees, Binary Heap, Leftist Heap. Applications of Queues in computer field.

UNIT IV Sorting:
Insertion sort, Merge sort, Quick sort, Heap sort, Sorting with disks – k-way merging – Sorting with tapes – Polyphase merge. Applications of sorting in computer field.

UNIT V Searching And Indexing:
Linear Search, Binary Search, Hash tables, Overflow handling, Cylinder Surface Indexing – Hash Index – B-Tree Indexing. Applications of searching and indexing in computer field.

Text Books

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Sorce,Gurgaon.
2. Gregory L. Heilman, Data Structures, Algorithms and Object

Oriented Programming, Tata Mcgraw-Hill, New Delhi.

Reference Books

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi.
3. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw- Hill

Experiment List

1. Arrays and Linked Lists: Compare basic operations on arrays and linked lists.
2. Stack and Queue Implementation: Implement and analyze stack and queue operations.
3. Tree Traversal and Manipulation: Implement tree traversal algorithms and basic manipulations.
4. Graph Representation and Traversal: Implement and analyze graph representation and traversal.
5. Sorting Algorithms: Implement and compare sorting algorithms.
6. Searching Techniques: Implement and compare searching algorithms.
7. Hashing and Collision Resolution: Implement hash tables with different collision resolution methods.
8. Priority Queues and Heaps: Implement priority queues using heaps.
9. Trie Implementation: Implement and understand trie data structures.
10. Dynamic Programming: Apply dynamic programming to solve optimization problems.

Course Outcomes (COs):

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

CO01	Explain the tools like linked list, stakes and queues and their applications.
CO02	Explain the tools like trees and graphs.
CO03	Explain and use appropriate search structure and priority queue.
CO04	Select an appropriate sorting tool
CO05	Explain various searching and indexing algorithms.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3CO29	Theory of Computation	4	0	0	4

Course Learning Objectives (CLOs):

CLO_{01}	To make student understand science behind computation theoretically.
CLO_{02}	To make student understand formal languages namely Regular language, context free language, recursively enumerable language and its grammar
CLO_{03}	To define and design abstract mathematical methods of various computing machine, namely Finite Automata, Pushdown Automata, and Turning Machines.
CLO_{04}	To make student understand relationship between abstract machine with formal language and grammar.
CLO_{05}	To understand the concept of computability and decidability of computational problems

Unit-1

Finite Automata and Regular Languages

Motivation for studying theory of computation, Notion of formal languages and grammars, Kleene's Closure, Regular Expressions and Regular languages, closure properties of regular languages, Finite Automata. Finite Automata with output: Mealy and Moore machines, applications.

Unit-2

Nondeterminism and Minimization

Nondeterministic Finite Automata, Acceptance condition. Kleene's Theorem, Myhill-Nerode relations, Minimization Algorithm, Non-Regular languages, Pumping Lemma for regular languages.

Unit-3

Grammars and Context-Free Languages

Grammars and Chomsky Hierarchy, Context-Free Grammars, Context-Free Languages (CFLs), Inherent Ambiguity of CFLs, closure properties of CFLs, Eliminating useless symbols; null-productions; and unit productions, Chomsky Normal Form, Greibach Normal Form, Cock-Younger-Kasami(CYK) Algorithm, Applications to Parsing.

Unit-4

Pushdown Automata

Pushdown Automata (PDAs), PDAs vs CFLs. Deterministic PDAs and CFLs, applications, notion of acceptance for PDAs: acceptance by final states, and by empty stack; the equivalence of the two notions, Proof that CFGs generate the same class of languages that PDAs accept, Pumping Lemma for CFLs.

Unit-5

Turing Machines and Computability

Introduction to Turing Machines, Configurations, Halting vs Looping, Turing computability, Nondeterministic, multitape and other versions of Turing machines. Church`s thesis, Universal Turing Machines, Linear Bounded Automata (LBAs) and context-sensitivelanguages, Recursive and Recursively enumerable languages, Undecidability of Halting Problem and unsolvable problems about Turing Machines, the diagonalization language and proof that it is not Recursively enumerable.

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.

References:

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.Papadimitrou, Elements of the Theory of Computation, Prentice Hall Inc.

Course Outcomes (COs):

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

CO_{01}	Design Deterministic Finite Automata and its relationship with Regular Languages and Regular expression and Properties of regular Languages.
CO_{02}	Design Non-Deterministic Finite Automata and its relationship with Regular Languages
CO_{03}	Describe Context free grammar, Context Free Language, properties of CFL.
CO_{04}	Design of push down automata and describe relationship with CFG and CFL.
CO_{05}	Design Turing machines, Its language. Describe computability problems

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

Course Learning Objectives

CLO_{01}	To familiarize with the concept of management.
CLO_{02}	To familiarize with the concept of marketing and human resource management.
CLO_{03}	To familiarize with fundamentals of economics.
CLO_{04}	To familiarize with basic accounting principles.
CLO_{05}	To familiarize with the concepts of financial management.

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

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 Outcomes (COs):

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

CO01	Explain the characteristics and importance of management
CO02	Analyse the concept of marketing and human resource management
CO03	Explain the objectives and Functions; Role of HR manager, Process and need for Human Resource Planning, Human resource policies.
CO04	Analyse the accounting principles and procedure and double entry system
CO05	Explain the concepts of financial management.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EN3NG04	Soft Skills-II	2	0	0	2

Course Learning Objectives (CLOs):

CLO01	Improving professional communication
CLO02	Knowing traits of personality and working on it
CLO03	Developing writing skills

CLO04	Improving interpersonal skills including Leadership qualities
CLO05	Improving interview and group discussion skills and hence employability

UNIT I

Introducing

Introduction – persons, places, objects, projects. Elevator pitch, self- introduction.

