

Department of Computer Science and Engineering

CURRICULUM AND SYLLABUS **(2022-2026)**

B.Tech. Computer Science and Engineering



MEDI-CAPS
UNIVERSITY

Computer Science and Engineering

B.Tech. (CSE)

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:

Inculcate the innovative thinking in Computer Science and Engineering graduates with domain knowledge and skills to address contemporary industrial and social requirements.

Mission of the Department:

1. Provide an environment to the students to learn with passion and equip with proper skill set to address current problems.
2. Provide maximum exposure to innovative techniques available to cater industrial needs by maintain the best Industry- Academia relation.
3. Imparting best problem-solving strategies in students to work in a team.
4. Develop leadership qualities in Computer Science graduates to work for the society.
5. Attract experienced and expert faculty members and create an enthusiastic academic environment.

Department of Computer Science and Engineering

Program Education Objectives (PEOs)

- PEO₀₁** Provide strong theoretical foundations to work with cutting edge computing technologies and design solutions to complex engineering problems to work in any competitive environments.
- PEO₀₂** Impart skills such as team building, inter-personal skills, and leadership qualities in order to effectively communicate with engineering community and with society at large.
- PEO₀₃** Promote research culture through internships, industry trainings, research-oriented projects, sponsored collaborative research and enable them to pursue higher studies in computer and related fields.
- PEO₀₄** Create ethically strong, professionally, and globally competent employees and entrepreneurs.

Department of Computer Science and Engineering

PROGRAMME OUTCOMES (POs)

- PO₀₁** **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of
- PO₀₂** **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
- PO₀₃** **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.
- PO₀₄** **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.
- PO₀₅** **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO₀₆** **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.
- PO₀₇** **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.
- PO₀₈** **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO₀₉** **Individual and teamwork:** 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.

Department of Computer Science and Engineering

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO₀₁** Ability to understand the principles and working of computer systems and a good knowledge about the hardware and software aspects of computer systems.
- PSO₀₂** Ability to work in multidisciplinary teams in small- and large-scale projects by utilizing modern software engineering tools and emerging technologies.
- PSO₀₃** Ability to design and develop computer programs and understand the structure and development methodologies of software systems.
- PSO₀₄** Ability to apply their skills in the field of the specialization AI, Data Science, Web Technology, Networking and Cloud Computing web design, cloud computing and data analytics.



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Medi-Caps University Indore (M.P.)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Choice Based Credit System- Scheme of B.Tech CSE-Core (2022 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			

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.	Course Code	Courses	L	T	P	Credit
1	CS3BS04	Discrete Mathematics	3	0	0	3
2	CS3CO30	Object Oriented Programming	3	0	2	4
3	CS3CO31	Data Structures	3	0	2	4
4	CS3CO32	Java Programming	2	0	2	3
5	CS3CO33	Digital Electronics	3	0	2	4
6	CS3CO28	Data Communication	3	0	0	3
7	CS3CO34	Computer System Architecture	3	0	0	3
8	EN3NG03	Soft Skills-I	2	0	0	2
		Total	22	0	8	26
		Total Contact Hours	30			

SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO35	Microprocessor and Interfacing	3	0	2	4
2	CS3CO36	Operating Systems	3	0	2	4
3	CS3CO37	Advanced Java Programming	2	0	2	3
4	CS3CO38	Theory of Computation	4	0	0	4
5	CS3CO39	Database Management Systems	3	0	2	4
6	CS3ELXX	Elective-1	3	0	2	4
7	EN3NG04	Soft Skill-II	2	0	0	2
		Total	20	0	10	25
		Total Contact Hours	30			

Scheme of B.Tech -Computer Science &Engineering 2022

SEMESTER – V

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO40	Software Engineering	3	0	2	4
2	CS3CO43	Computer Networks	4	0	2	5
3	CS3ELXX	Elective-2	3	0	2	4
4	CS3ELxx	Elective-3	3	0	2	4
5	EN3HS04	Fundamentals of Management, Economics & Accountancy	3	0	0	3
6	EN3NG04	Soft Skills-II	2	0	0	2
7	OE000XX	Open Elective-1	3	0	0	3
		Total	21	0	8	25

		Total Contact Hours	29	
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SEMESTER – VI

