Department of Electronics Engineering

CURRICULUM AND SYLLABUS

(2022-2026)

B. Tech. Electronics Engineering

Electronics Engineering

B. Tech. (EC)

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 skillful, experienced and specialist faculty members for building comprehensive academic environment expert faculty members and create an enthusiastic academic environment.

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

Scheme (2022-26 Batch)

SEMESTER I

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3BS11	Engineering Mathematics-I	3	0	0	3
2	EN3BS13	Engineering Physics	3	0	2	4
3	EN3ES17	Basic Electrical Engineering	3	0	2	4
4	EN3NG01	Environmental Science*	2	0	0	2
5	EN3ES19	Engineering Graphics	2	0	2	3
6	EN3ES21	Programming-I	0	0	4	2
7	EN3ES01	Basic Civil Engineering	3	0	2	4
		Total	**16**	**0**	**12**	**22**
		Total Contact Hours	**28**			

* Non-Gradial Courses

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	EN3ES18	Basic Mechanical Engineering	3	0	2	4
4	EN3ES22	Programming-II	0	0	4	2
5	EN3HS02	Communication Skills	2	0	2	3
6	EN3ES16	Basic Electronics Engineering	3	0	2	4
7	EN3ES20	Engineering Workshop - I	0	0	2	1
8	EN3HS01	History of Science and Technology	2	0	0	2
		Total	**15**	**0**	**14**	**22**
		Total Contact Hours	**29**			

SEMESTER – III

Sr. No.	Subject Code	Courses	L	T	P	Credit
1	**EC3BS01**	**Engineering Mathematics-III**	**3**	**0**	**0**	**3**
2	**EC3CO23**	**Signals and Systems**	**3**	**1**	**0**	4
3	EC3CO03	Electronic Devices and Circuits	4	0	2	5
4	EC3CO05	Circuit Analysis and Synthesis	3	1	2	5
5	EC3CO07	Digital Electronics	3	0	2	4

6	**EN3HS04**	**Fundamentals of Management, Economics and Accountancy**	**3**	**0**	**0**	3
7	EN3NG03	Soft Skills I	2	0	0	2
8	EN3NG06	Open Learning Courses	1	0	0	1
		Total	**22**	**2**	**6**	27
		Total Contact Hours	30			

SEMESTER – IV

Sr. No.	**Subject Code**	**Courses**	L	T	P	Credit
1	EC3CO17	Linear Integrated Circuit and Applications	3	0	2	4
2	**EC3CO18**	**Analog Communication**	**3**	**0**	**2**	**4**
3	**EC3CO09**	**Control Systems**	**3**	**0**	**2**	**4**
4	EC3CO08	Engineering Electromagnetics	4	0	0	4
5	EC3EL08	Program Elective I (Computer Organization and Architecture)	3	0	0	3
6	EN3NG02	Universal Human Values and Professional Ethics	2	0	0	2
7	**EN3ES23/ EC3ES01**	**Engineering Workshop II / Python Programing for Electronics Engg**	**0**	**0**	**2**	1
8	**EN3NG10**	**Soft Skills-II**	**2**	**0**	**0**	2
		Total	**20**	**0**	**8**	24
		Total Contact Hours	28			

SEMESTER – V

Sr. No.	**Subject Code**	**Courses**	L	T	P	Credit
1	**EC3CO06**	**Digital Signal Processing**	**3**	**1**	**2**	**5**
2	EC3CO11	Digital Communication	3	1	2	5
3	**EC3CO19**	**Antennas and Propagation**	**3**	**0**	**2**	**4**
4	EC3CO10	Microprocessors & Microcontrollers	3	0	2	4
5	EC3E*XX	Program Elective II	3	0	0	3
6	OEXXXXX	Open Elective I	3	0	0	3
7	EN3NG05	Soft Skills-III	2	0	0	2
		Total	**20**	**2**	**8**	**26**

		Total Contact Hours	30			

SEMESTER – VI

Sr. No.	Subject Code	Courses	L	T	P	Credit
1	**EC3CO20**	**VLSI Design**	**3**	**0**	**2**	**4**
2	**EC3CO21**	**Fiber Optic Communications**	**3**	**0**	**2**	**4**
3	**EC3CO22**	**Microwave Engineering**	**3**	**0**	**2**	**4**
4	EC3E*XX	Program Elective III	3	0	0	3
5	EC3E*XX	Program Elective IV	3	0	0	3
6	EC3PC09	Mini Project	0	0	4	2
7	OEXXXXX	Open Elective II	3	0	0	3
8	**EN3NG08**	**Soft Skills-IV**	**2**	**0**	**0**	2
		Total	**20**	**0**	**10**	25
		Total Contact Hours	30			

SEMESTER – VII

Sr. No.	Subject Code	Courses	L	T	P	Credit
2	EC3E*XX	Program Elective V	3	0	0	3
3	EC3E*XX	Program Elective VI	3	0	0	3
4	OEXXXXX	Open Elective III	3	0	0	3
5	**EC3PC06**	**Project I**	0	0	8	4
6	EC3PC03	Industrial Training	0	2	0	2
		Total	**9**	**2**	**8**	15
		Total Contact Hours	19			

SEMESTER VIII

Sr. No.	Subject Code	Courses	L	T	P	Credit
1	**EC3PC10**	**Project II**	**0**	**0**	**24**	12
		Total	0	0	**24**	12
		Total Contact Hours	24			

Total Credit 173

SEMESTER I

SNo.	Course Code	Courses	L	T	P	Credit
1	EN3BS11	Engineering Mathematics-I	3	0	0	3
2	EN3BS13	Engineering Physics	3	0	2	4
3	EN3ES17	Basic Electrical Engineering	3	0	2	4
4	EN3NG01	Environmental Science*	2	0	0	2
5	EN3ES19	Engineering Graphics	2	0	2	3
6	EN3ES21	Programming-I	0	0	4	2
7	EN3ES01	Basic Civil Engineering	3	0	2	4
		Total	**16**	**0**	**12**	**22**
		Total Contact Hours	**28**			

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

Course Learning Objectives (CLOs):

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

CLO02 To explain the concept of Differential Calculus.

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

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

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

Unit I Matrices and Linear Systems

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

Unit II Differential Calculus

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

Unit III Integral Calculus

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

Unit IV Ordinary Differential Equations

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

Unit V Complex Variable

Basics of Complex number, Functions of complex variable: Analytic functions, Harmonic Conjugate functions, Cauchy-Riemann Equations, Complex Line Integral, Cauchy's Theorem, Cauchy's Integral Formula.

Text books:

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

References:

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

Web Source:

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

Course Outcomes (COs):

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

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

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

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

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

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3BS13	Engineering Physics	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 They will be able to understand the concept of Laser devices.

CLO02 An ability to understand the phenomena occurs in optical fibre.

CLO03 Students came to know about the optical phenomenon like Interference, diffraction, and polarization with their use in daily life.

CLO04 They will be able to learn about the quantum physics.

CLO05 They will be able to understand the concept of modern physics

CLO06 An ability to recognise the crystal structure and their basics.

CLO07 An ability to adapt the classical concept of oscillations.

CLO08 They will be able to use the acoustics nature in practical applications.

CLO09 Students learn the advanced concept of the superconductivity.

Unit-I Laser and Fibre Optics

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

Unit-II Wave Optics

Interference: Fresnel's biprism experiment, Newton's ring experiment. Diffraction of light: Fraunhofer diffraction for single slit, N-slits diffraction (grating), Missing orders and Rayleigh criterion of Resolution. Polarization: General concept of Polarization, double refraction, Engineering Applications of Polarization.

Unit-III 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-IV Solid State Physics

Crystal Physics: Unit cell, Crystal System, Types of Unit cell: Simple cubic, Face centered cubic, Body centered cubic Crystal, Number of atoms per unit cell, Packing fraction in different cubical 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 Oscillations and acoustics

Oscillations: Concept of Simple, Periodic & harmonic Oscillation with illustrations; Differential equation of harmonic oscillator; Kinetic and potential energy of Harmonic Oscillator, compound pendulum. Acoustics: Introduction, Reverberation, Sabine's Formula, Eyring's Formula, Absorption Coefficient, Conditions for good acoustical design, Production and detection of ultrasonic waves and their applications.

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.

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

CO_{01}	Understand and analyse the different types of lasers and optical fibres, operation, and its characteristics.
CO_{02}	Understand and apply various phenomenon of Interference, diffraction and polarization and their applications.
CO_{03}	Understand and apply the concept of Quantum Mechanics.
CO_{04}	Understand and examine the crystal structures and acquire the basic knowledge of various semiconductor devices.
CO_{05}	Evaluate and apply the applications of superconductivity in technology and real world.
CO_{06}	Apply basic concepts of oscillations in harmonic oscillator and compound pendulum.
CO_{07}	To analyse and design acoustics applications.

List of Practical's

List of suggestive core experiments (Any 10 experiments from the list of 16)

Laser and Fiber Optics

1. To measure the beam divergence and beam waist of laser beam.
2. To measure the numerical aperture of an optical fiber by scanning method.
3. To find the thickness of thin wire using laser.
4. To study the working of laser using PhET simulation module.
5. To establish a fiber optic analog link and study of bending loss in optical fiber.

Wave Optics

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

Quantum Mechanics

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

Solid State Physics

12. To study the Hall Effect experiment and calculate the charge carrier concentration (density) of given semiconductor diode.
13. To determine the energy band gap of semiconductor diode.
14. To study V-I characteristics of semiconductor diode and Zener diode.

Oscillations and Acoustics

15. To find the frequency of AC Mains using Melde's method in longitudinal and transverse arrangement.
16. To determine the value of acceleration due to gravity (g) using compound pendulum

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

Course Learning Objectives (CLOs):

CLO_{01} To introduce fundamental concepts and analysis techniques in electrical engineering to students across all disciplines.

CLO_{02} To introduce the students about domestic wiring, the functioning of various electrical apparatus and the safety measures. Emphasize the effects of electric shock and precautionary measures.

CLO_{03} To impart basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.

CLO_{04} To provide knowledge about the basic DC and AC electric circuits and magnetic circuits.

CLO_{05} To introduce the concepts of power supply, UPS, SMPS, motors, transformers, and their applications.

Unit-I: DC circuit analysis

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

Unit-II: AC Circuit Analysis

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

Unit-III: Electrical Machines

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

Unit-IV: Industrial Electrical Engineering

Power supply: linear power supply, switch mode power supply (SMPS), block diagram of UPS.
Safety and protection: electric hazards and precautions, earthing, fuses, MCB, types of wires and

cables, components of domestic wiring, electricity metering and billing.

Unit-V: Electrical Energy Systems and Utilization

Power generation to distribution through overhead lines and underground cables with single line diagram, block schematic representation of hydroelectric and thermal power plants.

Advantages of electrical heating, induction heating and its applications, dielectric heating and its applications, welding transformer.

Textbooks:

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

References:

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

Course Outcomes (COs):

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

CO_{01}	Demonstrate an understanding of the basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.
CO_{02}	Demonstrate an understanding of basic concepts of analysis of simple DC and AC circuits used in electrical engineering.
CO_{03}	Demonstrate an understanding of power supply, UPS, type of motors and their applications.
CO_{04}	Demonstrate an understanding of basic concepts of transformers, power system components and their application in transmission and distribution of electric power system.
CO_{05}	Demonstrate an understanding of the effects of electric shock and precautionary measures.

List of Experiments

1. To study various electric hazards and corresponding precautions.
2. To verify KCL and KVL.
3. To verify Thevenin's and Norton's theorem.
4. Determination of resistance, inductance, capacitance and power factor of R-L, R-C & R-L-C series circuits.
5. To measure active power, reactive power & apparent power of a single-phase AC circuit.

6. To verify relation between line and phase quantities in a three-phase system.
7. To determine ratio and polarity of single-phase transformer.
8. To study construction of DC machine and three-phase induction motor.
9. To find out fusing factor and plot characteristic of fuse.
10. Study of different components of domestic wiring.
11. Preparation of energy bill based on energy consumption of residence/ Institute.
12. To study welding transformer and its accessories.

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

Course Learning Objectives (CLOs):

CLO_{01} To impart knowledge of Environment and its basic components.

CLO_{02} To build basic understanding of various effects of human activities to the environment.

CLO_{03} To understand concepts of water pollution

CLO_{04} To understand function of solid waste management

CLO_{05} To learn concepts of disaster management

Unit-I Ecosystem and Biodiversity

Concept of Ecosystem, Food Chains, Food Webs, Energy flow in an ecosystem.

Biodiversity**:** Introduction, Types, Significance and Conservation.

Unit-II Air Pollution

Causes, Effects and Control of Air Pollution, Greenhouse Effect - Climate changes and Global warming, Ozone layer depletion, Acid Rain.

Case studies on recent cases of air pollution and management.

Unit-III Water Pollution

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

Unit-IV Solid Waste Management

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

Unit-V Disaster Management

Concept of Disaster, Types of Disaster, Pre-disaster risk and vulnerability reduction, Post disaster recovery and rehabilitation.

Case studies on recent disasters and management.

Textbooks:

1. Preeti Jain, S.L.Garg, K.G.Garg, Energy, Environment, Ecology and Society, Variety Publication.
2. Surinder Deswal, Environmental Science, Dhanpat Rai & Co. publication.
3. R. Rajgopalan , Environmental Studies, Oxford IBH Publication.

References:

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

Course Outcomes (COs):

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

CO_{01} Gain knowledge of Ecosystem & Biodiversity.

CO_{02} Develop basic understanding of air pollution and its control method

CO_{03} Develop basic understanding of water pollution and its control method

CO_{04} Gain knowledge of Solid waste management and its importance.

CO_{05} Gain knowledge of Disaster Management.

Course Code	Course Name	Total Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES19	**Engineering Graphics**	**2**	**0**	**2**	**4**	**3**

Course Learning Objectives (CLOs):

CLO01 To familiarize with the construction of geometrical figures.
CLO02 To familiarize with the projection of 1D, 2D and 3D elements
CLO03 To familiarize with the projection and sectioning of solids.
CLO04 To familiarize with the Preparation and interpretation of building drawing.
CLO05 To familiarize with the Upgraded Drawing Software and their use.

Unit -I
Drawing scales: Engineering scale, graphical scale, plain scale, diagonal scale, scale of chord.
Orthographic Projections: Reference planes, types of orthographic projections–First angle projections, Third angle projections.

Unit-II
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-III
Projections of Planes: Projections of Planes in different Positions, Auxiliary planes, Auxiliary Vertical Plane (AVP), Auxiliary Inclined Plane (AIP)
Projection of Solids: Classification of solid. Projections in simple and complex positions of the axis of the solid.

Unit-IV
Sections of Solids: Sectional views and true shape of the section.
Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, non-Isometric lines, construction of isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.

Unit V
Computer Aided Drawing (CAD): Introduction to AutoCAD ,2D & 3D Basics, Modify & Draw Commands Using AutoCAD, Points, Lines planes and Solids and their projections.

Textbooks:
1. N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing House.
2. D. N. Johle, Engineering Drawing, Tata McGraw-Hill Publishing Co.Ltd.
3. P.S. Gill, Engineering Graphics, S.K. Kataria andSons.
4. Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.

5. F. E. Giesecke, A. Mitchell & others, Principles of Engineering Graphics, Maxwell McMillan Publishing.
6. K.C. John, Engineering Graphics for Degree, PHI Learning Pvt. Ltd.