UNIT II

Professional writing skills

Job application, resume, email etiquettes, netiquettes.

UNIT III

GD and Interviews

GD – Dos and Don'ts, importance, conduction, Mock GDs. Interviews – dressing, FAQs, mock interviews.

UNIT IV

Interpersonal skills I: Basic personality traits, emotional intelligence, adaptability, time management, goal setting, teamwork.

UNIT V

Interpersonal skills II: Leadership, problem solving, negotiation skills, stress management.

Text books

1. Rizvi, Ashraf M. *Effective Technical Communication* Tata Mc Graw-Hill Publishing Company Limited
2. K Alex, *Soft Skills: Know yourself and know the world*, S Chand & Company Ltd. New Delhi.

Reference Books

1. L Bovee Courtland, John V Thill and Mukesh Chaturvedi *Business Communication Today* Dorling Kindersley (India) Pvt. Ltd.
2. Ranjan Bhanu, *Communication Skills,* Dhanpat Rai & Co. (Pvt) Ltd Delhi.

Course Outcomes (COs):

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

CO01	Interact confidently at formal occasions
CO02	Understand their personality and improve it
CO03	Work on their writing skills
CO04	Improve interpersonal skills
CO05	Face interview confidently and will be able to know the qualities of participants taking part in GD

SEMESTER – V

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3CO30	Communication Systems	4	0	2	5
2	EC3CO31	Operating Systems	4	0	0	4
3	EC3CO08	Engineering Electromagnetics	4	0	0	4
4	EC3CO10	Microprocessor and Interfacing	3	0	2	4
5	EC3E*XX	Program Elective III	3	0	0	3
6	OEXXXXX	Open Elective I	3	0	0	3

7	EC3ES01	Python Programing for Electronics Engg.	0	0	2	1
8	EN3NG06	Open Learning Courses	1	0	0	1
9	EN3NG05	Soft Skills III	2	0	0	2
		Total	**24**	**0**	**6**	**27**
		Total Contact Hours	**30**			

Course Code	**Course Name**	Hours per Week			**Total**
		L	**T**	**P**	**Credits**
EC3CO30	Communication System	4	0	2	**5**

Course Learning Objectives:

CLO1 To familiarize with the principle of analog and digital communication.
CLO2 To familiarize with the various continuous modulation schemes like amplitude, phase and frequency modulation.
CLO3 To familiarize with the various line coding schemes and modulation techniques.
CLO4 To familiarize with the various shift keying techniques and spread spectrum techniques.
CLO5 To familiarize with phenomenon of information theory.
CLO6 To familiarize with the concept of channel coding techniques.

UNIT-I: Introduction:
Communication system, Basic blocks in a communication system: transmitter, channel and receiver; Characteristics and modeling of communication channel; baseband and pass band signals and their representations; concept of modulation and demodulation, need of modulation.

UNIT-II: Continuous wave (CW) modulation
Continuous wave (CW) modulation: AM, DSB/SC, SSB, VSB, methods of generation; Demodulation techniques of CW modulation: coherent and non-coherent; Nonlinear modulation techniques: FM and PM, narrowband FM, wideband FM, methods of generation; FM spectrum; Demodulation techniques for FM; Frequency Division Multiplexing (FDM); Radio transmitters and receivers.

UNIT-III: Noise in Analog Communication System:
Noise in Analog Communication System: Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and quadrature phase components and its Properties, Average

Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.
Performance of analog modulation schemes in AWGN :SNR, post-demodulation SNR and figure of merit for various modulation schemes, threshold effect in FM, pre-emphasis and de-emphasis in FM, FMFB. Noise in receivers; Noise figures;

UNIT -IV: Pulse Modulation schemes:
Sampling process, pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM) ; pulse code modulation (PCM); quantization error, nonlinear quantizer A-law , Mu- law , line coding; differential pulse code modulation; delta modulation and adaptive delta modulation, Basics of time division multiplexing, noise consideration in PAM and PCM systems.

UNIT -V: Digital Modulation Schemes:
Overview of geometric representation of signals, Gram-Schmidt Orthogonalization procedure;
Basic digital modulations schemes: Phase shift keying (PSK), amplitude shift keying (ASK), frequency shift keying (FSK) and Quadrature amplitude modulation (QAM); coherent demodulation and detection; probability of error. Basics of equivalent complex baseband representation of digitally modulated signals

Text Books:

1. Simon Haykins, Communication System, John Willy
2. H. Taub & D. Schilling, Principles of Communication Systems, TMH,
3. R.P. Singh & S.D. Sapre, Communication System, TMH

Reference Books:

1. B.P.Lathi, Modern Digital & Analog Communication System, TMH
2. J.G. Proakis, M. Salehi, Fundamentals of Communication Systems, Pearson Edu.
3. L. Couch, Modern Communication System, Pearson

List of Practicals

1. Study of front panel of Digital Storage Oscilloscope (DSO) and function generator.
2. Generate DSB-FC (AM), DSB-SC and SSB signals. Calculate the modulation index by using formula and trapezoidal pattern for DSB-FC and DSB-SC.
3. Demodulation of DSB-FC using Envelope detector.
4. To examine the operation of Noise generator, Signal Attenuator, Square wave distortion and measure the output power, frequency response of sine wave and Noise Figure.
5. Study and perform experiment based on Pulse Modulation and Demodulation techniques (PAM, PWM and PPM).
6. Generate PCM, learn transmitter and receiver system based on PCM
7. Generation of modulated signal based on Delta and Adaptive Delta method and demodulates them.
8. Perform Experiment based on digital companding techniques (A-law & μ-law)

9. Study of digital carrier techniques (ASK, FSK, PSK) transmitter and receiver system.
10. Generate and observe the data using various data formatting techniques.