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO44	Compiler Design	4	0	2	5
2	CS3CO45	Design and Analysis of Algorithms	4	0	2	5
3	CS3ELxx	Elective-4	3	0	0	3
4	CS3ES15	Research Methodology	3	0	0	3
5	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
6	CS3PC04	Mini Project	0	0	4	2
7	EN3NGxx	NSS/NCC/Yoga/Sports/Club Activities	0	0	2	1
8	OE000xx	Open Elective-2	3	0	0	3
		Total	19	0	10	24
		Total Contact Hours	29			

Scheme of B.Tech -Computer Science &Engineering

SEMESTER – VII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3ELXX	Elective-5	3	0	0	3
2	CS3ELXX	Elective-6	3	0	0	3
3	CS3PC03	Industrial Training	0	2	0	2
4	CS3PC05	Project-I	0	0	8	4
5	EN3NG06	Open Learning Courses	1	0	0	1
6	OE000xx	Open Elective-3	3	0	0	3
		Total	10	2	8	16
		Total Contact Hours	20			

SEMESTER VIII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3PC06	Project-II	0	0	24	12
		Total	0	0	24	12
		Total Contact Hours	24			

**Summary of Credits****171**

S.NO	Course Work	Total Credits (CS)	Credits as per Modal scheme (176)
1	Basic Sciences (BS)	16	10-15% (16-24)
2	Engineering Sciences (ES)	27	15-20% (24-32)
3	Humanities and Social Sciences (HS)	8	5-10% (8-16)
4	Core Courses (CO)	59	30-40% (48-64)
5	Program Electives (EL)	21	10-15% (16-24)
6	Open Electives (OE)	9	5-10% (8-16)
7	Project Work, Seminar	20	10-15% (16-24)
8	Non Grading	11	(11-16)

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Choice Based Credit System Scheme- B. Tech CSE

Batch 2022-2026

Medi-Caps University Indore (M.P.)

B.Tech. (I year)

Scheme (2022-26 Batch)

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			

* Non-gradual Courses

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:

CO₀₁ To illustrate the tools of matrices in solving the system of simultaneous equations,

CO₀₂ To investigate the tools of differential calculus to relevant fields of engineering and can implement the concept of several variables.

CO₀₃ 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.

CO₀₄ To solve Ordinary Differential Equations using different methods.

CO₀₅ To relate the knowledge of complex number and categorize it in solving functions of several complex numbers.

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
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 (T_c), 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:

- CO01** Understand and analyse the different types of lasers and optical fibres, operation, and its characteristics.
- CO02** Understand and apply various phenomenon of Interference, diffraction and polarization and their applications.
- CO03** Understand and apply the concept of Quantum Mechanics.
- CO04** Understand and examine the crystal structures and acquire the basic knowledge of various semiconductor devices.
- CO05** Evaluate and apply the applications of superconductivity in technology and real world.
- CO06** Apply basic concepts of oscillations in harmonic oscillator and compound pendulum.
- CO07** 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 and 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):

- CLO₀₁** To introduce fundamental concepts and analysis techniques in electrical engineering to students across all disciplines.
- CLO₀₂** 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.
- CLO₀₃** 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.
- CLO₀₄** To provide knowledge about the basic DC and AC electric circuits and magnetic circuits.
- CLO₀₅** 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:

- | | |
|-------------|--|
| CO01 | 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. |
| CO02 | Demonstrate an understanding of basic concepts of analysis of simple DC and AC circuits used in electrical engineering. |
| CO03 | Demonstrate an understanding of power supply, UPS, type of motors and their applications. |
| CO04 | Demonstrate an understanding of basic concepts of transformers, power system components and their application in transmission and distribution of electric power system. |
| CO05 | 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.



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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			Credits
		L	T	P	
EN3NG01	Environmental Science	2	0	0	2

Course Learning Objectives (CLOs):

- CLO₀₁** To impart knowledge of Environment and its basic components.
- CLO₀₂** To build basic understanding of various effects of human activities to the environment.
- CLO₀₃** To understand concepts of water pollution
- CLO₀₄** To understand function of solid waste management
- CLO₀₅** 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.



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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:

- CO₀₁** Gain knowledge of Ecosystem & Biodiversity.
- CO₀₂** Develop basic understanding of air pollution and its control method
- CO₀₃** Develop basic understanding of water pollution and its control method
- CO₀₄** Gain knowledge of Solid waste management and its importance.
- CO₀₅** 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:

- CO01** 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
- CO02** Understand the projection of points, straight lines and have the ability to convert the practical problems in to projections
- CO03** To understand and apply concepts of the projection of simple planes & solids.
- CO04** Understand and apply the concepts of Projection & Sections of solids & development of surfaces
- CO05** 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.