References:

1. Engineering Drawing- Basant Agarwal, TMH
2. D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi
3. Venugopal (2010), Engineering Drawing and Graphics, 2nd edition, New Age Publications, New Delhi.
4. Trymbaka Murthy (2007), Computer Aided Engineering Drawing, I.K. International Publishers, New Delhi.
5. 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 and Know purpose, procedures, materials and conventional symbols used. Create and read an engineering drawing using standard views and have ability to Convert pictorial (3D) drawings to orthographic (2-D) drawings and vice versa

CO_{02} Understand the projection of points, straight lines and have the ability to convert the practical problems in to projections

CO_{03} To understand and apply concepts of the projection of simple planes & solids.

CO_{04} Understand and apply the concepts of Projection & Sections of solids & development of surfaces

CO_{05} Convert simple 2D orthographic projections into 3D isometric projections with the help of auto cad commands

List of Experiments

Preparation of drawing sheets containing the drawings for topics covered in theory.

List of Drawing Sheets (Manual)

1. Orthographic Projections
2. Projections of points & Projections of straight lines
3. Projections of planes & Projections of solids
4. Projections of sections of solids & isometric projections
5. Drawing scales

List of CAD Sheets

1. To study about special features, advantages and applications of CAD in detail.
2. To study and practice basic draw commands, modifying commands exist in the CAD.
3. To construct a diagonal scale.
4. To draw orthographic projection of given pictorial views.
5. To construct the isometric views of given geometries.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3ES221	Programming-I	0	0	4	2

Course Learning Objectives (CLOs):

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

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

CLO03 Use different control structures for conditional programming.

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

CLO05 Use the functions and procedures to solve different problems..

Unit-I Introduction to Computer and Problem Solving Methodology

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

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

Unit-II Basics of Language

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

Unit-III Control Statements

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

Unit-IV Arrays and Strings

Defining an Array, One Dimensional Array, Two Dimensional Array, Multi-Dimensional Array. Basic Array Operations and Matrix Manipulation Operations (Addition, Subtraction, and Multiplication).Problem Solving Based on Array.

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

Unit-V Functions

Introduction, Functions Declaration, Definition, Calling, Return Statement, Parameter Passing (By

Value), Recursion, Library Functions. Problem Solving Based on Functions.

Text Books:

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

References:

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

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

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

List of Practical

1. Write a program to print hello user on output screen.
2. Write a program to perform arithmetic operation on two numbers.
3. Write a program to find sum of individual digits of any three digits number.
4. Write a program to print any three digit number in reverse order.
5. Write a program to swap any two numbers using third variable and without using third variable.
6. Write a program to check given number is even or odd.
7. Write a program to check given char is vowel or consonant.
8. Write a program to check given number is positive or negative.
9. Write a program to check given year is leap year or not.
10. Write a program to check given number in range of 100-200 or not.
11. Write a program to check given number is palindrome or not.

12. Write a program to print grade of student on the basis of percentage:
a. If per greater than or equal to 75 ➔ A grade
b. If per between 60-75 ➔ B grade
c. If per between 50-60 ➔ C grade
d. If per between 40-50 ➔ D grade
e. If per less than 40 ➔ Fail
13. Write a program for addition subtraction multiplication division using switch case.
14. Write a program to print table of any number.
15. Write a program to calculate factorial of any number.
16. Write a program to print series of alphabet.
17. Write a program to print Fibonacci series.
18. Write a program to check given number is perfect or not
19. Write a program to check given number is prime or not.
20. Write a program to check given number is Armstrong or not
21. Write a program to print number in word in between 1-5. Like (1 =one)
22. Write a program to check given char is vowel or consonant.
23. Write a program to print name of month according to number.
24. Write a program for convertor
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 arguments 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			
		L	T	P	Credits
EN3ES01	Basic Civil Engineering	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} 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_{02} To provide basic understanding of the forces and its components, stresses, strains and the modulus of elasticity of the different construction materials.

CLO_{03} To understand the components of the building such as beams, columns, foundations, slabs and different types of soils and their bearing capacities.

CLO_{04} 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_{05} To understand various aspects of structural members and application of loads, shear force & bending moment in the field of civil engineering.

Unit I Building Construction Material

Role of Civil Engineer in the construction of buildings, dams, expressways, and infrastructure projects for 21st century. Importance of an inter- disciplinary approach in engineering Building Materials: Bricks composition, classifications, properties and uses. Stone classification of rocks, quarrying, and Dressing properties uses. Timber properties uses plywood. Cement: grades, types, properties, uses. Steel: types, mild steel, medium steel, hard steel, properties, uses, market forms. Concrete: grade designation, properties, uses.

Unit II Surveying and levelling

Surveying-classification, general principles of surveying–Basic terms and definitions of chain, Chain survey, Compass survey and Levelling, Uses of surveying, Contours their characteristics and uses.

Unit III Building Components

Site selection, General Classification and building components. Soils: types and bearing capacity of soils, Foundation: functions and classifications. Flooring: requirements and selection types, Roof - types and requirements.

Unit IV Forces & Properties of Material

Forces and its components, Resolution and summation of forces, Lami's Theorem, Stress, Strain types, Hook's law, Three moduli of elasticity, poisons ratio, relationship, factor of safety.

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.

Text Books:

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

References:

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

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.

List of Experiments

1. To determine particle size distribution & fineness modulus of coarse and fine aggregates.
2. To determine standard consistency of cement paste. -
3. To determine initial and final setting times for cement by using Vicat's apparatus.
4. To determine the workability of fresh concrete of given proportion by slump cone test.
5. To determine the area of land by chain surveying.
6. To perform traverse surveying with prismatic compass check for local attraction and determine corrected bearing and to balance the traversing by Bowditch'srule.
7. To perform levelling by height of Instrument method.
8. To perform levelling by rise and Fall method.
9. To perform Plane Table Surveying work by (A) Radiation method and (.B) Intersection methods.
10. To measure horizontal and vertical angle sin the field by using Theodolite.

SEMESTER II

Course Code	Courses	L	T	P	Credit
EN3BS12	Engineering Mathematics-II	3	0	0	3
EN3BS14	Engineering Chemistry	2	0	2	3
EN3ES18	Basic Mechanical Engineering	3	0	2	4
EN3ES22	Programming-II	0	0	4	2
EN3HS02	Communication Skills	2	0	2	3
EN3ES16	Basic Electronics Engineering	3	0	2	4
EN3ES20	Engineering Workshop - I	0	0	2	1
EN3HS01	History of Science and Technology	2	0	0	2
	Total	**15**	**0**	**14**	**22**
	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.

Course Outcomes (COs):

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

CO_1 To impact mathematical models involving ordinary and partial differentialequationswith given boundary condition which is helpful in all engineering and research work.

CO_2 To examine the general mathematical concepts required for the field regarding Laplace and Fourier Transform.

CO_3 To compare and contrast importance of partial differential equations in physicalproblems.

CO_4 To prioritize derivatives of vector- point functions, gradient functions, evaluate integral of functions over curves, surfaces and domains in two and three dimensional.

CO_5 To examine numerical techniques and investigate its application in solving algebraic and transcendental 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, Laplacetransform 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 Evenand 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 CompanyLtd., 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 the mathematical 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_{01} To gain fundamental knowledge of the principles related to, so as to meet the challenging requirements of students in chemistry studies.

CLO_{02} To attain awareness in students about current & new issues in the fields of chemistry.

CLO_{03} To make students understand about the present needs without compromising on theability of future generations to meet their own needs for proper engineering, relevanteducation efficient management of resources.

CLO_{04} 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			Total	
		L	T	P	Hours	**Credits**
EN3ES18	**Basic Mechanical Engineering**	**3**	**0**	**2**	**5**	**4**

Course Learning Objectives (CLOs):

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

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

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

CLO04 To understand Construction and Working of Steam Generators

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

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

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

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

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

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

Textbooks:

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

References:

1. Anand K Bewoor, Vinay A Kulkarni, Ist edition, Metrology & Measurement, McGraw Hill.
2. Cengel and Boles, Thermodynamic, An Engineering Approach in S.I Unit, McGraw Hill.
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
EN3ES22	Programming-II	0	0	4	2

Course Learning Objectives (CLOs):

CLO01 Understand Pointer variables. Declaring and dereferencing pointer variables. Pointer Arithmetic. Accessing arrays, strings through pointers.

CLO02 Declaration and use structures, perform operations on structures, passing structures as function arguments. type defining structures.

CLO03 Use Function declaration, function definition, function call, Passing arguments to a function, by value, by reference. Scope of variable names, creation of header files

CLO04 Use calloc, malloc, realloc dynamic memory.

CLO05 Apply Input-output using files in C, Opening, closing and reading from files. Programming for command line arguments.

CLO06 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	Hours per Week			
		L	T	P	Credits
EN3HS02	COMMUNICATION SKILLS	2	0	2	3

Course Learning Objectives (CLOs):

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

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

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

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

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

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Text Books:

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

4. U. S. Rai and S.M, Rai, Effective Communication, Himalaya Publishing House.

References:

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

Course Outcomes (COs):

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

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

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

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

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

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

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

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3ES16	Basic Electronics Engineering	3	0	2	5

Course Learning Objectives (CLOs):

CLO01 To learn the basics of semiconductor materials and their usage in variety of PN junction diodes and applications of diodes

CLO02 To study transistor in different modes of configuration and basic biasing techniques, FET.

CLO03 To study of the fundamental concepts and various types of analog communication systems

CLO04 To study of the concept of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.

CLO05 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	Total Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES20	**Engineering Workshop -I**	**0**	**0**	**2**	**2**	**1**

Course Learning Objectives (CLOs):

CLO01 To familiar with Lathe, Drilling, Milling and shaping machines.

CLO02 The basic law of physics and their utilization in engineering.

CLO03 To understand different primary manufacturing process.

CLO04 To understand different metal joining process.

CLO05 To identify different tools used in basic manufacturing process.

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

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

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

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

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

Textbooks:

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

References:

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

Course Outcomes (COs):

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

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

CO_{02} Understand the primary manufacturing process.

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

CO_{04} Understand the basic process of forging.

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
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 Scienceand 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 thenew era, science and technology developments during the Five-Year Plan Periods and scienceand 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.

Sr. No.	Subject Code	Courses	L	T	P	Credit
1	**EC3BS01**	**Engineering Mathematics-III**	**3**	**0**	**0**	**3**
2	**EC3CO23**	**Signals and Systems**	**3**	**1**	**0**	4
3	EC3CO03	Electronic Devices and Circuits	4	0	2	5
4	EC3CO05	Circuit Analysis and Synthesis	3	1	2	5
5	EC3CO07	Digital Electronics	3	0	2	4
6	**EN3HS04**	**Fundamentals of Management, Economics and Accountancy**	**3**	**0**	**0**	3
7	EN3NG03	Soft Skills I	2	0	0	2
8	EN3NG06	Open Learning Courses	1	0	0	1
		Total	**22**	**2**	**6**	27
		Total Contact Hours	30			

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EC3BS01	Engineering Mathematics III	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To illustrate with the basic knowledge of graph theory.

CLO02 Elaborate the applications of graphs in network flows.

CLO03 Apply the knowledge of series solution of ordinary differential equations and Bessel and Legendre functions.

CLO04 Impart the knowledge of two-dimensional random variable.

CLO05 To prioritize the concept of correlation, regression and testing of hypothesis

Unit I: Summarizing Data using Statistical Measures:

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

Unit II: Theory of Random variables and Probability:

Random variables- Discrete and Continuous random variables, Mass and Density function (pmf, pdf), Cumulative Distribution function, Expectation ofa randomvariables, Expectation of random

variable in terms of variance, Introduction to probability Theory, Trial and Event, law of probability theory, Introduction to Conditional probability.

Unit III: Probability Distribution:
Discrete Distribution: Binomial, Poisson Distribution with mean variance, Moment generating function.
Continuous Distribution: Normal and Exponential Distribution with mean variance, moment generating function.

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

Unit V: Testing of Hypothesis:
Introduction to testing of hypothesis, Statistical assumptions, Level of significance, Confidence level, Type I Error, Type II error, Critical value, Power of the test, sampling distribution, Chi-Square test, small sample test – t test for one and two sample mean, F test, Large Sample test ,Z test for equality of single mean, equality of two sample.

Textbooks:

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

References:

1. Sheldon M. Ross, "Introduction to Probability Models", Elsevier Publication, Academic Press, UK
2. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier Publication, Academic Press, UK
3. Seymour Lipschutz, "Schaum's Outline: Introduction to Probability and Statistics".

Course Outcomes (COs):

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

CO_{01} Apply their knowledge in solving problems of graph theory.

CO_{02} Apply the theory of graphs in network flows.

CO_{03} Analyse importance of series solutions of ordinary differential equation as well as special functions.

CO_{04} Apply the concept of two dimensional random variable, random process and ergodicity in their respective fields.

CO_{05} Elaborate the concept of correlation, regression and testing of hypothesis.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO23	Signal and System	3	1	0	4

Course Learning Objectives (CLOs):

CLO01 To understand the basic fundamentals of various types of Signal and Systems.

CLO02 To study various operations of CT Signal and their transform.

CLO03 To study discrete time signals and systems.

CLO04 To understand different type of systems and their responses to various signal

CLO05 To study frequency domain analysis and Z transform of a DT signal.

UNIT I SIGNALS:
Basic definition of signals, Classification of Signals, Signal operations & properties, Analogy between Vectors and Signals, Orthogonal Signals, Signal approximation using Orthogonal functions, Mean Square Error, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function, Case study of different signals from communication field.

UNIT II ANALYSIS OF SIGNALS: -
Introduction Fourier Series Analysis of CT signals, Fourier Transform, properties of Fourier Transform, Laplace transform in signal analysis, Sampling of CT signals &aliasing.
Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal. **Introduction Discrete Fourier series and its properties,** DTFT and its properties.

UNIT III SYSTEMS:
Basic of systems, system properties: Linearity, Static and dynamic, stability and causality, time invariant and variant system, invertible and non-invertible, representation of continuous systems. Continuous Time LTI System: - Differential Equation, Block Diagram representation, Impulse response and convolution integral, properties of convolution, signal responses to Continuous LTI system,

UNIT IV DISCRETE TIME SYSTEM:
Introduction, Properties of discrete time systems, Impulse response characterization and convolution sum, Properties of convolution sum, Discrete systems described by difference equation, solution of difference equation, Impulse response of DT-LTI system.

UNIT V Z-TRANSFORM:
Concept of Z- Transform of a Discrete Sequence, Two sided and single sided Z- transform, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms. Solution of difference equation using Z-transform, Relationship between Z-transform and DTFT, Relation between Z-transform and Laplace Transform.

Textbooks:

1. Alan V. Oppenheim, Alan S. Wilsky and Nawab, Signal & system, Pearson Education.
2. Simon Haykin and Bary Van Veen, Signal & System, Wiley- India Publications
3. B.P. Lathi, Linear Signal & System, Oxford University Press
4. Anand Kumar, "Signal & System", PHI Learning.

References:

1. H P Hsu, Rakesh Ranjan, Signal and System, Schaum's Outlines, Tata McGraw Hill, Indian Reprint.
2. Michel J. Robert, "Fundamentals of Signals and Systems" MGH International Edition.
3. Benoit Boulet, Leo Chartrand, Fundamentals of Signal & Systems, Da Vinci Engineering Press.

Course Outcomes (COs):

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

CO_{01} Understanding of the fundamental concepts of Signal and Systems.

CO_{02} Analyse and categorize various Signals and systems.

CO_{03} Perform various operation on the given signal

CO_{04} Understanding of Various transforms to use signals effectively.