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

CO_{01}	Explain the analog communication model , its characteristics, applications and limitations.
CO_{02}	Explain the digital communication model , its characteristics, applications and limitations.
CO_{03}	Analyse various shift keying techniques, comparison of their performance. Analysis of various spread spectrum techniques.
CO_{04}	Analyse the practical design considerations modulations scheme in presence of noise.

Course Code	**Course Name**	**Hours Per Week**			
		L	**T**	**P**	**Credits**
EC3CTXX	Data Communication	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01}	Student will be able to understand basic data communication concepts.
CLO_{02}	Student will be able to understand about digital to digital and digital to analog conversion techniques.
CLO_{03}	Student will get knowledge about telephone network.
CLO_{04}	Student will get knowledge about various internetworking devices.
CLO_{05}	Student will get information about LRC,CRC,VRC, Checksum, Hamming code.

Unit-I

Introduction to digital communications, Components, Data Representation, Data Flow. Analog and Digital Signals and their representation, Transmission Impairment, Data Rate Limits- Nyquist's theorem, Shannon's theorem, Signal propagation, Signal types, Transmission mode and techniques, Transmission Media-Guided and Non-Guided, Noise.

Unit-II

Encoding of Signals -Analog to Digital Conversion, Digital to Digital conversion, - Unipolar, Polar, Bipolar line & block codes, Digital to Analog, Analog to Analog conversion, Spread Spectrum-FHSS, DHSS, CDMA. Modulation and Demodulation of Signals. Multiplexing: FDM, TDM, and WDM, QAM.
Data compression-Frequency dependent codes Run length encoding, Relative encoding, LZ Compression.

Unit-III
Switched Communication Networks: Circuit, Message, Packet & Hybrid Switching, Data Gram Network, Connection oriented services Vs Connectionless services. Public Switching Telephone Network, Digital Subscriber Line, ADSL, HDSL, SDSL, VDSL. Study of various types of topology and their comparative study.

Unit-IV
Reference model- OSI and TCP/IP model and its comparison, Layers in the model and its requirement, critiques of OSI and TCP/IP model, Use of Computer Networks. Architecture of Internet. Addressing-Physical, Logical, Port. Various Networking devices, Peer to Peer Protocols and service model.

Unit-V
Data Link Layer: -Transmission Errors : Content Error ,Error detection & Error correction ,Bit error rate , Error detection methods: Parity checking , Checksum Error Detection ,CRC ,Hamming code . Framing, Flow error Control - ARQ, Sliding Window Protocol, HDLC and PPP. L-2 Switches, Bridges.

Text Book

1. Andrew S.Tannenbaum, Computer Networks, Pearson Education.
2. William Stallings, Data and Computer Communication, Pearson Education.
3. Behrouz A.Fourouzan, Data Communication and Networking, Mc Graw Hill Publication.
4. Alberto Leon-Garcia, Indra Widjaja, Communication Networks-Fundamental concepts and key Architecture, TMH

References

1. Aftab Ahmad, Data Communication Principles for fixed and wireless networks, Kluwer Academic Publishers.
2. Gilbert Held, Data Communications Networking Devices:-Operation, Utilization, Lan and Wan Interworking, John Wiley and Sons.

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

CO_{01}	Learn the functioning of physical layer, its components, and techniques
CO_{02}	Gain the concept of efficient BW utilization.

CO_{03}	Acquire knowledge of basic telephone network
CO_{04}	Come to know about reference model and IP addressing
CO_{05}	Learn various error detection and correction methods

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EC3CO31	Operating System	4	0	0	4

Course Learning Objectives (CLOs):

CLO_{01}	To learn the need and concepts of Operating systems, its functions and to distinguish different types of operating systems
CLO_{02}	To learn various scheduling algorithms, problems of understanding multiple process executions with the concept of deadlock, its prevention and avoidance techniques.
CLO_{03}	To understand the concept of memory management and to implement it with the applications of segmentations and paging.
CLO_{04}	To learn the concept of virtual memory, page replacement algorithms and computational problems related to securities in operating systems.
CLO_{05}	To understand the concept of file, file protection, file sharing in various types of operating systems.

Unit-1

Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: Batch, Multi-Programmed, Time-Sharing, Real-Time, Distributed, Parallel. Process: Concept of Processes, Process Scheduling, Operations on Processes, Cooperating Processes, Inter-Process Communication. Precedence Graphs, Critical Section Problem, Semaphores, Threads.

Unit-2

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

Unit 3

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 4

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 5

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

Text Books:

1. Silberschatz, Galvin, Operating Systems Concepts, Wiley Publications.
2. Andrew S. Tenenbaum, Modern Operating Systems, Pearson Education Asia / PHI.

References:

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}	To understand the concepts of Operating systems and functions and to distinguish different types of operating systems and describe various types of process and its execution
CO_{02}	To implement various types of scheduling algorithms, its evaluations, to understand the concept of deadlock, its prevention and avoidance techniques.
CO_{03}	To understand the concept of memory management and to implement the concept of worst fit, best fit and and first fit memory allocations along with the applications of segmentations and paging in operating system.
CO_{04}	To make the students familiar with concepts of virtual memory, page replacement algorithms and computational problems related to securities in operating systems.
CO_{05}	To Involve students in designing, development and testing of file concept, file protection, file organisations and file sharing in various types of operating systems.