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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. Balaguruswamy, 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:

- CO01** Understand Basics of Computers and Programming languages.
- CO02** Understand basic concepts of C programming language required to create programs.
- CO03** Apply different types of control structures in problem solving.
- CO04** Use of Arrays and string in different problems and also to apply different operations on arrays and strings.
- CO05** 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.



sCourse Code	Course Name	Hours per Week			Credits
		L	T	P	
EN3ES01	Basic Civil Engineering	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** To give the knowledge of various building and general construction materials such as bricks, stones, timber, cement, steel and concrete & their properties and application.
- CLO₀₂** To provide basic understanding of the forces and its components, stresses, strains and the modulus of elasticity of the different construction materials.
- CLO₀₃** To understand the components of the building such as beams, columns, foundations, slabs and different types of soils and their bearing capacities.
- CLO₀₄** 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.
- CLO₀₅** 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, Poisson's 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:

- CO₀₁** Students will be able to recognize the civil engineering works and conversant about different construction materials and their uses.
- CO₀₂** Student will be able to differentiate force, pressure and stresses.
- CO₀₃** Students will be able to know the different building component and its importance.
- CO₀₄** Students will be conversant about vertical and horizontal variation of different terrains.
- CO₀₅** 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's rule.
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 in the field by using Theodolite.



SEMESTER II

SNo.	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			



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):

CLO₀₁ To illustrate knowledge of Laplace Transform and investigate its application.

CLO₀₂ To explain the concept of Fourier Series and Fourier Transform.

CLO₀₃ To illustrate the concept of Partial Differential Equations.

CLO₀₄ To impart the knowledge of Vector Calculus.

CLO₀₅ 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:

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

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

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

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

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

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 Even and Odd function, Half range series, Fourier Transform, Sine and Cosine Transform.

Unit III Partial Differential Equations

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

Unit IV Vector Calculus

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

Unit V Numerical Analysis

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

Textbooks:

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

References:

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

Web Source:

1. nptel.ac.in/courses/111103021/15
2. nptel.ac.in/courses/111105035/22
3. <https://swayam.gov.in/courses/public>
4. <http://nptel.ac.in/course.php>

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

Course Learning Objectives (CLOs):

- CLO₀₁** To gain fundamental knowledge of the principles related to, so as to meet the challenging requirements of students in chemistry studies.
- CLO₀₂** To attain awareness in students about current & new issues in the fields of chemistry.
- CLO₀₃** To make students understand about the present needs without compromising on the ability of future generations to meet their own needs for proper engineering, relevant education efficient management of resources.
- CLO₀₄** To increase curiosity and give them awareness about practical knowledge of various laboratory methods among the students regarding the course.

Unit-I Lubricants

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

Unit -II Polymer

Introduction and Classification of polymer, Preparation, Properties and Uses 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, Properties and Applications of - Superconductors, Optical Fiber, Fullerenes, Graphene, Carbon nanotubes, Nanowires.

Unit -IV Instrumental Techniques in Chemical Analysis

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

Unit- V Electrochemistry

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



Text Books:

1. Preeti Jain, Anjali Soni, Jeetendra Bhawsar, A text book of Engineering Chemistry, 1st edition, Manthan Publication, 2016.
2. Preeti Jain, S L Garg, Engineering Chemistry, 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.

Course Outcomes (COs):

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

- CO₀₁ To Understand the lubricants, their mechanism and practically analyze the properties of lubricants.
- CO₀₂ 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.
- CO₀₃ Will get familiarised with new engineering materials and their commercial applications.
- CO₀₄ Will get knowledge of using instrumental techniques and their applications for determination of chemical structure of any compound.
- CO₀₅ 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 Complexometric titration.
2. To determine total and mixed Alkalinity of given water sample using phenolphthalein and methyl orange as indicator.
3. To determine strength of unknown FAS solution by Redox titration using N-Phenyl anthranilic acid as internal indicator.
4. To determine strength of unknown CuSO₄ solution by Iodometric titration using Starch as internal indicator.
5. To determine Chloride content of water sample by Mohr's method (Argentometric titration).