CO_{05} Analyse and solve the problem with practically approach.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO03	Electronic Devices and Circuits	4	0	2	5

Course Learning Objectives (CLOs):

CLO01 To learn the basics of semiconductor materials and their usage in variety of PN junction diodes. To study and analyse the behavioral characteristics of diodes and its applications.

CLO02 To study and analyse the behavioral characteristics and working of transistors. Its applications and working configurations. To learn the need of biasing in transistors and its AC & DC analysis.

CLO03 To study and analyse the behavioral characteristics and working of field effect transistor. Its working and its applications.

CLO04 To learn designing techniques of multistage amplifiers and power amplifiers using transistors and to identify the need of cascading stages in amplification and learning various methods of coupling.

CLO05 To understand the importance of Feedback in Amplifiers and Oscillator circuits.

UNIT-I SEMI-CONDUCTORS AND DIODES:

Introduction, Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors, Charge Densities, Hall Effect, Drift and diffusion current Continuity equation.

PN junction diode- Construction of PN junction diode, space charge region, barrier potential and energy hill in PN junction diode. Forward and reverse biasing, V-I characteristics of PN junction, diode resistance and diode junction capacitance, temperature dependency.

Types of diodes- Zener, Photodiodes, Varactor diode, Tunnel diode, Schottky diode. Rectifiers and filter circuit: Clippers , Clampers **and their types,** Regulated supply using zener diode.

UNIT-II BIPOLAR JUNCTION TRANSISTOR:

Construction, basic operation, current components ,CB, CE and CC- configuration, input and output characteristics, Early effect, 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 circuits and analysis: Introduction, various biasing methods: Fixed bias,Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point , Bias Stabilization and Thermal Runaway.

AC Model: Hybrid π 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, drain and transfer Characteristics.

UNIT -IV AMPLIFIER AND OSCILLATORS:

Amplifier Types and Analysis: Introduction, Voltage amplifier, current amplifier, transconductance amplifier and trans resistance amplifier. Analysis of transistor amplifier using h-parameter model, Single stage RC coupled amplifier.

Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier and cas-code amplifier, Coupling methods in multistage amplifier, Low and high frequency response.

Large Signal analysis and Power Amplifiers: Class A, Class B, Class AB, Class C, Class D, Transformer coupled and Push-Pull amplifier.

UNIT-V FEEDBACK AMPLIFIER AND OSCILLATORS:

Feedback Amplifier: Classification of amplifiers, The Basic concepts of Feedback, Effect of Negative Feedback, Various Feedback Topologies, Method Of Identifying Feedback Topology and Feedback Factor , Stability Of Feedback Amplifier.

OSCILLATORS: Criterion for oscillation, Types of oscillators: Hartley oscillator, Colpitt oscillator, RC-phase shift oscillator, Wein bridge oscillator.

Textbooks:

1. Millman and Halkias: Integrated electronics, TMH.
2. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.

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.

LIST OF PRACTICALS:

1. To determine and analyse the V-I characteristics of PN Junction diode and Zener diode.
2. To realize and analyse full wave rectifier with different filters.
3. To realize and analyse different clipper and clamper circuits.
4. To determine input and output characteristics of transistor amplifiers in CE, CB &CC configurations.
5. To determine the frequency response of transistor CE amplifier, direct coupled and RC coupled amplifier.
6. To determine Drain and Transfer Characteristics of JFET.
7. To determine Drain and Transfer Characteristics of Enhancement and Depletion type MOSFET.
8. To determine the frequency response of two stage CE amplifier with direct coupling and RC coupling.
9. To determine characteristics of class A and B power amplifiers.
10. Realization of Wein Bridge and RC Phase Shift Oscillator.

Course Outcomes (COs):

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

CO_{01} Understanding of the fundamental concepts of semiconductor device operation.

CO_{02} Explain and model diode-based circuits.

CO_{03} Explain and model BJT-based circuits.

CO_{04} Analyse the amplifier operation and design an amplifier circuit as per the specifications.

CO_{05} Analyse and explain feedback amplifier and oscillator circuits.

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

Course Learning Objectives (CLOs):

CLO_{01} To learn the basic concepts of circuit theory & importance of network simplification

CLO_{02} To understand the behaviour of various circuit elements under different sources and to learn various theorems useful for network simplification.

CLO_{03} To learn behaviour of circuits in time domain and frequency domain

CLO_{04} To learn various two port model and can evaluate two port network parameters

CLO_{05} To understand the difference between analysis and synthesis & to learn various analysis and synthesis techniques.

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,sourcetransformation,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 parameters, 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.

Textbooks:

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

References:

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 link:

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

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 Outcomes (COs):

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

CO_{01} Students will be able to understand the concept of circuit theory and various techniques to solve circuit.

CO_{02} Student will become well conversant with Graph theory.

CO_{03} Students will be able to understand the concept of transient and steady state analysis.It would able to develop practical approach and understand the technicality behind it.

CO_{04} Students will be able to apply time domain to frequency domain in Laplace transform and learned the importance & requirement of Laplace in circuit theory.

CO_{05} Students will be able to Synthesize the circuit by using Foster's and Cauer Form.

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

Course Learning Objectives (CLOs):

CLO01 To understand the concept of number systems and Boolean Algebra.

CLO02 To learn minimization of Boolean function by different methods.

CLO03 To understand the concept of Logic gates and other Combinational circuits and their designing.

CLO04 To workout above in practical and To gain awareness of digital circuits and its applications in day to day life.

CLO05 An understanding of professional and technical responsibility. Introduction to the lab environment and circuit designing

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, subtractors, BCD adder, magnitude comparator, decoders and encoders, multiplexers and demultiplers, 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 IVMEMORIES:
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.

Textbooks:

1. D Roy Choudhury, Digital Electronics, Vol-I & II,TMH Publication.

2. M. Mano, Digital and Computer Design, Pearson Education.

References:

1. Leach and Melvino, 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.

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 subtraction by half subtractor and full subtractor 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 Outcomes (COs):

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

CO_{01} Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

CO_{02} To understand and examine the structure of various number systems and its application in digital design.

CO_{03} The ability to understand, analyse and design various combinational and sequential circuits using programmable logic.

CO_{04} Ability to identify basic requirements for a design application and propose a cost-effective solution.

CO_{05} To develop skill to build and troubleshoot digital circuits.

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 (CLOs):

CLO_{01} To enable the students to study the basics of management & managerial operations.
CLO_{02} To study concept nature, functions & emerging concepts of HR & marketing.
CLO_{03} To learn the basics of economics with respect to business cycle.
CLO_{04} To create an understanding over accounting principles.
CLO_{05} To see the financial management & investment decision making.

Unit I: Concepts of Management

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

Unit II: Fundamentals of Marketing and Human Resource Management

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

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

Unit III: Fundamentals of Economics

Introduction to Economics: Definition, nature, scope and significance; Difference between micro and macroeconomics; 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).

Textbooks:

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

References:

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:

CO_{01}	Explain the characteristics and importance of management
CO_{02}	Analyse the concept of marketing and human resource management
CO_{03}	Explain the objectives and Functions; Role of HR manager, Process and need for Human Resource Planning, Human resource policies.
CO_{04}	Analyse the accounting principles and procedure and double entry system
CO_{05}	Explain the concepts of financial management.

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

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.	Subject Code	Courses	L	T	P	Credit
1	EC3CO17	Linear Integrated Circuit and Applications	3	0	2	4
2	**EC3CO18**	**Analog Communication**	**3**	**0**	**2**	**4**
3	**EC3CO09**	**Control Systems**	**3**	**0**	**2**	**4**
4	EC3CO08	Engineering Electromagnetics	4	0	0	4
5	EC3EL08	Program Elective I (Computer Organization and Architecture)	3	0	0	3
6	EN3NG02	Universal Human Values and Professional Ethics	2	0	0	2
7	**EN3ES23/ EC3ES01**	**Engineering Workshop II / Python Programming for Electronics Engg**	**0**	**0**	**2**	1
8	**EN3NG10**	**Soft Skills-II**	**2**	**0**	**0**	2
		Total	**20**	**0**	**8**	24
		Total Contact Hours	28			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO17	Linear Integrated Circuit & Applications	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To enable the students to study the basics of operational amplifier.
CLO_{02} To study, analyse and model opamp based circuits and design as per the requirement.
CLO_{03} To study, analyse and model opamp based filters.
CLO_{04} To study operation and applications of 555 Timer.
CLO_{05} To study and design regulator based power supply.

Unit I Introduction

Introduction to integrated circuits: Advantages of IC's, basic building components.

Operational Amplifier: Introduction of OP-AMP, Block diagram, characteristics and equivalent circuits of an ideal OP-AMP, Power supply configurations for OP-AMP.
Differential amplifier and analysis: Configurations- Dual input balanced output differential amplifier, Dual input unbalanced output differential amplifier, single input balanced output differential amplifier, single input unbalanced output differential amplifier, Common-Mode Rejection Ratio (CMRR), Current Follower, Voltage Follower.
Characteristics of OP-AMP: Ideal and Practical, input offset voltage, offset current, input bias current, Output offset voltage, Compensation circuits for offset reduction, thermal drift, Effect of variation in power supply voltage, slew rate and its effect, Power Supply Rejection Ratio (PSRR) and gain bandwidth product, frequency limitations and compensations, transient response.

Unit-II OP-AMP Amplifiers and Wave Shaping
OP-AMP applications: Inverting and non-inverting amplifier configurations, summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier.
Generator and Wave Shaping: Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, Voltage Controlled Oscillator, Comparator, Zero Crossing Detector.

Unit-III OP-AMP Filters
Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter, all pass filters, self-tuned filters, AGC and AVC using op-AMP.

Unit-IV Timer
IC-555 Timer concept, Block pin configuration of timer. Mono-stable, Bi-stable and A-stable Multi-vibrator using timer 555-IC, Schmitt Trigger, Voltage limiters, Clipper and clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

Unit-V Regulators
Voltage Regulator using OP-AMP, Fixed and Adjustable Voltage Regulators. Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs (LM317, LM78XX and LM79XX). Type of regulator: Series and Shunt, Line and Load Control, Regulated and Unregulated power supply, Switch Mode Power Supply (SMPS)

Textbooks:

1. Ramakant A. Gaikwad, OP- Amp and linear Integrated circuits, Pearson.
2. B. Visvesvara Rao Linear Integrated Circuits Pearson.
3. D. Roy Choudhury, Linear Integrated Circuits, New Age Publication.

References:

1. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press
2. J. Millman and C. Halkias: Integrated electronics, TMH.
3. A. Sedra and K. Smith: Microelectronics, Oxford Press.

Web Sources:

1. http://www.nptelvideos.in/2012/11/analog-ics.html

Course Outcomes (COs):

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

CO_{01} To design and analyse differential amplifier and operational amplifier circuits.

CO_{02} Designing of operational amplifier-based summing, subtractor, integrator and wave shaping circuits.

CO_{03} To design and analyse active filters and advanced applications of OP-AMP such as AGC, AVC etc.

CO_{04} To design and analyse applications of 555 timer.

CO_{05} To design and analyse unregulated and regulated power supply and SMPS.

List of Experiment

1. To determine common mode gain and differential mode gain of duel input balanced output differential amplifier.
2. To determine CMRR and slew rate of 741
3. To study inverting and non-inverting amplifier and realize circuits with different gain
4. To realize arithmetic circuits like adder, subtractor, log amplifier using op amp.
5. To realize integrator and differentiator using op amp
6. To realize phase-shift oscillators, Wein bridge oscillator using op amp.
7. To realize I and II order LPF using op amp
8. To design a quasi-stable multi vibrator with given duty cycle using 555 timer.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO18	Analog Communication	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To enable the students to study the basics of amplitude modulation.
CLO_{02} To study and analyse angle modulation schemes.
CLO_{03} To study, analyse and model modulation circuits.
CLO_{04} To study the effect of extraneous signals on modulated signals.
CLO_{05} To study pulse modulation schemes.

Unit-I: Amplitude Modulation: Block Diagram of Communication system, Need of Modulation, Type of Modulation, Amplitude Modulation and spectral interpretation, BW, Power requirement and Efficiency. Study of AM suppressed carrier (DSB-SC, SSB-SC, VSB-SC), BW & power requirement, Efficiency, Generation & detection methods of AM, synchronous detection & carrier acquisition.

Unit-II: Angle Modulation system:- Types of Angle Modulation, NBFM, WBFM, frequency domain representation, , BW, Power requirement and efficiency, generation of FM (Direct & Indirect method), Detection of FM by various methods (frequency discriminators & phase discriminators, PLL). Advantages of FM over AM.

Unit-III: AM & FM transmitter, Receiver:- Low & high level AM transmitters, features of a receiver, TRF receiver, Super heterodyne Receiver, Image frequency rejection, FM transmitter and receiver, pre-emphasis and de-emphasis, AGC, AVC, AFC.

Unit-IV: Noise: - Correlation, Energy Spectral Density & Power Spectral Density. Noise classification, Sources of noise, Noise Figure, Noise temperature, Noise Bandwidth, Figure of Merit, Narrow Band Noise, Figure of Merit for various AM & FM, and effect of noise on AM & FM receivers.

Unit V: Sampling, Pulse Modulation: - Types of Pulse modulation (PAM, PWM, PPM) : their generation & Detection.

Textbooks:

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. A. B. Carlson, Communication System, Mc-Graw Hill

Web Source

1. https://onlinecourses.nptel.ac.in/noc17_ec11
2. www.nptelvideos.in/2012/11/communication-engineering.htm

Course Outcomes

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

CO_{01} Explain the fundamental concept of Analog communication system

CO_{02} Conversant with different types of modulation techniques

CO_{03} Select suitable transmitter and receiver for the particular application and can design of their own communication systems

CO_{04} Understand the performance of communication system in presence of noise.

CO_{05} Explain the basics used for moving from analog to digital communication.

List of Practical

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. Perform experiment based on AM transmitter and receiver and study the Superheterodyne Receiver.
5. Modulate and demodulate FM signal. Calculate the frequency deviation and modulation index.
6. To understand the principle of pre-emphasis and de-emphasis circuits and measure the operating characteristics of pre-emphasis and de-emphasis circuits through the experiment.
7. Study of Frequency Division Multiplexing/De-multiplexing with sinusoidal inputs / audio inputs.
8. Analyse the spectrum of AM, SSB and NBFM modulation using TINA PRO.
9. Study of spectrum analyser and observe the spectrum of sine waveform and modulated AM and FM wave.
10. 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.
11. Study and perform experiment based on Pulse Modulation and Demodulation techniques (PAM, PWM and PPM).

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO09	Control System	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To enable the students to study the basics of feedback.
CLO_{02} To study and analyse system response to various signals.
CLO_{03} To study and analyse the system behaviour in frequency domain.
CLO_{04} To study and design compensating circuits as per the system requirement.
CLO_{05} To study system modelling using state space.

UNIT I Introduction
Concept of control system, basic terminology, objectives/specifications. Mathematical modeling of physical systems such as mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques, Mason's Gain formulae. Concept of feedback, open loop and closed loop systems, types and effects of feedback.

UNIT II Time response analysis
Standard test signals, time response analysis (1^{st} and 2^{nd} order), Transient and steady state response, response parameters and their qualitative analysis; Transient and steady state response analysis for 1^{st} and 2^{nd} order systems with negative feedback; effect of close loop on system parameters. Stability of linear systems, stability norms, effects of pole location on system stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus., applications of root locus.