List of Experiments:

Lab No.	Name of Experiment	Unit
Week 1:	Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine. (Linux Installation) along with some latest operating system	1
Week 2:	Write a C/C++ program to simulate producer-consumer problem using Semaphores	1
Week 3:	Write a C/C++ program to implement classical inter process communication problem (Reader Writers).	1
Week 4:	Write a C/C++ program to implement classical inter process communication problem (producer consumer).	1
Week 5:	Write a Program to implement classical inter process communication problem (Dining Philosophers).	1
Week 6:	Write a C/C++ program to Bankers Algorithms for deadlock avoidance and dead lock prevention	2
Week 7:	Simulate the following First Come First Serve CPU scheduling algorithms	2
Week 8:	Simulate the Shortest Job First CPU scheduling algorithms	2
Week 9:	Simulate the Round Robin CPU scheduling algorithms .	2
Week 10:	Simulate the Priority based CPU scheduling algorithms	2
Week 12:	Write a C/C++ program to simulate the concept of Dining-philosophers problem.	2
Week 13:	Write a C/C++ program to simulate Worst fit contiguous memory allocation Techniques	3
Week 14:	Write a C/C++ program to simulate Best fit contiguous memory allocation Techniques.	3
Week 15:	Write a C/C++ program to simulate First fit contiguous memory allocation Techniques.	3
Week 16	Write a C/C++ program to simulate all page replacement algorithms using FIFO.	4
Week 17:	Write a C/C++ program to simulate all page replacement algorithms using LRU	4
Week 18	Write a C/C++ program to simulate all page replacement algorithms using Optimal method	4
Week 19	Write a C/C++ program to implement disk scheduling algorithm FCFS	5

Week 20	Write a C/C++ program to implement disk scheduling algorithm SSTF.	5
Week 21	Write a C/C++ program to implement disk scheduling algorithm SCAN.	5
Week 22	Write a Program to implement disk scheduling algorithm C-SCAN	5
Week 23	Write a Program to implement disk scheduling algorithm C-LOOK	5

Course Code	**Course Name**	Hours per Week			**Total**
		L	**T**	**P**	**Credits**
EC3CO08	Engineering Electromagnetics	4	0	0	**4**

Course Learning Objectives (CLOs):

CLO1 : To introduce the basic mathematical concepts related to electromagnetic vector fields.

CLO1 : To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.

CLO1 : To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

CLO1 : To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations.

CLO1 : To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines.

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 and potential, Potential field of a point charge and different charge distributions, Potential gradient, Dipole, Capacitance between two isolated conductors, Boundary conditions at discontinuities between two media including conducting boundaries, 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 incidence and at oblique incidence, Standing wave ratio, Brewster Angle, total internal reflection, transmission line analogy.

Textbooks:

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

References:

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

Web Sources

1. https://www.youtube.com/watch?v=pGdr9WLto4A&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&spfreload=10
2. https://www.youtube.com/watch?v=EiX3R6IkDDU&list=PLBZrb0wA6HTd9CclN_Ku_I065MXbHZh6U&index=2&spfreload=10

Course Outcomes (COs):

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

CO_{01} Understand the basic mathematical concepts related to electromagnetic vector fields

CO02 Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density

CO03 Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.

CO04 Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.

CO05 Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO10	Microprocessor and Interfacing	3	0	2	**4**

Course Learning Objectives:

CLO1 To familiarize with the principle of microprocessor and microcontrollers.

CLO2 To familiarize with the architecture and programming of 8086.

CLO3 To familiarize with the concept of interfacing of devices with 8086.

CLO4 To familiarize with micro controller , its comparison with microprocessor, instruction set.

CLO5 To familiarize with the concept of high end processors.

UNIT I BASICS OF MICROPROCESSOR SYSTEM

Evolution of microprocessor, internal architecture and pin diagram of 8085 microprocessor, operations of microprocessor, address de-multiplexing in microprocessor, addressing modes, memory and concept of memory/IO device interfacing, timing diagram of memory read, memory write cycle, definitions of Machine cycle, instruction cycle and T state.

UNIT II 8086 MICPROCESSOR

Internal architecture and pin diagram of 8086 microprocessor, segmentation of memory, minimum mode and maximum mode operation, addressing modes and instruction set of 8086, assembler directives, assembly language

programming, and interrupt of 8086.

UNIT III INTERFACING OF DEVICES WITH 8086

Memory interfacing, interfacing of 8255 PPI, 8253/54 Programmable Counter/ Timer, 8257 DMA controller, USART 8251 and 8259A Programmable Interrupt controller.

UNIT IV 8051 MICROCONTROLLER

Difference between microcontroller and microprocessor, internal architecture and pin diagram of 8051 microcontroller, memory organization, Timer/counter and interrupt , addressing modes, instruction set of 8051 , and applications of microcontroller.

UNIT V HIGH END PROCESSSORS & MICROCONTROLLER

Concepts of RISC & CISC, Von Neumann and Harvard Architecture, Salient features of miroprocessors 80286, 80386, 80486, and Pentium, Introduction to ARM processors (ARM 7,9,11), ARM Programmer's Model.

Text Books:

1. R.S. Goankar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing.
2. A.K. Ray and K. M. Bhurchandi, Advanced Microprocessoprs and Peripherals- Architecture , Programming and Interfacing ,Tata McGraw-Hill
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded System, Pearson Education.