Fuel Testing:

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

Lubricant Testing:

1. To determine penetration number of grease by Cone Penetrometer apparatus.
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 given lubricant.
6. To determine Aniline point of given oil sample.
7. To determine Cloud and Pour point of given lubricating sample.
8. To study rate of change of viscosity with temperature of the given lubricating oil by means of Redwood Viscometer no.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 $\text{Zn}/\text{Zn}^{2+}/\text{Cu}^{2+}/\text{Cu}$ 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.
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:

- CO01** Students will be able to understand the engineering materials, their properties, Iron-Carbon Diagram and Stress-Strain Curve, Measuring Equipment's and Testing Machines.
- CO02** Student will be thorough with the basic laws of thermodynamics and their applications in engineering also know about Refrigeration cycles and properties of refrigerants.
- CO03** Students will be able to understand the construction and working of I.C. Engines .
- CO04** Students will be able to understand the construction and working of Steam Generators
- CO05** 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:

- CO₀₁** Apply Pointers, Pointer Arithmetic and Accessing arrays, strings through pointers.
- CO₀₂** Use different user defined data types like structures, union and enum.
- CO₀₃** Understand and Use of dynamic memory allocation and preprocessor directives.
- CO₀₄** Use the concepts of file handling.
- CO₀₅** 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 animations.
41. Write a program to implement traffic signal.
42. Write a program to simulate a moving car. Draw car using simple shapes like line, circle and polygon.



Course Code	Course Name	Hours per Week			Credits
		L	T	P	
EN3HS02	COMMUNICATION SKILLS	2	0	2	3

Course Learning Objectives (CLOs):

- CLO₀₁** To develop, enhance and demonstrate LSRW Skills.
- CLO₀₂** To enable students to acquire oral presentation skills.
- CLO₀₃** To prepare students to become more confident and active participants in all aspects of their undergraduate programs
- CLO₀₄** To enable students with good vocabulary, grammar and writing skills.
- CLO₀₅** 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.



MEDI-CAPS
UNIVERSITY

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:

- CO₀₁** The students will be able to enhance confidence in their ability to read, comprehend, organize, and retain written and oral information.
- CO₀₂** The students will be able to distinguish between general and technical communication and understand its importance
- CO₀₃** The students will be able to improve upon their language skills, communication skills, group discussion, and personality development and confidence level.
- CO₀₄** The students will be able to bridge the language gap which is vital to their success
- CO₀₅** 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			Credits
		L	T	P	
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:

- CO01** Should have the knowledge of basic semiconductor materials and their usage in variety of PN junction diodes and applications of diodes
- CO02** Should be able to understand the concept operation of transistors and its configuration.
- CO03** Understand and identify the fundamental concepts and various components of analog communication systems
- CO04** Should have the knowledge of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.
- CO05** 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.

Reference Books:

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

Course Outcomes (COs):

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

- CO01** Understand the engineering materials, their properties, and their utilization in manufacturing tool and other equipment's.
- CO02** Understand the primary manufacturing process.
- CO03** Understand the basic operation involve in casting.
- CO04** Understand the basic process of forging.
- CO05** Basic knowledge of simple cutting, holding. Marking and striking tool.

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

Course Learning Objectives (CLOs):

- CLO₀₁** To know the historical perspective of science and technology in India, its roots and its role.
- CLO₀₂** To know how research and development field is progressing in India.
- CLO₀₃** To know what were the policies and plans are proposed after independence to be technologically sound.
- CLO₀₄** To Know what were the developments done in major areas of science & technology.
- CLO₀₅** To know the relationship between the technologies.

Unit-I Historical Perspective

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

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

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

Unit-III Policies and Plans after Independence

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

Unit-IV Science and Technological Developments in Major Areas

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

Unit-V Nexus between Technologies

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



Textbooks:

1. K. Rajaram, Science and Technology in India, Published and Distributed by SpectrumBooks (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:

- | | |
|-------------|--|
| CO01 | Student will be aware about the ancient India & the existence of science & technology in that era & how it is reciprocated. |
| CO02 | Student will be aware about the upliftment done in the field of R & D after independence. |
| CO03 | Student will come to know about the plans and policies that brought about radical changes for the growth of science in India. |
| CO04 | Student will come to know about the major areas of the applied science and their existence. And can set the relationship between the technologies. |
| CO05 | Students will understand the need of technology transfer, its types and processes. |