UNIT III Frequency response analysis
Concept of frequency response, Frequency response plots such as Polar plots, Bode Plots, log-magnitude versus Phase-Plots, M and N circles, Correlation between time and frequency response. Frequency domain stability analysis, Nyquist stability criterion, stability margins: phase margin and gain margin, Relative stability analysis using Nyquist plot and Bode plot.

UNIT IV Compensators and controllers
Design problem, types of compensation techniques, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain. P, PD, PI, PID error control strategies; effect of controllers on transient and Steady state response.

UNIT V State space analysis
State space representation of systems, State Space equations in Canonical forms, Modelling of electrical and mechanical systems in State Space form, Solution of state space equation, state transition matrix, Controllability and Observability, Relation between transfer function and state space representations, Design of state feedback controller.

Textbooks:

1. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers.
2. Benjamin C. Kuo, "Automatic Control systems", Wiley India Pvt. Ltd.
3. K. Ogata, "Modern Control Engineering", PHI.

References:

1. M. Gopal, "Control System Principles and Design", Tata McGraw Hill, New Delhi.

2. S. Salivahanan, “Control System Engineering”, Pearson Education, New Delhi.
3. B.S Manke, “Linear Control Systems With MATLAB Applications”, Khanna Publisher.

List of Practicals

1. Transfer Function From Zeros And Poles
2. Zeros And Poles From Transfer Function
3. Impulse, Step And Ramp Response Of A Transfer Function
4. Time Response Of A Second Order System
5. Root Locus From A Transfer Function
6. Bode Plot From A Transfer Function
7. Nyquist Plot From A Transfer Function
8. Transfer Function From State Model State Model From Transfer Function
9. State From Zeroes And Poles Zeros And Poles From State Model
10. Lag And Lead Compensator
11. Pid Controller

Course Outcomes

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

CO_{01} Explain the fundamental concept of feedback and closed loop system performance.

CO_{02} Apply various test signals to the systems and analyse their response in time domain.

CO_{03} Analyse the system performance and stability in frequency domain,

CO_{04} To design compensator for steering the system performance in a desired way.

CO_{05} To perform state space modelling of linear systems.

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.
CLO2 : To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
CLO3 : To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
CLO4 : To impart knowledge on the concepts of Faraday‘s law, induced emf and Maxwell‘s equations.
CLO5 : 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

CO_{02} Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density

CO_{03} Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.

CO_{04} Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.

CO_{05} 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
EC3EL08	Program Elective I (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} Analyse the performance of various classes of Memories, build large memories using small memories for better performance and analyse arithmetic for ALU implementation

CO_{04} Demonstrate an understanding of the design of the functional units of a digital computer system. To analyse 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
EN3NG02	Universal Human Values and Professional Ethics	2	0	0	0

Course Learning Objectives (CLOs):

CLO_{01} To enable the students to understand the necessity of value-based education in life.
CLO_{02} To study the harmony and its significance.
CLO_{03} To study and analyse human relationship and their role in preserving the values and morals.
CLO_{04} To study the existence of self and co-existence of mutually interacting units.
CLO_{05} To inculcate the understanding of value based professional life.

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} Understand 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			Total
		L	T	P	Credits
EC3ES01	Python Programming for Electronics Engineering	0	0	2	2

Course Learning Objectives (CLOs):

CLO_{01} To acquire programming skills in Core Python.

CLO_{02} To acquire Object Oriented Skills in Python

CLO_{03} To develop the skill of Plotting in Python

CLO_{04} To develop the ability to write Image processing applications in Python

CLO_{05} 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, File Attributes, 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. Bala Guruswamy," Introduction to Computing and Problem Solving using Python"
McGraw Hill Education India Pvt., 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:

CO_{01} **Explain** basic principles of Python programming language.

CO_{02} **Implement** object-oriented concepts,

CO_{03} **Implement** skill of Plotting in Python

CO_{04} **Implement** Image processing applications.

CO_{05} **Implement** Electronics and Communication applications.

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EN3NG10	Soft Skills-II	2	0	0	2

Course Learning Objectives (CLOs):

CLO_{01}	Improving professional communication
CLO_{02}	Knowing traits of personality and working on it
CLO_{03}	Developing writing skills
CLO_{04}	Improving interpersonal skills including Leadership qualities
CLO_{05}	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:

CO_{01}	Interact confidently at formal occasions
CO_{02}	Understand their personality and improve it
CO_{03}	Work on their writing skills
CO_{04}	Improve interpersonal skills
CO_{05}	Face interview confidently and will be able to know the qualities of participants taking part in GD

Medi-Caps University, Indore
Department of Electronics Engineering

SEMESTER – V

Sr. No.	Subject Code	Courses	L	T	P	Credit
1	**EC3CO06**	**Digital Signal Processing**	**3**	**1**	**2**	**5**
2	EC3CO11	Digital Communication	3	1	2	5
3	**EC3CO19**	**Antennas and Propagation**	**3**	**0**	**2**	**4**
4	EC3CO10	Microprocessors & Microcontrollers	3	0	2	4
5	EC3E*XX	Program Elective II	3	0	0	3
6	OEXXXXX	Open Elective I	3	0	0	3
7	EN3NG05	Soft Skills-III	2	0	0	2
		Total	**20**	**2**	**8**	**26**
		Total Contact Hours	30			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO06	**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 Orthogonal transforms: Properties and applications of DFT, implementing linear time invariant systems using DFT, circular convolution, linear convolution using DFT; two dimensional DFT, FFT algorithms: Decimation in time, decimation in frequency; Goertzel algorithm, Chirp Z, DCT.

Unit-II 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.

Unit-III Implementation of digital filters : Direct form-I, Direct form-II, Cascade form and Parallel form structures for FIR and IIR filters. Lattice and Lattice-Ladder Structures. Telligen's theorem for digital filters and its applications. Quantization, round-off and over flow errors in Digital Filters.

Unit-IV Discrete Random Signals: Random variables, statistical averages, correlation, covariance, central limit theorem, Discrete time random process, response of linear system to random signals, power spectral density of random process, bandpass random processes, optimum filtering.

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

Textbooks:

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	Analyze the discrete signals in frequency domain using DFT, FFT and other algorithms.
CO03	Analyze and implement digital filters using different structures.
CO04	Analyze 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
EC3CO11	Digital Communication	3	1	2	5

Course Learning Objectives:

CLO1 To familiarize with the principle of digital communication.

CLO2 To familiarize with the various line coding schemes and modulation techniques.

CLO3 To familiarize with the various shift keying techniques and spread spectrum techniques.

CLO4 To familiarize with phenomenon of information theory.

CLO5 To familiarize with the concept of channel coding techniques.

UNIT I Digital communication system model, analog vs. digital communication; Fundamental limitations of communication systems. PCM, Quantization (uniform and non-uniform), quantization noise, DPCM, ADPCM, DM, ADM. Audio and video compression.

UNIT II Baseband Pulse Transmission: Line coding: Characteristics of line codes, NRZ and RZ forms of unipolar, polar, bipolar and bi-phase line codes, their waveforms & PSD. **Baseband demodulation techniques:** Matched filter, Inter Symbol Interference, Pulse shaping (Raised cosine spectrum, duo-binary signalling), Equalization, Eye patterns. **Signal-space representation:** Geometric representation of signals and WGN. MAP and ML detectors. Error performance of detectors.

UNIT III Digital Passband Modulation, Demodulation and Spread Spectrum techniques: BPSK, DPSK, QPSK, BFSK, M-ary PSK & FSK, MSK, QAM, Non-

coherent BFSK and DPSK: Their generation, detection, waveforms, PSDs, performance of these systems in the presence of noise. Introduction to Spread Spectrum techniques: Spread Spectrum overview, pseudo-noise sequence, Direct Sequence & Frequency Hopping Spread Spectrum.

UNIT IV Introduction of Information theory: Concept of amount of information, entropy & its types, source encoding such as Shannon-Fano, Huffman Codes, Information rate, Channel capacity (its calculation for BSC, BEC, noiseless channels and Gaussian channel), Shannon's theorem, Bandwidth and S/N trade off.

UNIT V Channel coding: Linear Block codes (Systematic codes, Parity check matrix, Syndrome testing), Cyclic codes, Hamming codes, BCH codes, Convolutional codes. Low Density Parity Check codes. Block codes

Text Books

1. S. Haykin, “Digital Communication”, John Wiley & Sons.
2. B. P. Lathi, “Modern Digital and Analog Communication Systems”,Oxford University Press.
3. Taub & Schilling, “Principles of Communication System”, TMH.

Reference Books

1. J. G. Proakis & M. Salehi, “Digital Communications”, McGraw-Hill International.
2. M. S. Roden, “Analog and Digital Communication Systems”, Discovery Press.
3. B. Sklar, “Digital Communications”, Pearson.

Web resources

1. Prof. Bikash Kumar Dey, Digital Communication, IIT Bombay (nptel.iitm.ac.in)\
2. Saswat Chakrabarti, Prof. R.V. Rajakumar, Digital Communication, Prof., IITKharagpur (nptel.iitm.ac.in)
3. Prof. Lizhong Zheng, Prof. Robert Gallager, Principles of Digital Communications I, MIT

List of Practicals

1. Understand the concept of TDM and perform four channel time division multiplexing and de multiplexing operation.
2. Generate PCM, learn transmitter and receiver system based on PCM
3. Generation of modulated signal based on Delta and Adaptive Delta method and demodulates them.
4. Generate and observe the data using various data formatting techniques.
5. Perform Experiment based on digital companding techniques (A-law & μ-law)
6. Study of digital carrier techniques (ASK, FSK, PSK) transmitter and receiver system.
7. Experiments based on MATLAB Simulation tool
    a. To design and verify the operation of ASK, FSK and PSK generator & demodulation
    b. Calculate BER of ASK, FSK & PSK using constellation diagram.
8. Write a program for determination of various entropies and mutual information of a given channel. Test various types of channel such as
    a) Noise free channel. c) Binary symmetric channel
    b) Error free channel d) Noisy channel
9. Write a program for generation and evaluation of variable length source coding using
    a) Shannon –Fanocodingandecoding b) Huffman Coding and decoding
10. Write Programs for coding & decoding of Linear block codes and cyclic code.

Course Outcomes (COs):

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

CO01	Explain the digital communication model , its characteristics, applications and limitations.
CO02	Analyse the performance of various line coding techniques , their mechanism . Analysis and design of matched filter, ISI, electric and magnetic field emission from various basic antennas with mathematical formulation of the analysis.
CO03	Analyse various shift keying techniques , comparision of their performance. Analysis of various spread spectrum techniques.
CO04	Analyse the practical design considerations of horn, slot, microstrip antennas.
CO05	Explain the space wave propagation focusing on field strength variation with distance and height, effect of earth's curvature, absorption, and super refraction.
CO06	Explain the concept of information theory, Shannon-Fano, Huffman Codes, Information rate, Channel capacity and SNR.
CO07	Explain various channel coding techniques.

Medi Caps University

Faculty of Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credit
EC3CO19	Antennas and Propagation	3	0	2	4

Course Learning Objectives:

CLO1 To familiarize with the principle of radiation and the way a body radiates.CLO2 To familiarize with the performance parameters of antenna

CLO3 To familiarize with the geometry, characteristics, and performance of antennas like horn,slot, log periodic and others.

CLO4 To familiarize with antenna modelling tools.

CLO5 To familiarize with the concept of radio wave propagation, wave propagation throughionosphere; diversity principles.

UNIT I

BASIC CONCEPTS OF RADIATION

Basic sources of Radiation i.e. Single-wire, Two-wires, Dipole, Radiation Integral and Auxiliary Potential Functions.
Basic antenna parameters – Types of Radiation pattern, Antenna field Zones, Radiation power density, Radiation Intensity, Beamwidth, Directivity, Antenna efficiency, Gain, Beam efficiency, Bandwidth, polarization, Antenna Impedance, Antenna Vector effective length and Equivalent Area, Maximum Effective Area, Friis transmission and Radar range equation, Reciprocity Theorem.
Radiation from Wires - Infinitesimal dipole, finite-length dipole, Half dipole, Monopole antenna.

UNIT II

ANTENNA ARRAYS ANALYSIS

Two element arrays – different cases, Principle of Pattern Multiplication, N element Uniform
Linear Arrays – Broadside, Endfire Arrays, EFA with Increased Directivity; Concept of Scanning Arrays. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Related Problems.

UNIT III

SPECIAL ANTENNAS

Traveling wave, slot, Loop and folded dipole antennas, Arrays with Parasitic Elements, Yagi - Uda Arrays & their characteristics, Log Periodic Antenna, Reflector Antennas: Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds.
Helical Antennas – Significance, Geometry, basic properties; Design considerations for monomial helical antennas in Axial Mode and Normal Modes

UNIT IV

HORN AND MICRO STRIP ANTENNA

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Base Station Antenna, Mobile Station Antenna.
Radiation from rectangular and circular patches, feeding techniques. Basic Knowledge Microstrip array and feed network; Introduction to CAD tools used for antenna modelling i.e. CST, HFSS, I3DE.

UNIT V

PROPAGATION OF RADIO WAVE

Basics of propagation – Ground wave propagation, Effect of Earth on Radiation Pattern, Space wave propagation – considerations in space wave propagation, super refraction , Ionospheric wave propagation - Structure of ionosphere mechanism of Ionospheric propagation, Effect of earth's magnetic field on radio wave propagation, Virtual height, MUF, Skip distance, OWF, Ionosphere abnormalities.

TEXT BOOKS

1. A. Balanis, "Antenna Theory Analysis and Design", John Wiley and Sons, New York.
2. J.D. Kraus, "Antennas for All Application", III edition, Tata McGraw-Hill.
3. Jordan and Balmain " Electromagnetic Waves and Radiating System" , PHI Learning

REFERENCE BOOKS

1. R.E. Collin and F. Zucker– "Antenna theory" Part I, Tata Mc Graw Hill, New York.
2. I.J. Bahl and P. Bhartia," Microstrip Antennas", Artech House, Inc.

WEBSITE RESOURCES

1. Online Antennas course by IIT Bombay https://onlinecourses.nptel.ac.in/noc18_ee13.
2. You Tube Video on antennas https://www.youtube.com/channel/UCjzx-cRhnmymh18W18sMdjw/videos.

List of Practicals

1 Introduction of a Motorized Antenna Trainer Kit & Knowledge of Antenna designing tools like (HFSS and CST)

2
I. Design and analysis of Simple Dipole (L = 3λ/2, λ/2, λ/4) antenna using full wave simulator.
II. Plotting & Comparisons of the Polar graph/ radiation pattern of Simple Dipole (L = 3λ/2,λ/2, λ/4) antenna using Antenna Trainer Kit

3
I. Design and analysis of Yagi-UDA 5 & 7 Element Simple dipole antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern & Comparisons of Yagi-UDA 5 & Element Simple dipole antenna using Antenna Trainer Kit.

4
I. Design and analysis of Yagi-UDA 3 & 5 Element Simple dipole antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern & Comparisons of Yagi-UDA 3 & Element Simple dipole antenna using Antenna Trainer Kit.