Reference Books

1. Steve Furber, ARM system-on-chip architecture, Addison Wesley Publication.
2. Hall Douglas V, Microprocessor and Interfacing, McGraw-Hill Education (India) Pvt Limited.
3. Kenneth J. Ayala, The 8051 Microcontroller Architecture the III Edition- Cengage Learning.
4. Eben Upton, Raspberry Pi – User Guide, John Wiley & Sons Publication.

Web Sources:

1. https://www.intel.com/content/dam/www/public/us/en/documents/white- papers/ia-introduction-basics-paper.pdf

Experiment List

1. Assembly Language Programs based on 8086 microprocessor.
2. I/O devices interfacing with 8086/8051 (microprocessor/microcontroller) using Peripheral ICs.
3. Hands-on with Raspberry Pi kit.

Course Outcomes (COs):

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

CO01	Explain the internal architecture, instructions set , applications, interfacing of microprocessors as 8085.
CO02	Explain the internal architecture, instructions set , applications, interfacing of microprocessors as 8086.
CO03	Interface various devices with 8086.
CO04	Explain the concept of micro controller 8051, its architecture, instruction set, interfacing and applications.
CO05	Explain various high end micro processors.

Course Code	Course Name	Hours per Week L	T	P	Total Credits
EC3ES01	**Python Programming for Electronics Engineering**	**0**	**0**	**2**	**1**

Course Learning Objectives (CLOs):

CLO01	To acquire programming skills in Core Python.
CLO02	To acquire Object Oriented Skills in Python
CLO03	To develop the skill of Plotting in Python
CLO04	To develop the ability to write Image processing applications in Python
CLO05	To develop the ability to write Communication applications in Python

Unit I: Fundamentals of Python

Introduction to Python, Downloading and installing Python; basic syntax, interactive shell, editing, saving, and running a script concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; strings, lists, tuples, comments in the program; understanding error messages.

UnitII: Control statements and Functions in Python

While, for, Nested loops. Use of Continue, Pass and Break statement. Range functionConditional Statements: if, else, elif, nested if and Switch Case statements Function arguments pass by value and reference, Recursive Functions.

UNIT-III: Files Directories & Flow control
Making and List directories, Changing directory, List files in directories. File & Directory manipulation, File functions, File object attributes, close () method, Opening a binary file, FileAttributes, read (read_fixed_size) readline( ) tell (). Read data from keyboard.

File handling: Opening and closing file, Reading and writing files. Exception Handling, Except Clause, User defined Exceptions

Unit IV: Python libraries
Working with numpy, constructing numpy arrays, Printing arrays, Arithmetic operations onmatrix, Slicing Arrays, Random number generation. Working with sciPy, Matplotlib. Installation, Python Pandas - Data alignment, aggregation, summarization, computation and analysis with Pandas.

UNIT-V Python Applications for Electronics and Communication
Statistical data analysis: Measures of Central Tendency, Mean, Median, Mode, Measures of Variability: Variance, Standard deviation, Range; Signal Processing: Elementary signal generation with Python: Sine wave, Square wave, Triangle wave, Exponential signal, Unit Step signal, Operations on the signals : addition , subtraction, Fourier transform, Frequency Analysis. Sampling and Reconstruction, Simulate modulation: Frequency Modulation, amplitude modulation, Basic Image Processing operations: Read and display Images, Image Enhancement, basic Image Filtering using SciPy, numpy, PIL.

List of Experiments

1. (a) Write a program that asks the user for his name and then welcomes him. The output should look like this: Enter your name: Ram Hello Ram
   (b) Write a program that prompts the user to input a Celsius temperature and outputs the equivalent temperature in Fahrenheit. The formula to convert the temperature is: F = 9/5 C + 32 where F is the Fahrenheit temperature and C is the Celsius temperature.
   (c) Write a program that prompts the user to input the length and the width of a rectangle and outputs the area and circumference of the rectangle.

2. (a) Write a program that prompts the user to input a number and display if the number is even or odd.
   (b) Write a program that prompts the user to input three integers and outputs the largest.
   (c) Write a program that prompts the user to input a character and determine the character is vowel or consonant.

3. (a) Write a program to print numbers from 1 to 15.
   (b) Write a program that prompts the user to input a decimal integer and display its binary equivalent.
   (c) Write a program that prompts the user to input a number and prints its factorial.

4 (a) Write a Python program that accepts a string from user. Your program should create and display a new string where the first and last characters have been exchanged. For example if the user enters the string 'HELLO' then new string would be 'OELLH'
   (b) Write a program that accepts a list from user and print the alternate element of list.
   (c) With a given tuple (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), write a program to print the first half
   values in one line and the last half values in one line.

5 (a) Write Python script to display file contents
   (b) Write Python script to copy file contents from one file to another.
   (c) Write a function display_words() in python to read lines from a text file "class.txt", and display those words, which are less than 4 characters.

6. For given data x = [8.0, 1, 2.5, 4, 28.0] calculate Measures of Central Tendency: Mean, Median, Mode and Measures of Variability: (Variance, Standard deviation, Range)

7 (a) Generate Basic Signals in Python. (Sine wave, Square wave, Triangle wave, Exponential signal, Unit Step signal and plot them in Subplots and Multiple Plots
   (b) Generate the 1 kHz , 100kHz sin signal and find out its frequency spectrum. Plot the time signal and their frequency spectrum side by side.

8. Generate 20 Hz and 40 Hz cos signal add them and perform the sampling. Display all the output in single plot.

9 (a) Simulate Amplitude Modulation in Python and display the massage signal, carrier signal and modulated signal.
   (b) Simulate Frequency Modulation in Python and display the massage signal , carrier signal and modulated signal.