5	I.	Design and analysis of Log Periodic & Helix Antenna using full wave simulator.
	II.	Plotting the Polar graph/ radiation pattern of Log Periodic & Helix Antenna using Antenna Trainer Kit.
6	I.	Design and analysis of slot, Loop and Rhombus Antenna using full wave simulator.
	II.	Plotting the Polar graph/ radiation pattern & Comparisons of slot ,Loop and Rhombus antenna using Antenna Trainer Kit
7	I.	Design and analysis of cut Parabolic Reflector Antenna using full wave simulator.
	II.	Plotting the Polar graph/ radiation pattern of cut Parabolic Reflector antenna using Antenna Trainer Kit
8	I.	Design and analysis of λ /2 Phase Array (End fire) antenna & λ / 4 Phase Array (End fire) Antenna using full wave simulators.
	II.	Plotting the Polar graph/ radiation pattern of λ /2 Phase Array (End fire) antenna & λ / 4 Phase Array (End fire) antenna using Antenna Trainer kit.
9	I.	Design and analysis of λ /2 Phase Array (End fire) antenna & λ / 4 Phase Array (End fire) Antenna using full wave simulators.
	II.	Plotting the Polar graph/ radiation pattern of Combined Co-linear Array and Broadside Array Antenna
10	I.	Design and Analysis of Micro strip Patch antenna for Wi-Fi Application using full wave simulator.

[* All antennas should be design & simulate for 750MHz/ 1GHz Frequency using any full wave simulator.]

Course Outcomes (COs):

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

CO01	Explain the radiation mechanism in wire antennas and analyse the concept of antenna properties based on reciprocity theorem
CO02	Analyse the electric and magnetic field emission from various basic antennas with mathematical formulation of the analysis.
CO03	Analyse and model uniform linear arrays such as broadside array and end fire array, derive their characteristics.
CO04	Analyse the practical design considerations of horn, slot, microstrip antennas.
CO05	Explain the space wave propagation focusing on field strength variation with distance and height, effect of earth's curvature, absorption, and super refraction.
CO06	Analyse the structure of ionosphere and understand the sky wave propagation through refraction and reflection by ionosphere.
CO07	Model various antenna structures using CST, HFSS etc.

Medi Caps University

Faculty of Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO10	Microprocessor & Microcontrollers	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.

Medi Caps University

Faculty of Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3EC04	Satellite Communication	3	0	0	3

Course Learning Objectives:

CLO1 To familiarize with the principle of Satellite Communication.CLO2 To familiarize with the orbits of Satellite.

CLO3 To familiarize with the attitude and orbit control system, equipment reliability and spacequalification and others.

CLO4 To familiarize with satellite links design equation, earth station subsystem and differenttypes of earth stations.

CLO5 To familiarize with the concept of Space segment access methods, TDMA, FDMA,CDMA, SDMA, assignment methods etc.

Unit 1 Basic Principles of Satellite

Introduction, Evolution and growth of satellites, General features, frequency allocation for satellite services, properties of satellite communication systems, role and application of Satellite Communication

Unit 2 Satellite Orbits

Elements of orbital mechanics, Equation of Motion, Kepler's laws, orbital characteristics, satellite spacing and orbital capacity, angle of elevation, eclipses, launching and positioning, satellite drift and station keeping

Unit 3 Satellite Space Segment

Attitude and orbit control system; telemetry, tracking and command; power systems, communication subsystems, antenna subsystem, equipment reliability and space qualification

Unit 4 Satellite Links and Earth station

General link design equation, system noise temperature, uplink design, downlink design, complete link design, effects of rain, earth station subsystem, different types of earth stations

Unit 5 Multiple Access and Capacity Enhancement

Space segment access methods, TDMA, FDMA, CDMA, SDMA, assignment methods, Nonlinearity, Synchronization

Text books –

1. Timothy Pratt, Charles W. Bostian, Satellite Communications, John Wiley & Sons 2001.
2. Dennis Roddy, Satellite Communications, 3rd Ed., Mc. Graw-Hill International Ed. 2001.
3. W L. Pritchard, HG. Suyderhoud, RA. Nelson, "Satellite Communication SystemEngineering".

Reference Books –

1. *Agarwal: Satellite Communications, Khanna Publishers*
2. *Raja Rao: Fundamentals of Satellite communications, PHI Learning.*

Course Outcomes (COs):

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

CO01	Explain the basic principle of satellite communication and its applications.
CO02	Explain the orbital mechanics and allied terminologies.
CO03	Explain the concept of attitude and orbit control system in satellite system along withissues like equipment reliability.
CO04	Analyze the satellite links design equation and can explain the concept of earth stationsubsystem and different types of earth stations.
CO05	Explain the concept of Space segment access methods, TDMA, FDMA, CDMA, SDMA,assignment methods etc.

Medi Caps University

Faculty of Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3ET04	Data Structure	3	0	0	3

Course Learning Objectives:

CLO1 To familiarize with the principle of linear data structure.

CLO2 To familiarize with the nonlinear 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.

Textbooks

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia BookSorce, 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

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.

Medi Caps University

Faculty of Engineering

SEMESTER – VI

Sr. No.	Subject Code	Courses	L	T	P	Credit
1	EC3CO20	VLSI Design	3	0	2	4
2	EC3CO21	Fiber Optic Communications	3	0	2	4
3	EC3CO22	Microwave Engineering	3	0	2	4
4	EC3E*XX	Program Elective III	3	0	0	3
5	EC3E*XX	Program Elective IV	3	0	0	3
6	EC3PC09	Mini Project	0	0	4	2
7	OEXXXXX	Open Elective II	3	0	0	3
8	EN3NG08	Soft Skills-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
OE00002	Neural Network and Fuzzy System	3	0	0	3

Course Learning Objectives:

CLO1 To familiarize with the principle of Artificial Neural Network and its classification,Topologies, functions and algorithms.

CLO2 To familiarize with the performance parameters of feed forward neural networks.

CLO3 To familiarize with the basic concepts, Architecture and training algorithms of recurrentneural networks.

CLO4 To familiarize with basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguisticvariables, Fuzzy sets and elements.

CLO5 To familiarize with the concept of Fuzzification and Defuzzification methods.

UNIT-I

Introduction: Evolution of neural networks, Biological Neurons, Artificial neurons, Basic model of Artificial Neural Network (ANN), Classification, Topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline, Basic Learning laws, Hebb's rule, Delta rule, widrow and Hoff LMS learning rule.

UNIT–II

Feed Forward Neural Networks:

Single -layer perceptron: Topology, learning allgorithms, Perceptron convergence theorem, limitations. Multi-layer perceptron: Topology, Back propagation learning algorithm, Kolmogorov Theorem, limitations.

UNIT–III

Recurrent Neural Networks:

Recurrent Neural Networks: Basic concepts, Architecture and training algorithms, Hopfield network: Topology, learning algorithm. Applications of Neural networks: Communication, Robotics, and pattern recognition.

UNIT–IV

Fuzzy Logic:

Basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguistic variables, Fuzzy sets and elements: Representation, Operations and Properties, Fuzzy Relations: Cardinality, Operations, Properties, Membership function and uncertainty. Fuzzy equivalence and tolerance relation, Value assignment: cosine amplitude and max-min method;

UNIT-V

Fuzzification, Membership value assignment, development of rule base and decision-making system. Defuzzification to crisp sets, Defuzzification methods, Applications of fuzzy theory: fuzzy logic control.

Text Book

1. S. Hakins, Neural Networks – , Pearson Education.
2..T. J. Ross, Fuzzy Logic with Engineering Applications, McGraw Hill.

Reference Book

1. B. Yegnanarayana, Artificial Neural Networks, PHI, India.
2. F. O. Karray and C. De Silva., Soft Computing and Intelligent Systems Design, Theory, Tools and Applications, Pearson Education, India.

Course Outcomes (COs):

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

CO01	Explain Artificial Neural Network and its classification, Topologies, functions andalgorithms and apply the tool.
CO02	Explain the concept of feed forward neural networks.
CO03	Explain the basic concepts, Architecture and training algorithms of recurrent neural networks
CO04	Analyze the efficiency of fuzzy systems in various applications of approximation and classifications and explain basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguistic variables, Fuzzy sets and elements.

Medi Caps University

Faculty of Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00003	Industrial Electronics	3	0	0	3

Course Learning Objectives:

CLO1 To familiarize with the principle of power semiconductor devices.

CLO2 To familiarize with the performance parameters of Rectifiers.

CLO3 To familiarize with the principle of chopper operation, Chopper classifications, constantfrequency system, variable frequency system and others.

CLO4 To familiarize with Voltage and Current commutated Inverters, PWM inverters. VoltageSource Inverter and Current source inverters.

CLO5 To familiarize with the concept of Cyclo converter and AC Voltage Converters

Unit I

Power semiconductor devices

Operation, characteristics and construction of Power diodes, Power transistor, Power MOSFET. Thyristor**:** Construction of Silicon controlled rectifies (SCR), Modes of operation, V-I characteristics, two transistor analogy of SCR, turn-on and turn-off methods, thermal characteristics of SCR. Other members of SCR family such as DIAC, TRIAC, IGBT, GTO.

Unit II

SCR Analysis and Phase Controlled Rectifier

Triggering methods of SCR and other members, types of commutation, analysis of SCR commutation circuits , Operation and characteristics of UJT, relaxation oscillator.
Phase Controlled rectifiers, Half wave and full wave configurations, Phase controlled rectifiers with R , RL and RLE load. Use of freewheel diode in controlled rectifiers.

Unit III

DC-DC Converters and Regulators:

Principle of chopper operation, Chopper classifications, constant frequency system, variable frequency system.
Buck converter, Boost converter, Buck-Boost converter. Cuk converters, series, shunt, fixed voltage regulators and adjustable voltage regulators.

Unit IV Inverters:

Classification and analysis of single phase inverters, Voltage and Current commutated Inverters, PWM inverters. Voltage Source Inverter and Current source inverters.

Unit V Cyclo converter and AC Voltage Converters:

Classification and operation of single phase Cyclo-converters and AC Voltage Controller, analysis for different types of loads.

Text Books

1. M. H. Rashid, 'Power Electronics - Circuits, Devices and Applications', Prentice Hall Publications.
2. P. S. Bimbhra, 'Power Electronics', Khanna publishers.

Reference Books:

1. V. Subramaniam, 'Power Electronics', New Age International (P) Ltd Publishers.
2. V.R.Moorthi, 'Power Electronics- Devices, Circuits and Industrial Applications', Oxford University Press.

Course Outcomes (COs):

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

CO01	Explain power semiconductor devices, differentiation with normal devices.
CO02	Explain the operation, construction, characteristics and applications of SCR.
CO03	Explain the working principle of chopper operation, Chopper classifications, constantfrequency system, variable frequency system and others.
CO04	Explain the concept of inverters their commutation techniques, PWM.
CO05	Explain the concept of Cyclo converter and AC Voltage Converters

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00057	System, Design and Modeling	3	0	0	3

Course Learning Objectives:

CLO1 To familiarize with the principle of data and information.

CLO2 To familiarize with the concept of system analysis and design life cycle.

CLO3 To familiarize with the concept of random variables.

CLO4 To familiarize with the concept of Markov chain.

CLO5 To familiarize with the concept of Markov processes.

Unit 1

Data and Information – Types of information: operational, tactical, strategic and statutory– why do we need information systems – management structure – requirements ofinformation at different levels of management – functional allocation of management – requirements of information for various functions – qualities of information – small case study.

Unit 2

Systems Analysis and Design Life Cycle: Requirements determination – requirements specifications – feasibility analysis – final specifications – hardware and software study – system design – system implementation – system evaluation – system modification. Role of systems analyst – attributes of a systems analyst – tools used in system analysis .

Unit 3

Random Variables- Definition, Discrete Random Variables, Probability mass Function , Distribution Functions: Bernoulli, Binomial, Geometric pmf, Poisson pmf, Continuous Random Variables, Cumulative Distribution Function(CDF), Probability Density Function (PDF), Exponential Distribution, Reliability and failure rate, Normal Distribution, Uniform Distribution. Mean, Variance and Moments of Random Variables, Function of a Random Variable and it's Expectation, Jointly Distributed Random Variable.

Unit 4

Markov Chains- Classification of stochastic process, Introduction to Markov chains, Classification of States, Transition Probabilities, Limiting State Probabilities, Higher Transition Probabilities, Concept of Transient States and Absorption Probabilities, Solution of Problems Based on Markov Chains.

Unit 5

Markov Processes -Introduction to Continues Time Markov Chains, Birthand Death Processes, The Transition Probability Function, Limiting Probabilities, Exponential

Distribution & Poison Process. Solution of Problems Based on Continuous Time Markov Chains, Introduction to Queuing Theory and M/M/1 Queuing Systems.

Reference:

1. S.M. Ross, "Introduction to Probability Models, Elsevier Publication", 2007.
2. K.S. Trivedi, "Probability and Statistics with Reliability, Queuing and Computer Science Applications", A Wiley-Interscience Publication.
3. Averill M. Law, W. David Kelton, "Simulation Modelling and Analysis , Tata McGraw-Hill Publication.
4. A Papoulis, S.V Pillai, "Probability Random Variables and Stochastic Processes", TMH Publication, 2002.

Web Sources:

1. NPTEL video lectures on **System Analysis and Design**

Course Outcomes (COs):

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

CO01	Explain the difference between data and information, types of information
CO02	Explain the concept of system analysis and design life cycle.
CO03	Explain the concept of random variables.
CO04	Explain the concept of Markov chain.
CO05	Explain the concept of Markov processes.

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

Course Learning Objectives (CLOs):

CLO01 To understand significance of VLSI in Electronics domain and to gain awareness of VLSI applications in daily life.

CLO02 To understand the operation of MOS transistors their properties and application as circuit element in VLSI circuits.

CLO03 To learn about the synchronous and asynchronous machines.

CLO04 To learn the minimization of different machines and remove redundant states & implement algorithms for system.

CLO05 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 characteristics, 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.

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.

New Course Code	New Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO21	Fiber Optic Communications	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To provide a fundamental understanding of optical communication with brief introduction to light waves and different types of optical fiber, modes configuration and its geometry.

CLO_{02} To elaborate signal degradation factors and dispersion mechanisms.

CLO_{03} To be familiar with the principles and fundamentals of optical sources (source types, used modulation techniques & source to fiber power launching) .

CLO_{04} To be familiar with the principles and fundamentals optical receivers and amplifiers

CLO_{05} Finally, students will understand the design calculation for a point-to-point optical fiber link and overview of performance measurement and monitoring equipments.

Unit 1:

Optical Fibers: Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems The nature of light, basic optical Laws, fiber types, waveguide equations for step index fibers, modes in step index fiber, power flow in the step index fibers, graded index fiber, modes in graded index fiber. Fiber fabrication: outside vapor phase oxidation, vapor phase axial deposition, modified chemical vapor deposition, double crucible method.

Unit 2:

Signal Degradation: Signal degradation in optical fibers: absorption, scattering losses, bending loss, material dispersion, waveguide dispersion, intermodal distortion, Dispersion-modified -single mode fibers. Fiber splicing: splicing techniques, optical fiber connectors.

Unit 3:

Optical Sources: Types of optical sources, Lasers: basic concepts, absorption and emission of radiation, population inversion, optical feedback and laser oscillation, spontaneous emission, stimulated emission and lasing, laser modes, single mode operation, non-semiconductor laser, Light emitting diodes: the double heterojunction LED, Planner LED, surface emitter LEDs, edge emitter LEDs, LED characteristics, optical output power, output spectrum, modulation bandwidth, reliability.

Unit 4:

Detectors and Amplifiers: Device types, optical detection principles, absorption, quantum efficiency, responsivity, long wavelength cutoff, semiconductor photodiodes without internal gain, photodiodes with internal gain, phototransistors, Optical amplifiers: semiconductor amplifiers, fiber amplifiers.

Unit 5: Advanced Systems And Applications: Wavelength Division Multiplexing, nonlinear optical effects, optical sensors, optical isolators, circulators.

Textbooks:

[1] Senior, J M, "Optical Communication Principle and Practices", II edition Pearson Education Ltd.

[2] Keiser G, "Optical Fiber communications", second edition, McGraw hill.

References:

[1] Biswas Sambhu Nath, Optoelectronic Engineering", Dhanpat Rai Publication.

[2] Gowar J., optical communication systems, PHI.

[3] William B. Jones jr., Introduction to optical fiber communication systems, Holt, Rinehart and Winston,

List of Experiments:

1. Preparation of optical fiber (single and multi-mode) for launching of light into the optical fiber and
2. calculation of numerical aperture and V-number. Identification of single mode and multi-mode fiber.
2. Measurement of attenuation loss in an optical fiber.
4. Measurement of connectorzation and splicing losses in an optical fiber system.
5. To set up a fiber optic analog link and study of PAM.
7. To set up a fiber optic digital link and study of TDM.
8. To study and measure propagation losses in an optical fiber system.
9. To study the load cell transducer characteristics of optical fiber.

Course Outcomes

After completion of this course the students shall able to:

CO_{01} Students will be able familiar with optical communication and advantages and types of optical fiber.

CO_{02} Realize the need of low loss fiber with less dispersion effect.

CO_{03} Student will become recognize role and working of main components or equipments of an optical communication system.

CO_{04} Students will be able to understand the performance measurement & monitoring techniques

CO_{05} Students will be able to understand the OFC multiplexing techniques and application

Course Code	Course Name	Hours Per Week			
EC3CO22	Microwave Engineering	**L**	**T**	**P**	**Credits**
		3	**0**	**2**	**4**

Course Learning Objectives (CLOs):

CLO_{01} To understand the propagation techniques and all intricate things connected with guided media.

CLO_{02} To understand the wave propagation effects in microwave devices.

CLO_{03} Knowing and Selection microwave tubes for generation of microwave signals.

CLO_{04} Knowing different solid-state devices for generation and reception of microwave signal

CLO_{05} Validating the microwave generations and reception using different measuring instruments

UNIT I
INTRODUCTION
RF & Microwave Spectrum. Historical Background. Typical applications of RF & Microwaves. Transmission lines and Waveguides: Circuit model for transmission lines, loss less and lossy lines, field analysis of transmission lines, Smith chart, impedance matching. Rectangular and Circular Waveguides, Concept of Mode, Characteristics of TEM, TE ,TM and Hybrid Modes; Cut-off frequency, Propagation characteristics, Wall current, Attenuation constant, Waveguide excitations.

UNIT II
PLANAR STRUCTURE
Strip Lines: Microstrip lines, coplanar structures, Slot lines, Substrate Integrated Waveguide Suspended strip lines, Fin lines – configurations, Field patterns, propagation characteristics, Design considerations. Comparison of characteristics of lines.

UNIT III
WAVEGUIDE PASSIVE COMPONENTS
Waveguide Resonators-Rectangular & Cylindrical; Resonant frequencies, Mode structures, Q factor, Co-axial Resonators; Excitation & Coupling of cavities, Design of resonators. N-port networks – circuit representations, Z – matrix, Y – matrix, S – matrix, transmission matrix; their relationships; Attenuators, Phase shifter, Directional couplers, Power divider E & H plane Tee, Magic Tee, Hybrid ring, Circulators, Isolators, Flanges, Bends, Irises, Posts, Loads.

UNIT IV
SOLID STATE MICROWAVE DEVICES
Tranferred electron devices- GUNN EFFECT; negative differential resistance phenomenon, field domain formation. GUNN diode structure. Avalanche transit time devices, IMPATT, TRAPATT, BARITT diodes, parametric amplifiers.

UNIT V
MICROWAVE FILTERS
Periodic Structures, Filter Design by the Image Parameter Method, Filter Design by the Insertion Loss Method, Filter Transformations,
Textbooks:

- David M. Pozar, "Microwave Engineering", Third Edition, Wiley India.
- R.E. Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press.
- Samuel Y. Liao, Microwave Devices and Circuits, PHI.

References:

- M.L. Sisodia and G.S. Raghuvanshi, Microwave Circuits and Passive Devices, Wiley Eastern Ltd., New Age International Publishers Ltd.
- I.J. Bahl and P. Bhartia," Microstrip Transmission Lines", Artech House, Inc.
- Harrington RF, "Electromagnetic fields" Mc Graw Hill

WEBSITE RESOURCES

- Online Microwave Theory & Techniques course by IIT Bombay
  http://nptel.ac.in/noc/individual_course.php?id=nocHYPERLINK
  "http://nptel.ac.in/noc/individual_course.php?id=noc18-ee22"18HYPERLINK
  "http://nptel.ac.in/noc/individual_course.php?id=noc18-ee22"-eeHYPERLINK
  "http://nptel.ac.in/noc/individual_course.php?id=noc18-ee22"22.

List of Experiment

1. Introduction & study of Different microwave measurement instrument and components. Design and analysis of X- BAND Rectangular and Circular waveguide using full wave simulator.
2. To study the V-I characteristics of Gunn oscillator and to observe the variation of power & frequency with the biasing voltage.
3. Characterization of a crystal detector at microwave frequency using waveguide test bench (WR 90).
4. To study the variation of output power and frequency of a Reflex Klystron with the variation of repeller voltage (Dynamic method) & hence to determine mode number, transit time, electronic tuning range (ETR) and electronic tuning sensitivity (ETS).
5. Measurement of Wavelength, Guided wave length and Frequency using Waveguide test bench (WR-90). Calculation of broad wall dimension of waveguide and plot -.
6. Measurement of Unknown Impedance (Inductive, Capacitive and Resonant Windows) using Smith Chart.

7	Measurement of Coupling Factor and Directivity of Directional Coupler using Calibrated Attenuator Design and analysis of Directional Coupler using full wave simulator.
8	Measurement of Reflection Coefficient without using Slotted line.
9	To Measure the dielectric constant of a low loss solid dielectric using waveguide test bench (WR 90).
10	To measure the Scattering Matrix of Magic Tee & E & H Plane Tee. Design and analysis of Magic Tee & E & H Plane Tee using full wave simulator.

Course Outcomes (COs):

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

CO_{01} Students will be able to understand wave propagation effects in waveguides and waveguide circuits.

CO_{02} Student will become well conversant with different types of Microwave devices and circuits.

CO_{03} Will acquire design skills and grow confident.

CO_{04} Students will be able to select suitable sources for the particular application and can design of their own.

CO_{05} Students will be able to design microwave filters.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3ET01	Artificial Intelligence	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand basic fundamental of artificial intelligent and search techniques.

CLO_{02} To understand optimization algorithms and importance of heuristic function in it.

CLO_{03} To study and understand various type of knowledge representation used in artificial intelligent.

CLO_{04} Knowing different type of reasoning and planning to design artificial intelligent system.

CLO_{05} To understand game playing techniques along with block problem in robotics

UNIT I
Introduction to artificial intelligence, various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search techniques.

UNIT II
Optimization Problems: Hill-climbing search Simulated annealing like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies, Heuristic Functions, Constraint Satisfaction Problem.

UNIT III
Knowledge Representation, structures, Predicate Logic, Resolution, Refutation, Deduction, Theorem proving, Inferencing, Semantic networks, Scripts, Schemas, Frames, Conceptual dependency.

UNIT IV
Uncertain Knowledge and Reasoning, forward and backward reasoning, monotonic and nonmonotonic reasoning, Probabilistic reasoning, Baye's theorem, Decision Tree, Understanding, Common sense, Planning.

UNIT V
Game playing techniques like minimax procedure, alpha-beta cut-offs etc, Study of the block world problem in robotics.

Textbooks:
1. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH
2. Artificial Intelligence: A Modern Approach by Peter and Norvig

References:
1. Artificial Intelligence by Saroj KausikISBN, Cengage Learning
2. Nils Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann

3. David Poole, Alan Mackworth, Artificial Intelligence: Foundations for Computational Agents, Cambridge Univ. Press.
4. Artificial Intelligence and Intelligent Systems by Padhy, Oxford University Press,

Course Outcomes (COs):

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

CO_{01} Understand basic fundamental of artificial intelligent and able to differentiate between AI algorithm and normal algorithm

CO_{02} Become well conversant with heuristic function and optimization algorithms.

CO_{03} Able to understand and represent various methods used for knowledge representation in artificial intelligent system

CO_{04} Able to understand and represent different type of reasoning and planning to design in artificial intelligent system

CO_{05} Student able to implement AI algorithms to solve block problems and game design

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

Objective:

The objective of this course is to familiarize the students with basic concepts of electronic circuit design and development. 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.

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} Become familiarize with basic electronic circuits & component.

CO_{02} Develop & verify simple circuits on PCB like power supply.

CO_{03} Students able to learn about Soldering and de-Soldering of electronic components on PCB

CO_{04} Students will be able to analyse different circuits.

CO_{05} Students will be able to design & simulate project.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EL02	Data Communication and Computer Networks	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand the basic concepts of data communication and computer network and concept behind OSI and TCP/IP reference model.

CLO_{02} To learn about services, issues and features of Data Link layers of TCP/IP protocol suite

CLO_{03} To learn about services and protocols of MAC sub-layer and about LAN/ WLAN standards.

CLO_{04} To learn various networking devices, routing protocols and IP addressing concepts.

CLO_{05} To learn about services & protocols of Transport and Application Layer.

Course Outcomes (COs):

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

CO_{01} Describe the components and process of data communication system and Computer Network.

CO_{02} Identify the services offered and issues of various layers of TCP/IP protocol suites.

CO_{03} To have the knowledge of underlying technique and methodology for implementation of computer network.

CO_{04} To have an understanding of protocols used for data communication and Computer networks.

CO_{05} To understand the quality of service issues in a network.

MEDI-CAPS UNIVERSITY
Knowledge is Power

MEDI-CAPS UNIVERSITY

With effect from 2018 Batch

Electronics & Communication Engineering

Course Code	Course Name	Hour Per Week			Credit
		L	T	P	
EC3EL02 / EI3EL02	Data Communication and Computer Networks	3	0	0	3

UNIT I Overview of data communication, Introduction to computer networks: network criteria and application, protocol and standards, line configuration, topologies, categories of networks. Concepts of layering and layered model: OSI reference model, TCP/IP reference model, their comparative study. **The Physical Layer:** Introduction to physical layer-data and signal, digital data transmission, parallel and serial transmission, transmission impairments, channel capacity, performance metrics of networks, overview of bandwidth utilization: multiplexing schemes, concepts of switching: Circuit switching: time division & space division switch, TDM bus, message switching and packet switching.

UNIT II The Data Link Layer: Error detection techniques: Parity check, Vertical and longitudinal redundancy check, CRC code and checksum. Data link layer issues-Point to point and multipoint links, flow control, sliding window protocol, various ARQ techniques for error and flow control and their comparison.

UNIT III Medium Access Control- Pure and slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Protocol, **LAN/WLAN Standards:** A brief survey of IEEE LAN standards, Comparative study of Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, IEEE802.11.

UNIT IV The Network Layer: Network layer Services, Design Issues, Concept of Internet working & devices-Repeaters, Hubs, Bridges, Switches, Router and Gateway. Routing algorithms-shortest path algorithm, flooding, distance vector routing and link state routing. Internet addressing- IP addressing scheme, IPv4 protocol, IPv6 protocol.

UNIT V The Transport & Application Layer: Transport layer services, User Datagram Protocol and Transmission Control Protocol, Congestion control algorithm-Leaky bucket algorithm, Token bucket algorithm, choke packets, Quality of service-techniques to improve QoS, Application Layer Design issues and services, client server model, HTTP, SMTP, domain name system.

Text Book:

1. Behrouz A. Forouzan, Data Communication and Networking, Tata-McGraw Hill.
2. Andrew S. Tanenbaum, Computer Networks, Pearson Education.

References:

1. Bertsekas and Gallager, Data Networks, Pearson Education
2. William Stallings, Data and Computer Communications, Pearson Education.
3. Uyless D. Black, Computer Networks, Pearson Education.
4. Alberto Leon-Gracia, Indra Widjaja, Communication Networks: Fundamental Concepts and Key Architectures, Tata-McGraw Hill.
5. Gerd Keiser, Local Area Network, Tata-McGraw Hill.

SEMESTER – VII						
Sr. No.	**Subject Code**	**Courses**	L	T	P	Credit
1	EC3E*XX	Program Elective V	3	0	0	3
2	EC3E*XX	Program Elective VI	3	0	0	3
3	OEXXXXX	Open Elective III	3	0	0	3
4	**EC3PC06**	**Minor Project**	0	0	8	4
5	EC3PC03	Industrial Training	0	2	0	2
		Total	**9**	**2**	**8**	15
		Total Contact Hours	19			

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3ET05	Introduction to Machine Learning	3	0	0	3

Course Learning Objectives (CLOs):

CLO$_{01}$ To explain the formulation of well-specified machine learning problems.

CLO$_{02}$ To explain the formulation machine learning problems corresponding to different applications.

CLO$_{03}$ Classification of different types of Machine Learning models.

CLO$_{04}$ Understand the fundamental concepts in machine learning and popular machine learning algorithms

CLO$_{05}$ To explain deep learning concepts

UNIT I

Introduction to Machine learning, Types of Learning, Hypothesis Space & Inductive Bias, Evaluation, Cross Validation, Linear regression with single and multiple variables, Logistic regression, regularization.

UNIT II

Neural Network: Biological neuron, structure of an artificial neuron, feed forward neural network, back propagation algorithm, single layer perceptron, multi-layer perceptron.

UNIT III

Classification: Generalized linear models, SVM, Non-linear hypothesis and Kernel Methods, Multi-class Classification, Model Representation, learning, unconstrained and constrained optimization.

UNIT IV

Unsupervised learning algorithms: Clustering, Dimensionality reduction, PCA, Anomaly detection, recommender systems.

Unit V

Semi-supervised Learning, Reinforcement Learning: Deep Learning, CNN, RNN architectures, Training RNN- Loss and BPTT, LSTM, Deep RNN and Bi-RNN.

TextBooks:

- E. Alpaydin, Introduction to Machine Learning, MIT Press
- A. Smola and S.V.N. Vishwanathan Introduction to Machine Learning, Cambridge University Press

References:

- T. Mitchell, Machine Learning, McGraw Hill
- Rudolph Russell, "Machine Learning", bpb.
- Manaranjan Pradhan, "Machine Learning using Python", Wiley.

Course Outcomes (COs):

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

CO_{01} To explain the concepts of machine learning and its applications

CO_{02} To explain the concepts of neural network, its architecture, learning and application

CO_{03} To explain the different types of Machine Learning models.

CO_{04} To analyze and use concepts of training in machine learning and popular machine learning algorithms for neural network training

CO_{05} To apply the deep learning concepts for construction of CNN and RNN

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3ET06	Metaheurisctic Techniques	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand basic fundamental of Optimization Algorithms .

CLO02 To study to solve multi-objective and multi-model optimization problems by using met heuristic techniques.

CLO03 To study Genetic Algorithm , Ant Colony , BEE Optimization ,PSO Algorithm, Bacterial Foraging Optimization

CLO04 To understand the implementation of Genetic Algorithm , Ant Colony , BEE Optimization ,PSO Algorithm, Bacterial Foraging Optimization in given problem

CLO05 To study applications of meta-heuristic techniques

UNIT I
Introduction
Optimization, Type of Optimization, combinatorial optimization, Optimization Algorithms, Met heuristics, Exploration and Exploitation, Algorithm Complexity, No Free Lunch Theorems, Multi objective and Multi-model optimization

UNIT II
Genetic Algorithm :
Basic concepts, Search space, working principle. Encoding : binary, permutation, Value and Tree. Decoding, fitness function, Parent Selection : Roulette-wheel, Boltzmann, Tournament, Rank, Crossover : single-pint, two-point, multi-point, uniform, matrix and cross over rate, Mutation , mutation rate, Surviver selection: Delete all , Steady-state and Elitism. Adaptive GA and Real coded GA.