10 (a) Read and display the Images and give proper title.
   (b) By using SciPy, numpy, PIL libraries perform the Image Filtering and Enhancement operation on given image.

Textbooks:

1. James Payne, "Beginning Python: Using Python 2.6 and Python 3.1", Wrox Publication
2. Dr. R. Nageswara Rao, "Core Python Programming" Dreamtech Press, Wiley Publication.
3. Magnus Lie Hetland, "Beginning Python from Novice to Professional", Second Edition", Apress Publication.
4. Charles Dierbach, Introduction to Computer Science using Python, Wiley, 2013

References:

1. Wesley J Chun, "Core Python Applications Programming", Third Edition, Pearson Publication.
2. E. Balaguruswamy," Introduction to Computing and Problem Solving using Python"
   McGraw Hill Education IndiaPvt., Ltd.
3. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", Wiley

Web Resources:

1. https://www.edx.org/course/introduction-to-computer-science-and-programming-using- python-2
2. http://www.openculture.com/2017/05/learn-python-with-a-free-online-course-from-mit.html
3. https://www.edx.org/course/introduction-to-python-absolute-beginner-3
4. https://onlinecourses.nptel.ac.in/noc19_cs40

Course Outcomes (COs):

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

CO01	Explain basic principles of Python programming language.
CO02	Implement object oriented concepts,
CO03	Implement skill of Plotting in Python
CO04	Implement Image processing applications.
CO05	Implement Electronics and Communication applications.

SEMESTER – VI

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3CO20	VLSI Design	3	0	2	4
2	EC3CO32	Software Engineering	3	0	2	4
3	EC3CO33	Computer Networks	3	0	2	4
4	EC3E*XX	Program Elective IV	3	0	0	3
5	EC3E*XX	Program Elective V	3	0	0	3
6	OEXXXXX	Open Elective II	3	0	0	3
7	EC3PC09	Mini Project	0	0	4	2
8	EN3NG08	Softskill-IV	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO20	VLSI Design	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01}	To understand significance of VLSI in Electronics domain and to gain awareness of VLSI applications in daily life.
CLO_{02}	To understand the operation of MOS transistors their properties and application as circuit element in VLSI circuits.
CLO_{03}	To learn about the synchronous and asynchronous machines.
CLO_{04}	To learn the minimization of different machines and remove redundant states & implement algorithms for system.
CLO_{05}	To learn about programmable logic devices and various fabrication processes for ICs.

Unit1

Introduction, VLSI designs Flow, Y-chart, Moore's law, MOS transistors (Enhancement type): structure and operation, I-V characteristics, Threshold voltage, channel length modulation, body effect. MOS transistor as a switch, pass transistor logic, Tristate inverter, transmission gate operation, transmission gate logic: logic gates, multiplexers, latches and registers.

Unit2

MOS inverters: Resistive Load Inverter, Inverters with n-type MOSFET Load, CMOS inverter: structure, operation, voltage transfer characterstics, switching threshold, noise margin, delay characteristics, power dissipation. Static CMOS: combinational logic circuits, XOR, XNOR gates, half adder, full adder, SR latch, D latch.

Unit3

Synchronous sequential circuits: Finite state machine, state graph, state table,mealy and moore machines, conversion between mealy and moore machines, Excitation table of flip-flops, synthesis of synchronous sequential circuits, state equivalence and machine minimization, simplification of incompletely specified machines.

Unit4

Asynchronous sequential circuits, Fundamental mode circuits, synthesis, Races and cycles, secondary state assignment, pulse mode circuits, hazards in combinational circuits, essential hazards, hazard free realization using SR flip flops. Algorithmic state machine (introduction).

Unit5

Programmable logic devices: PROM, PLA, PAL, programmable interconnects, logic realization by using PLDs, Study of PAL16L8, CPLD, FPGA.

IC fabrication: Basic steps of IC fabrication, CMOS n-well, p-well, twin-tub processes, Bipolar technology. Layout design rules.

Textbooks:

1. Neil Weste and D. Harris: CMOS VLSI Design, Pearson Education India
2. Kohavi: Switching & Finite Automata Theory, TMH
3. Kang and Leblebici:CMOS Digital Integrated Circuits: Analysis and Design, TMH
4. S.M.Sze: VLSI Technology , TMH

References:

1. Neil Weste and Eshragian: Principles of CMOS VLSI Design, Pearson Education India
2. W. Wolf, Modern VLSI Design – System on Chip Design, Pearson Education
3. Lee: Digital Circuits and Logic Design, PHI Learning.
4. Roth Jr.: Fundamentals of Logic Design, Jaico Publishing House

List of Experiments

1. Design CMOS Inverter using S-edit and getting its transient response.
2. Design Universal gates and all other gates using S-edit and getting its transient response.
3. Obtain the DC- characteristics of CMOS Inverter using DC-analysis.
4. Design Symbol of CMOS Inverter and using instances of its getting transient response.
5. Design Symbol of Universal gates and using instances of them getting transient response.
6. Design a Half Adder and Full adder using instances.
7. Design a Transmission gate using PMOS & NMOS by instance calling.
8. Design of D flipflop using transmission gate.
9. Design the Layout of NMOS and PMOS transistor.
10. Design the Layout of CMOS Inverter.