UNIT III
Ant colony and BEE optimization
Ant foraging behavior, Ant Colony Optimization, Double Bridge Problem, Virtual Ant Algorithm
Behavior of Honey Bees, Honey Bee Algorithm, Virtual Bee Algorithm Artificial Bee Colony Optimization, traveling sales man problem, graph portioning,

UNIT IV
Particle swarm Optimization
Basic principle, algorithm, flowchart. Variations of PSO: weighted, repulsive, stretched, comprehensive learning, combined effect PSO , clonal PSO, Accelerated PSO and multimodal PSO

UNIT V
Bacterial Foraging Optimization

Forging theory, social foraging, foraging behavior of E. Coli bacteria, BFO algorithm, chemotatic, swarming, reproduction and elimination and dispersal. Variations of BFO: fuzzy BFO and Adaptive BFO
Applications: function optimization, adaptive system identification, channel equalization and financial forecasting.

Textbooks:

1. Engineering Optimization: An Introduction with Metaheuristic Applications, Xin-She Yang, John Wiley
2. Evolutionary Computation: A Unified Approach De Jong PHI

References:

1. K. M. Passino, Biomimicry for optimization, control and automation
2. Search and Optimization by Metaheuristics Techniques and Algorithms Inspired by Nature **Du**, Ke-Lin, **Swamy**, M. N. S. , Birkhauser.
3. Modestus o. Okwu, lagouge K. Tartibu, "Metaheuristic optimization" springer.

Course Outcomes (COs):

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

CO_{01} Learner is able understand the fundamental concept of Optimization techniques and categorizing them.
CO_{02} Develop the skill to understand and implement ,Genetic Algorithm for various optimization problems
CO_{03} Develop the understanding and knowledge of Ant colony and BEE optimization technique
CO_{04} Develop the understanding and knowledge of Particle swarm Optimization technique
CO_{05} Develop the understanding and knowledge of Bacterial Foraging Optimization technique

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EV01	Design for Testability	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To explain the need of testing , modeling of faults

CLO_{02} To explain the techniques for fault diagnosis in digital circuits

CLO_{03} To explain the different types of testing circuits.

CLO_{04} To understand basic fundamental of Ad hoc techniques

CLO_{05} To explain the Built in self test (BIST).

UNIT I

VLSI Testing needs and challenges, defects and faults, modelling of faults: stuck at faults, bridging faults, breaks and transistor stuck on/open faults, delay faults, temporary faults.

UNIT II

Fault diagnosis in digital circuits, test generation techniques for combinational circuits: one dimensional path sensitization, Boolean difference, D- algorithm, PODEM, FAN.

UNIT III

Testing of sequential circuits as iterative combinational circuits, state table verification, test generation based on circuit structure, functional fault models, test generation based on functional fault models

UNIT IV

Design for testability: Ad hoc techniques, scan path technique, level sensitive scan design, partial scan, boundary scan.

UNIT V

Built in self test (BIST): Test pattern generation for BIST, exhaustive testing, pseudo exhaustive and pseudo random pattern generator, output response analysis, BIST architecture.

Textbooks:

1. N. Jha & S.D. Gupta, “Testing of Digital Systems”, Cambridge.
2. W. W. Wen, “VLSI Test Principles and Architectures Design for Testability”, Morgan Kaufmann Publishers.
3. P. K. Lala,” Fault tolerant and fault testable hardware design”, BS publication.

References:

1. M. L. Bushnell &V.D. Agrawal,” Essentials of Electronic Testing for Digital, memory & Mixed signal VLSI Circuits”, Kluwar Academic Publishers.

2. P. K. Lala," Digital circuit Testing and Testability", Academic Press.
3. M. Abramovici, M. A. Breuer, and A.D. Friedman, "Digital System Testing and Testable Design", Computer Science Press,

Course Outcomes (COs):

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

CO_{01} Apply the concepts in testing which can help them design a better yield in IC design

CO_{02} Tackle the problems associated with testing of semiconductor circuits at earlier design

CO_{03} Analyse the various test generation methods for static & dynamic CMOS circuits.

CO_{04} Identify the design for testability methods for combinational & sequential CMOS circuit

CO_{05} Recognize the BIST techniques for improving testability.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EV03	Low Power VLSI Design	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand in detail various power dissipation mechanisms in VLSI Circuits.

CLO_{02} To infer the significance of low power designing and learn methods of reducing the power dissipation.

CLO_{03} To study the design methodology of various architectures and systems using low power design approach.

CLO_{04} To explore various power estimation techniques in VLSI Circuits.

CLO_{05} To understand the synthesis and simulation techniques using software for low power VLSI designs.

UNIT-I

Introduction: Introduction to VLSI design, Review of MOS transistor models, CMOS logic families including static and dynamic logic.

Power dissipation mechanisms: Sources of power dissipation in VLSI circuits, Physics of power dissipation in CMOS devices – Basic principle of low power design.

UNIT-II

Static Power Dissipation: Charge leakage mechanisms in MOS transistors, Technology scaling and its effect; Threshold voltage roll-off and its effect on sub-threshold current, Gate leakage – limitations of SiO2 as gate oxide, high-k dielectric and its advantages.

Low power approach: Power supply gating principles, Multiple-threshold circuits, Frequency vs. dissipation, strained Silicon MOS technology requirements.

UNIT-III

Dynamic Power dissipation – Short circuit power, switching power dissipation, Supply voltage scaling approaches: Static Voltage Scaling; Single-level Voltage Scaling (SVS), Frequency vs. dissipation.

Low power approach: Circuit level – Transistor sizing, Scaling Approaches, Architecture level – Parallel and pipeline architectures, Algorithm level – Transformations to exploit concurrency,.

UNIT-IV

Low power Architecture & Systems:

Adders: Standard Adder Cells, CMOS Adders Architectures, Low Voltage Low Power Design Techniques, Current Mode Adders.

Multipliers: Types Of Multiplier Architectures- Braun, Booth Multipliers and their performance comparison.

Memories: Sources of power dissipation in SRAMs, Low power SRAM circuit techniques, Sources of power dissipation in DRAMs, Low power DRAM circuit techniques.

UNIT-V

Power estimation techniques – logic power estimation, Simulation power analysis, Probabilistic power analysis.

Synthesis and software design for low power – Behavioral level transform, software power estimation – co-design.

Textbooks:

1. Gary K. Yeap, Practical Low Power Digital VLSI Design, KAP.
2. Rabaey and Pedram, Low power design methodologies, Kluwer Academic.
3. Kiat Seng Yeo and Kaushik Roy, Low- Voltage, Low-Power VLSI Subsystems, Tata Mc Graw Hill
4. Abdelatif Belaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer.

References:

1. Soudris D, Piguet C and Goutis C, Designing CMOS Circuits for Low Power, Kluwer Academic Publishers.
2. Kaushik Roy, Sharat Prasad, Low-Power CMOS VLSI Circuit Design, Wiley.
3. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley.
4. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer.

Course Outcomes (COs):

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

CO_{01} Ability to identify the sources and types of power dissipation existing in a CMOS VLSI Circuits.

CO_{02} Understand the effect of miniaturization of transistors for low power techniques

CO_{03} Competence for designing various systems and architectures like multiplexers, adders etc using low power approach

CO_{04} Capability to locate the sources of power dissipation in SRAM & DRAM circuits and design them using low power approach.

CO_{05} Acquiring knowledge for estimation of power at different level- behavioral level, Architectural level, logic level and circuit level.

Antenna

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EV05	VLSI for Wireless Communication	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01}	To understand the basic concepts of communication , path loss, fading
CLO_{02}	To explain the designing aspects of receiver
CLO_{03}	To explain the designing aspects of mixers
CLO_{04}	To explain the designing aspects of data converters
CLO_{05}	To explain the designing aspects of frequency synthesizers

UNIT I

Communication Concepts in terms circuit designer perspective

Introduction, Access methods, Overview of Modulation schemes (BFSK,BPSK,QPSK), Wireless channel description, Path loss and its characteristics, characteristics of Multipath fading. Importance of Radio frequency Design, RF Behavior of Passive Components. Review of MOS device physics, Nonideal effects in MOSFET.

UNIT II

Receiver Architectures

Introduction, Receiver front end, Filter design, Rest of receiver front end, Nonlinearity, Harmonic distortion, intermodulation,IP_3, Gain compression, Noise, Noise Sources, Noise Figure.

Low Noise Amplifier (LNA): Introduction, Matching Networks, Matching for Noise and Stability, CMOS LNA.

UNIT III

Mixers

Introduction, mixer fundamentals, Conversion Gain, unbalanced mixer, CMOS active Mixer, single balanced mixer, double balanced mixer: Gilbert Mixer, Passive CMOS Mixer.

UNIT IV

Data Converters

Characteristics of S/H and Quantization noise, ADC and DAC specifications, ADC and DAC architectures, OP-AMP based ADC and DAC.

UNIT V

Frequency Synthesizer: Phase/Frequency-Processing Components Introduction, PLL based Frequency Synthesizer, Phase Detector/Charge Pump, Dividers, VCO, LCO, Ring Oscillator.

Textbooks:

- B. Leung VLSI for Wireless Communication, Prentice Hall - Electronics and VLSI Series
- B. Razavi, RF Microelectronics, Pearson
- T. H. Lee, The Design Of CMOS Radio-Frequency Integrated Circuits Cambridge University Press

Reference:

- R. Ludwig, P. Bretchko, "RF Circuit Design" 1st Indian Reprint, Pearson Education Asia
- B Razavi, "Design of Analog CMOS Integrated Circuits" McGraw Hill.
- Jeremy Everard "FUNDAMENTALS OF RF CIRCUIT DESIGN", John Wiley & Sons Ltd.

Course Outcomes (COs):

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

CO_{01} To explain the basic concepts of communication , path loss, fading

CO_{02} To design receiver and CMOS low noise amplifiers and addressing the issues of noise , stability and nonlinearity

CO_{03} To design CMOS mixers

CO_{04} To design data converters

CO_{05} To design frequency synthesizers

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00040	**Optimization Techniques**	**3**	**0**	**0**	**3**

Course Learning Objectives (CLOs):

CLO_{01} To understand basic fundamental of optimization techniques.

CLO_{02} To understand the various aspects of linear programming.

CLO_{03} To understand the concepts of Unconstrained Nonlinear Programming

CLO_{04} To understand the concepts of Constrained Nonlinear Programming

CLO_{05} To understand the concepts of dynamic programming

Unit I
Introduction to Optimization Techniques
Engineering applications of Optimization, Statement of an Optimization problem: design vector, design constraints, constraint surface, objective function, objective function surfaces; Classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization; Multi variable Optimization without constraints: necessary and sufficient conditions for minimum/maximum; Multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers; Multivariable Optimization with inequality constraints –Kuhn – Tucker conditions.

Unit II
Linear Programming
Standard form of a linear programming problem; Geometry of linear programming problems Definitions and theorems ; Linear programming problem-simplex method, Two Phases of the Simplex Method, Duality, Mixed-integer programming. Goal programming, Quadratic programming, Transportation models and its variants, Sequencing problem, Replacement theory.

Unit III
Unconstrained Nonlinear Programming
One dimensional minimization methods and Classification, Fibonacci method and Quadratic interpolation method; Quadratic interpolation method; Newton method; Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

Unit IV
Constrained Nonlinear Programming
Characteristics of a constrained problem; Classification ; Complex method ;Sequential linear programming; Basic approach of Penalty Function method : convex programming problem; Basic approaches of Interior and Exterior penalty function methods .

Unit V
Dynamic Programming

Formulation of Multi stage decision problem–Characteristics; Concept of sub-optimization and the principle of optimality; Formulation of Dynamic programming–Backward and Forward recursion; Computational procedure–Conversion offinal value problem in to Initial value problem.

Textbooks:

- Singiresu S. Rao "Engineering Optimization: Theory and Practice", Fourth Edition ,John Wiley & Sons, Inc.
- Hillier and Lieberman "Introduction to Operations Research", TMH.
- R. Panneerselvam, "Operations Research", PHI.
- Hamdy ATaha, "Operations Research –An Introduction", Prentice Hall India.

References:

- Philips, Ravindran and Solberg, "Operations Research", John Wiley.
- Ronald L.Rardin, "Optimization in Operation Research" Pearson Education Pvt. Ltd. New Delhi.
- Chander Mohan, Kusum Deep, "Optimization Techniques", New Age Science.

Course Outcomes (COs):

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

CO_{01} Able understand the fundamental concept of Optimization techniques and categorizing them.

CO_{02} Develop the skill to understand and use Linear Programming for various optimization problems

CO_{03} Develop the skill to understand and use Unconstrained Nonlinear Programming for various optimization problems

CO_{04} Develop the skill to understand and use Constrained Nonlinear Programming for various optimization problems

CO_{05} Develop the understanding and knowledge of Dynamic Programming

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00041	Random Process	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand basic fundamental of probability, probability distribution and analysis of random variables

CLO02 To understand the various concepts of bivariate distributions

CLO03 To understand the concepts of random process

CLO04 To understand the concepts of spectral characteristics random processes.

CLO05 To calculate and analyze the response of linear systems to random processes.

UNIT I
RANDOM VARIABLES
Probability –Axioms of probability Conditional probability, Baye‘s theorem, Probability Distributions: Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions. Discrete, continuous and mixed random variables, probability mass function, probability density function, cumulative distribution functions, Expectation , Moments, Moment generating functions, Markov inequality , Chebyshev inequality.

UNIT II
DIMENSIONAL RANDOM VARIABLES
Joint distributions, Marginal and conditional distributions, Covariance, Correlation, Regression, Transformation of random variables, Central Limit Theorem.

UNIT III
RANDOM PROCESSES
Classification, Stationary, Nonstationary and Wide-Sense stationary processes , Gaussian Process, Markov process, Poisson process, Random telegraph process.

UNIT IV
SPECTRAL CHARACTERISTICS
Auto correlation functions, Cross correlation functions, Properties, Power spectral density, Cross spectral density, Properties, White Gaussian Random Process,.

UNIT V
LINEAR SYSTEMS RESPONSE
Linear time invariant system , System transfer function , Linear systems with random inputs , Auto correlation, Cross correlation functions and power spectral density of output, Bandpass Random Process, Wiener Hopf filter.

Textbooks:

1. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press.
2. S. Palaniammal, "Probability and Random Processes", PHI.

References :

1. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint.
2. Hwei Hsu, "Schaum"s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill, New Delhi.
3. Scott miller, "Probability and random process", Academic press.

Course Outcomes (COs):

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

CO_{01} Analyze the randomness involved in various phenomenon using probability, probability distribution and moments

CO_{02} To apply various probability norms and correlation analysis for bivariate random variables.

CO_{03} To explain random process

CO_{04} To explain the correlation and PSD for random processes.

CO_{05} Able to calculate and analyze the response of linear systems to random processes.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00018	Python Essentials	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To acquire programming skills in core Python. Learn the syntax and semantics of the Python language.

CLO02 Use the most important elements of Python Standard Library. To acquire Object Oriented Skills in Python

CLO03 To develop the skill of designing Graphical user Interfaces in Python

CLO04 To develop the ability to write Implement database and GUI applications.

CLO05 Install runtime environment and write program in Python.

UNIT – I
Basic Introduction
Introduction to Python, History, Features, Command interpreter and development environment IDLE, Application of Python, Python 2/3 differences, Basic program structure-quotation and indentation, operator, basic data types and In-bult objects.

UNIT – II
Function and Sequence
Functions: definition and use, arguments, block structure, scope recursion, argument passing, conditionals and Boolean expressions, Lambda function, in build functions (str(),globals().locals().vars(),eval(),exec()execfile(),repr(),repr(),ascii()) Sequences: Strings, Tuples, Lists Literation, looping and control flow, string methods and formatting.

UNIT – III
File Operation & OOPS concepts
Reading config files in python, writing log files in python, understanding read functions, read(), readline() and readline(), understanding write functions, write() and writelines(), Mainpulating file pointer using seek.

UNIT - IV
OOPS Concepts
Object oriented concepts – Encapsulations, polymorphism, classes, class instances, constructor & Destructors__init__. __del__. Multiple inheritance, operator overloading properties, special methods, emulating build-in types.

UNIV – V
Mutable data types, Exception and standard modules
Dectionaries, sets and mutability, exceptions list and dict comprehensions, standard modules-math, random packages.

Textbooks:

1. Dr. R. Nageswara Rao, Core Python Programming, dreamtech press.
2. Paul Barry, Head First Python, O RELLY

References:

1. Mark Luiz, Learning Python, O RELLY
2. Jamie Chan, Cearn Python in one day, LCF Publishing.
3. Steven F. Lott, “Python Essentials”, packt publishing.

Course Outcomes (COs):

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

CO_{01} Explain basic principles of Python programming language

CO_{02} Implement object oriented concepts,

CO_{03} Implement database and GUI applications.

CO_{04} Install runtime environment and perform programming

Course Code	Course Name	Hours Per Week			
OE00042	DATA ACQUISITION SYSTEMS	L	T	P	Credits
		3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand basic fundamental of Data Acquisition system, Be able to identity a data acquisition system. General structure of a system of data acquisition and processing

CLO_{02} To understand the different methods of Digital to Analog (DAC) and Analog to Digital convertor and its Operating principles.

CLO_{03} To understand the different types of Data Acquisition techniques and Sensor/Transducer interfacing. Understand the principles of operation of commonly used sensors, transducers, and instruments.

CLO_{04} To understand the different characteristics and application of Op-Amp.

CLO_{05} To understand the different types of data transfer techniques .

UNIT I
INTRODUCTION
Objective of DAS, Generalities about data acquisition and processing, General structure of a system of data acquisition and processing , Single Channel DAS, Multi Channel DAS, Components used in DAS, Graphical Interface (GUI) Software for DAS, Remote Terminal Unit (RTU), PC-Based data acquisition system

UNIT II
DATA ACQUISITION SYSTEM (DAS)
Digital to Analog Converters (DAC), Operating principles and implementation of DAC, Characteristics of DAC- Resolution, Linearity, Monotonicity, Settling time, Digital to Analog converter DAC0804
Analog to Digital Converters (ADC), Operating principles and implementation of ADC, Characteristics of DAC- Resolution, Linearity, Monotonicity, Settling time, Analog to Digital converter ADC 0804

UNIT III
DATA ACQUISITION TECHNIQUES
Analog and digital data acquisition, Sensor/Transducer interfacing, Unipolar and bipolar transducers, Sample and hold circuits, Interference, Grounding and Shielding

UNIT IV
DATA ACQUISITION WITH OP-AMPS
Operational Amplifiers, CMRR, Slew Rate, Gain, Bandwidth. Zero crossing detector, Peak detector, Window detector. Difference Amplifier, Instrumentation Amplifier (IA), Interfacing

of IA with sensors and transducer, Basic Bridge amplifier and its use with strain gauge and temperature sensors, Filters in instrumentation circuits

UNIT V
DATA TRANSFER TECHNIQUES
Serial data transmission methods and standards RS 232-C: specifications connection and timing, 4-20 mA current loop, GPIB/IEEE-488, LAN, Universal serial bus, HART protocol, Foundation- Fieldbus, ModBus, Zigbee and Bluetooth.

Textbooks:

- Coughlin, R.F., Operational Amplifiers and Linear Integrated Circuits, Pearson Education
- Kalsi, H.S., Electronic Instrumentation, Tata McGraw Hill
- Gayakwad, R.A., Op-Amp and Linear Integrated Circuits, Pearson Education
- Mathivanan, N., Microprocessor PC Hardware and Interfacing, Prentice Hall of India Private Limited
- Dinesh K. Anvekar & B.S. Sonde, Electronic Data Converters-Fundamentals & applications, Tata McGraw Hill

References:

- Ananad, M.M.S., Electronic Instruments and Instrumentation Technology, Prentice Hall of India Private Limited.
- Murthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India Private Limited
- Hermann Schmid, Electronic Analog/Digital Conversions, Tata McGraw Hill

Course Outcomes (COs):

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

CO_{01} Explicate the elements of data acquisition techniques.

CO_{02} Design and simulate signal conditioning circuits.

CO_{03} Elucidate various data transfer techniques

CO_{04} Understand the components of data acquisition system

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00003	Industrial Electronics	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Learning of power semiconductor devices like power diode, transistor, IGBT etc

CLO02 Learning and understanding about thyristor

CLO03 Learning about dc to dc converter

CLO04 Learning of inverters

CLO05 Learning Cyclo converter and AC Voltage Converters

Unit I

Power semiconductor devices

Operation, characteristics and construction of Power diodes, Power transistor, Power MOSFET. Thyristor**:** Construction of Silicon controlled rectifies (SCR), Modes of operation, V-I characteristics, two transistor analogy of SCR, turn-on and turn-off methods, thermal characteristics of SCR. Other members of SCR family such as DIAC, TRIAC, IGBT, GTO.

Unit II

SCR Analysis and Phase Controlled Rectifier

Triggering methods of SCR and other members, types of commutation, analysis of SCR commutation circuits , Operation and characteristics of UJT, relaxation oscillator.

Phase Controlled rectifiers, Half wave and full wave configurations, Phase controlled rectifiers with R , RL and RLE load. Use of freewheel diode in controlled rectifiers.

Unit III

DC-DC Converters and Regulators:

Principle of chopper operation, Chopper classifications, constant frequency system, variable frequency system.

Buck converter, Boost converter, Buck-Boost converter. Cuk converters, series, shunt, fixed voltage regulators and adjustable voltage regulators.

Unit IV

Inverters:

Classification and analysis of single phase inverters, Voltage and Current commutated Inverters, PWM inverters. Voltage Source Inverter and Current source inverters.

Unit V

Cyclo converter and AC Voltage Converters:

Classification and operation of single phase Cyclo-converters and AC Voltage Controller, analysis for different types of loads.

Textbooks:

- M. H. Rashid, 'Power Electronics - Circuits, Devices and Applications', Prentice Hall Publications.
- P. S. Bimbhra, 'Power Electronics', Khanna publishers.

References:

- V. Subramaniam, 'Power Electronics', New Age International (P) Ltd Publishers.
- V.R.Moorthi, 'Power Electronics- Devices, Circuits and Industrial Applications', Oxford University Press.
- Bogdan M. Wilamowski, J. David Irwin. "Fundamentals of Industrial Electronics", CRC Press.

Course Outcomes (COs):

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

CO_{01} Students will be able to understand about power semiconductor devices.

CO_{02} Student will become familiar with SCR and its use in rectifiers.

CO_{03} Students will be able to understand DC-DC conversion circuits.

CO_{04} Acquire knowledge about inverter.

CO_{05} Acquire knowledge about AC voltage regulator.

Course Code	Course Name	Hours Per Week				
		L	T	P	Credits	
OE00058	Internet of Things	3	0	0	3	

Course Learning Objectives (CLOs):

CLO_{01} To understand the definition, basic design and conceptual framework of IoT.

CLO_{02} To learn about characteristics of M2M devices and its protocols and learn the concepts of software defined networking and network function virtualization.

CLO_{03} To learn about web & messaging protocols used by IoT/M2M devices and Internet connectivity principles.

CLO_{04} To study about different types of sensors and actuators used in IoT applications and learn concepts of various sensor data communication protocols.

CLO_{05} To learn about generic IoT system design methodology and to study about IoT application deployment.

UNIT I
Introduction:
Definition, Characteristics of IoT, IoT Components and its Implementation, Physical design of IoT, Logical design of IoT, Applications of IoT, IoT Levels and Deployment Templates.

UNIT II
IoT & M2M:
Machine-to-machine (M2M), SDN (software defined networking) and NFV (Network Function Virtualization) for IoT, IoT Cloud Based Services.

UNIT III
Communication Protocols and Design Principles for Web Connectivity:
IoT Communication Environment, Communication Protocols for IoT/M2M connected devices: COAP, LWM2M, JSON,MQTT, XMPP. Web Connectivity for connected devices network using Gateway, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity, Internet based communication, IP addressing in IoT.

UNIT IV
Sensors and IoT enabling Technologies:
Sensor Technology, Industrial IoT and Automotive IoT, Actuator, Sensor Data Communication Protocols, RFID IoT Systems, Wireless Sensor Network Concepts and Architecture.

UNIT V
IOT Design methodology & Case studies:

Specifications - Requirement, Process, Domain model, Service, Functional & Operational view. Raspberry Pi & Arduino devices. IoT Case Studies: Home Automation, Smart City Streetlights Control and Monitoring.

Textbooks:

- Rajkamal, "Internet of Things", Tata McGraw Hill publication.
- V. Madisetti and A. Bahga, "Internet of things (A-Hand-on-Approach)", Universal Press.

References:

- H. Chaouchi "The Internet of Things: Connecting Objects", Wiley publication.
- F. Dacosta "Rethinking the Internet of things: A scalable Approach to connecting everything",
  Apress publications.
- Qusayf. Hassan, " Internet of things", Wiley.

Course Outcomes (COs):

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

CO_{01} Define IoT and illustrate logical and physical design of IoT.

CO_{02} Describe the next generation IoT networking architecture and various protocols used for connecting M2M devices.

CO_{03} Illustrate the features and working of various protocols in Constrained Restful Environment.

CO_{04} Illustrate the use of sensors and actuators in IoT applications and working principle of data communication technologies used in IoT.

CO_{05} Describe the IoT system design methodology, use of IoT deployment boards like Raspberry Pi and Arduino and elaborate the IoT system deployment in smart city.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00059	Cyber Security	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand the Cybercrime, Classifications of Cybercrimes

CLO02 To understand the Cyber Security, Internet Governance

CLO03 Knowing about Cyber Security Vulnerabilities

CLO04 Knowing different Cryptography and Network Security

CLO05 Understand Cyber Forensics, Cyber Security Regulations.

UNIT I

Introduction to Cyber Crime

Introduction to Cybercrime, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Hacking, Software Piracy, Password Sniffing, Credit Card Frauds, Cyberstalking, Botnets, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, DoS and DDoS Attacks, Malware, Cyber terrorism.

UNIT II

Introduction to Cyber Security

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Security Evolution, Need for a Comprehensive Cyber Security Policy.

Securing Web Application, Services and Servers: Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services.

UNIT III

Cyber Security Vulnerabilities and Cyber Security Safeguards

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Authentication, Biometrics.

UNIT IV

Cryptography and Network Security

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication and Hash functions, Digital Signatures, Public Key infrastructure, Diffe-Hellman key exchange protocol, Applications of Cryptography, Overview of Firewalls-Types of Firewalls,

UNIT V

Cyber Forensics, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy.

Testbooks:

- N. Godbole and S. Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
- W. Stallings, "Cryptography and Network Security: Principles and Practice" Pearson

References:

- Principles of Cyber crime, Jonathan Clough Cambridge University Press.
- William Stallings, "Network Security Essentials Applications and Standards Pearson.
- Fourozon, "Cryptography & Network Security" TMH.
- Harish Chander , Cyber Laws and IT Protection, PHI.

Course Outcomes (COs):

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

CO_{01} Students will be able to understand Cybercrime, and Cyber Security, Internet Governance.

CO_{02} Student will become well conversant with different types of Cyber Security Vulnerabilities

CO_{03} Develop requirement and understanding of Cryptography and Network Security

CO_{04} Students will be able understand Cyber Forensics, Cyber Security Regulations.

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

Purpose:

Purpose of Major Project is to provide the students an opportunity to develop an operating prototype or some design or analysis of a complex system using system analysis tools. Primary objective is to motivate them for converting innovative and novel ideas / techniques into a working model / prototype involving multi-disciplinary skills and / or knowledge.

Primary objectives of the Project are:

1) To conceptualise an idea / technique into a product, to get an insight of the practical aspects of the contemporary technical realms.
2) To analyze and understand the management aspects of implementing a project
3) To understand and analyze the challenges of teamwork, preparation of presentation in a professional manner, and documentation of all aspects of design work.

Description of Topic

An appropriate topic from core or allied fields based on the contemporary realms may be taken up by a team of maximum of four students and supervised by a member of staff. Development of prototype product, design, empirical analysis, simulation may be permitted as the actions to be carried out. The contribution of the individuals in the project should be clearly brought out. A technical report describing the developments, in a prescribed format, is to be prepared. A presentation is to be made for the reviewers on the work done by the candidate.

Action plan and schedule:

S.No.	Description of project work progress	Week	Submission
1	Team Formation (Max. 4 members in a Group), Identification of broad area and pilot survey or preliminary search.	1	Proposal Submission and Internal Presentation (Week 3)
2	Literature survey and selection and finalization of topic before a committee	2-3	
3	Project identification, the objective and methodology and expected outcome of the proposed work.		
4	Detailing and preparation of Project (Modelling, Analysis, Design and Development of Project)	4-8	Project Progress Submission and Presentation (Week 7)
5	Testing and improvement	9-10	

6	Acceptance Testing	11	Discussion with guide and reviewers
7	Report Writing	11-13	
8	Presentation	13	Final Project Report and Presentation

Project Evaluation

S.No.	Assessment component	Expected outcome	Evaluators and week
1	Review -1 Project Proposal	A short presentation to be delivered on: 1) A brief, descriptive project title (appropriate word length). 2) Technical details such as Relevancy of the project in contemporary aspects; technology to be used; Viability /feasibility of the project; Extent of preliminary work done.	Panel of reviewers 3
2	Review-2 Progress Analysis	Analysis of Techniques, Concept Sketches, Design Specifications / Modules & Techniques used along with System architecture • Coding; Experimental Analysis Emphasis on Originality, clarity in implementation of idea and teamwork	Panel of reviewers 7
3	Review-3 Final Analysis	Final Concept and Model / Algorithm/ Technique /Prototype / Coding • Final Presentation and Demonstration Emphasis on Originality, clarity in implementation of idea and teamwork,	Panel of reviewers 11
4	Review-4 Report Approval	Technical Report Systematic, in prescribed format; clearly reflecting the progress and extent of work	Guide and panel of reviewers 13

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.

Medi Caps University

Faculty of Engineering

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	**EC3PC10**	**Major Project**	**0**	**0**	**24**	**12**
		Total	0	0	24	12
		Total Contact Hours	2		24	

A project encourages students to learn new techniques and technology which will be required in their professional place / industry and gain experience in the professional employment world. This program is an essential component in the curriculum of Engineering bachelor's 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 • Estimations – Time and Features	2nd week
Analysis	• Software Requirement Specification • Presentation I	4th week
Design	• Software Design Specification • Presentation II	8th week
Implementation	Presentation – III	14th week

	Dissertation – I Report + Viva – Voce	End Sem exam (Evaluation by External examiner must)