Course Outcomes (COs):

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

CO_{01}	Understand, analyse and design various circuits and systems using MOSFETs.
CO_{02}	Understand impact of various parameters on circuit design.
CO_{03}	Acquire design skills and grow confidence in design methods of VLSI circuits.
CO_{04}	Minimization of machines and removing redundant state.
CO_{05}	Ability to identify basic requirements for a system and propose an effective solution.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3CO32	Software Engineering	3	0	2	4

Course Learning Objectives (CLOs):

CLO01	Knowledge of basic SW engineering methods and practices, and their appropriate application. Along with general understanding of software process models such as the waterfall and evolutionary models
CLO02	Understanding of software requirements and the SRS documents.
CLO03	Describe data models, object models, context models and behavioral models with understanding of different software architectural styles.
CLO04	Understanding of software testing approaches such as unit testing and integration testing. Describe software measurement and software risks.
CLO05	Understanding on quality control, software metrics and how to ensure good quality software.

Unit 1

Software Engineering – Definition, Process, Evolution and Myths, Generic Process Model, Framework, Process Models – Waterfall, Incremental, Evolutionary, Spiral, Component Based Model, Rational Unified Process

Unit 2

Requirement Analysis, Stakeholders, Elicitation Techniques, Requirement Modelling - Use Cases, Activity Diagrams, Swimlane Diagrams, Data Modelling, Data Flow Diagram, Overview of Class Based Modelling, requirement Tracking.

Unit 3

Principles of Software Design, Design Concepts – Abstraction, Architecture, Modularity, Relationships, Design Model, Component Design, User Interface Design, Configuration Management

Unit 4

Software Quality, Approaches for Quality Assurance, Software Testing, Verification and Validation, Types of Testing, Risk Assessment, Risk Mitigation, Monitoring and Management

Unit 5

Software Metrics, Process Metrics, Product Metrics, Function Oriented Metrics, Software Project Estimations, Function Point Based Metrics, COCOMO Models, Project Scheduling, Effort Distribution

Text Books:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill.

2. Ian Sommerville, Software Engineering, Pearson Education Inc., New Delhi

References:

1. Fundamentals of Software Engineering by Rajib Mall, – PHI

Experiment List :

1. Requirements Gathering: Conduct interviews and create use cases to gather project requirements.
2. UML Modeling: Develop use case diagrams and UML diagrams for system modeling.
3. System Architecture Design: Identify system modules and create a high-level architecture diagram.
4. Coding Standards and Implementation: Write code for a specific functionality adhering to coding standards.
5. Unit Testing and Test Case Design: Conduct unit testing and design comprehensive test cases.
6. Version Control and Collaboration: Use Git for version control and collaborate on a project.
7. Software Maintenance and Bug Fixing: Identify and fix bugs in a codebase while maintaining software integrity.
8. Software Documentation: Generate user manuals, technical documentation, and API documentation.
9. Agile Development Practices: Implement agile methodologies and Scrum practices in a small-scale project.
10. Project Management with Tools: Manage a software project using project management tools for tracking tasks and milestones.

Course Outcomes (COs)

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

CO_{01}	Students will have thorough understanding of the basic structure and operation of software & various SDLC models.

CO02	Students will be able to trace out requirements of a software to be build and also learn to prepare SRS.
CO03	They will be able to draw the different types design models (UML Diagrams).
CO04	Students will be able to understand the role & importance of SQA & software testing.
CO05	They learnt different ways of maintenance in software and measuring project.

Course Code	Course Name	Hours Per Week			
		L	**T**	**P**	**Credits**
EC3CO33	Computer Networks	3	0	2	4

Course Learning Objectives (CLOs):

CLO01	Describe how computer networks are organized with the concept of layered approach.
CLO02	Implement a simple LAN with hubs, bridges, and switches
CLO03	Describe how packets on the Internet are delivered
CLO04	Analyse the contents in each Data Link layer packet, based on the layer concept.
CLO05	Design logical sub-address blocks with a given address block
CLO06	Describe how routing protocols work and decide routing entries given a simple example of network topology

Unit-1

MAC Sublayer: Static and Dynamic Chanel Allocation in LAN, MAC protocols-ALOHA and Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision Free protocols, Limited Contention Protocols. Ethernet-Ethernet Cabling, Frame Format, Binary Exponential Back-off Algorithm, Ethernet Performance, Fast and Gigabit Ethernet, MAC address.

Unit-2

Internetworking, Tunnelling, Fragmentation and Reassembly. IP protocol, IPv4 Addresses, Subnet Addressing, Subnet Mask, Supernetting CIDR, NAT, ICMP-header, message type, trace route, ARP & RARP, BOOTP and DHCP: Address allocation, configuration & packet format, OSPF and BGP, Comparative study of IPv4 & IPv6.

Unit-3

Network Layer: Design issues, Routing algorithms: Dijkstra's algorithm, Bellman-ford algorithm, Link State Routing, Hierarchical Routing, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. QOS-techniques for achieving good QOS, Traffic Management, Integrated and Differentiated Services. RSVP

Unit-4

Transport Layer: Design Issues, Transport Service Primitives, Socket Programming, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. UDP: Header Format, RPC, RTP, Session layer: Authentication, Authorization, Session layer protocol (PAP, SCP, H.245).

Unit-5

Presentation layer: Data conversion, Character code translation, Presentation layer protocol. Application Layer: WWW Architectural Overview, URL-Static and Dynamic Web, FTP, SSH, Email- Architecture and Services, SMTP, DNS-Name System, Resource Records, Name Servers, Network Management (SNMP).

Text Books:

1. Computer Networks-V Edition, Andrew S. Tanenbaum-Pearson Education (Chapter No.4-7).
2. Data and Computer Communication-VIII Edition, William Stallings-Pearson Education (Part-3-6)
3. Data Communication and Networking- V Edition, Behrouz A. Fourouzan- Mc Graw Hill Publication (Part-3-6).
4. Communication Networks-Fundamental concepts and key Architecture, Alberto Leon-Garcia &Indra Widjaja-TMH (Unit1,2,7,8,10,12)

Practical Understanding

1. Data Communication Principles for fixed and wireless networks-Aftab Ahmad, Kluwer Academic Publishers.
2. Data Communications Networking Devices: -Operation, Utilization, Lan and Wan Interworking-IV Edition, Gilbert Held-John Wiley and Sons.

Course Outcomes (COs):

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

CO_{01}	Analyse the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO_{02}	Understanding of the use of various networking devices such as L-2 switch, L-3 Switch and Routers.
CO_{03}	Understanding of data link layer protocols, multi-channel access protocols and IEEE 802 standards for LAN
CO_{04}	Apply the routing and congestion in network layer with routing algorithms using simulators and classify IPV4 and IPV6 addressing scheme
CO_{05}	Describe the elements and protocols of transport layer.

CO_{06}	Understanding of network security and define various protocols such as FTP, HTTP, Telnet, DNS

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3PC09	Mini Project I	0	0	4	2

Objective:

The objective of this course is to familiarize the students with basic concepts of electronic circuit design and development as well as the aspects of computer science principles to design and develop software solutions. This objective will be achieved through the steps like problem analysis from design perspective, circuit design, component selection, PCB design and development, soldering, itching and subsequent steps. This course will provide them an opportunity to develop hands-on skills, problem-solving and design attitude, testing and evaluation of electronic circuits and algorithm design, development, and testing.

Guidelines:

1. Students are supposed to select a design problem which addresses some life applications.
2. Students are supposed to design a circuit for the problem under consideration
3. Select components, prepare PCB layout
4. Perform screen printing, soldering
5. Group of maximum three students can be permitted to work on a single mini project.
6. The mini project must have hardware part. The software part is optional.

Course Outcomes (COs):

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

CO_{01}	Demonstrate practical application of theoretical knowledge and skills acquired throughout the program.
CO_{02}	Develop and deliver a functional software solution or solve a real-world problem.
CO_{03}	Showcase effective project management skills, including planning, organization, and timely execution.
CO_{04}	Communicate project outcomes and technical ideas effectively to a non-technical audience.
CO_{05}	Enhance teamwork and collaboration skills through effective group work.

SEMESTER – VII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EC3E*XX	Program Elective VI	3	0	0	3
2	OEXXXXX	Open Elective III	3	0	0	3
3	EC3PC06	Project I	0	0	8	4
4	EC3PC03	Industrial Training	0	2	0	2
		Total	**6**	**2**	**8**	**12**
		Total Contact Hours	**16**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EC3PC06	Project Work-I	0	0	8	4

Course Learning Objectives (CLOs):

CLO_1	To apply electronics theory to real-world projects, selecting components and designing circuits for specific applications.
CLO_2	To develop proficiency in soldering, bread boarding, and using electronic instruments for circuit assembly, testing, and troubleshooting.
CLO_3	To learn effective project planning, scheduling, and teamwork for on-time project completion.
CLO_4	To develop critical thinking skills to diagnose and resolve electronic system issues and challenges.
CLO_5	To improve technical communication through written reports, oral presentations, and comprehensive project documentation.

Course Description:

This course is designed to provide hands-on experience in electronics through the completion of practical projects. Students will apply theoretical knowledge to design, assemble, and troubleshoot electronic circuits and software, while also developing project management and communication skills.

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	• Evaluation by supervisor and 2 additional teachers	
Final Presentation	• Presentation IV • Assessment by Departmental Project Evaluation Committee	14th week
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

In above context, students are required to note

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. All the students are required to adhere to the schedule. In case of any problem they can contact their respective project coordinator/ project guide.

Course Outcomes (COs):

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

CO_{01}	Able to apply theoretical knowledge of electronics, gained from previous courses, to real-world projects.
CO_{02}	Develop practical skills in soldering, breadboarding, and using various electronic instruments and tools.
CO_{03}	Able to manage project timelines effectively and work collaboratively in teams to complete complex projects
CO_{04}	Learn to identify issues, diagnose faults, and implement solutions, fostering critical thinking abilities.
CO_{05}	Understand to communicate project findings effectively through written reports, clearly articulating project goals, methodologies, results, and conclusions.

Medi Caps University

Faculty of Engineering

Syllabus for Bachelor of Technology (B.Tech.)

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
XX3PC03	Industrial Training	0	0	0	0	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- Students 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 student from the options provided by university, students will not be allowed to change.

Procedure:

i. Internal and external guide from the department and 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 logbook 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 examination.
v. Well formatted summary of work and report is required to be submitted in the department as per the prescribed format.

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Syllabus for Bachelor of Technology (B.Tech.)

vi. The students 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 mark external total 100(60+40).

ix. Only industries registered and active with Ministry of Corporate Affairs will be accepted as industry for valuation of industrial training.

xi. Professor in charge Training /HoDs 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, be granted for such companies.

31/5/19.

SEMESTER VIII						
Sr. No.	**Subject Code**	**Courses**	L	T	P	Credit
1	**EC3PC07**	**Major Project**	**0**	**0**	**20**	**10**
		Total	0	0	20	10
		Total Contact Hours	20			

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
EC3PC07	Major Project	0	0	20	0	10

Aproject 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
iii. To develop professional attitude and critical thinking
iv. To learn organizational ethics and work culture
v. 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	2nd week

	• Estimations – Time and Features	
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)