SEMESTER – III

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3BS04	Discrete Mathematics	3	0	0	3
2	CS3CO30	Object Oriented Programming	3	0	2	4
3	CS3CO31	Data Structures	3	0	2	4
4	CS3CO32	Java Programming	2	0	2	3
5	CS3CO33	Digital Electronics	3	0	2	4
6	CS3CO28	Data Communication	3	0	0	3
7	CS3CO34	Computer System Architecture	3	0	0	3
8	EN3NG03	Soft Skills-I	2	0	0	2
		Total	22	0	8	26
		Total Contact Hours	30			

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3BS04	Discrete Mathematics	3	0	0	3

Course Learning Objectives (CLOs):

- CLO₀₁** To understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.
- CLO₀₂** To understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.
- CLO₀₃** Equip the students with the knowledge of group theory and its application in computer science as coding theory.
- CLO₀₄** To study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.
- CLO₀₅** To develop the ability to solve the recurrence relations by using various methods.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit –V

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

Text Books

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

References

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

Course Outcomes (COs):

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

- CO₀₁** Understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.
- CO₀₂** Understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.
- CO₀₃** Equip the students with the knowledge of group theory and its application in computer science as coding theory.
- CO₀₄** Study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.
- CO₀₅** Develop the ability to solve the recurrence relations by using various methods.



Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO30	Object Oriented Programming	3	0	2	4

Course Learning Objectives (CLOs):

CLO₀₁ Understand the concepts of Object-Oriented Programming.

CLO₀₂ Understand the concepts of Objects and Classes.

CLO₀₃ Understand the concept of relationships between classes.

CLO₀₄ Understand the concept of inheritance and polymorphism.

CLO₀₅ Understand the concept of container classes.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Text Books

1. David Parsons; Object oriented programming with C++; BPB publication
2. Robert Lafore, Object-oriented programming in Turbo C++, Galgotia Publication.
3. E. Balaguruswami, "Object Oriented Programming in C++", TMH.
4. Scott W Amber, The Object Primer , 3/e, Cambridge.



References

1. Schildt H., Teach Yourself C++, Tata McGraw Hill.
2. Hubbard J. R., Schaum's Outline of Programming with C++, McGraw Hill.

Course Outcomes (COs):

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

- CO01** Differentiate between OO Programming vs Procedural Programming.
- CO02** Understand the OO Programming with its properties.
- CO03** Understand the object-oriented programming paradigm specifically including abstraction, encapsulation, inheritance, and polymorphism.
- CO04** Describe and explain the factors that contribute to a good object-oriented solution, reflecting in your own experiences and drawing upon accepted good practices.
- CO05** Learn the preliminaries of Object-Oriented modelling and how it helps in software development.

List of Experiments:

1. Write a program to find out the largest number using function.
2. Write a program to find the area of circle, rectangle and triangle using function overloading.
3. Write a program to implement complex numbers using operator overloading and type conversion.
4. Write a program using class and object to print bio-data of the students.
5. Write a program which defines a class with constructor and destructor which will count number of objects created and destroyed.
6. Write a program to implement single and multiple inheritances taking student as the sample base class.
7. Write a program to add two private data members using friend function.
8. Write a program using dynamic memory allocation to perform 2x2 matrix addition and subtraction.
9. Write a program to create a stack using virtual function.
10. Write a program that store five student records in a file.
11. Write a program to get IP address of the system.
12. Write a program to shut down the computer system.



Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO31	Data Structures	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** To impart the basic concepts of Data structure and algorithm
CLO₀₂ To understand concept about Linked lists and their types.
CLO₀₃ To understand concept about stacks, and Queue and recursion function
CLO₀₄ To know various Searching and sorting algorithm with all its complexity and favourable cases and to understand about hash function and storage management techniques
CLO₀₅ To understand about Tree and graph representation
CLO₀₆ To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

Unit-I

Definitions and Types of Data Structures, Concept of Linear and Non-Linear, Static and Dynamic, Primitive and Non-Primitive, Persistent and Non-Persistent Data structure, Overview of array, one dimensional array and multidimensional array, Pointers, Recursive functions

Unit-II

Concept of Linked List organization, Singly List, Doubly List, Circular list and doubly circular Linked List Operations: Linked list implementation of stack and queue, Applications of Linked List data structure

Unit-III

Stack, Primitive Stack operations, Array Implementation of Stack, Multiple Stack, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Queue, Overview of Queue, Operations on Queue, Circular Queues, Array implementation of Queues, Dequeue and Priority Queue

Unit-IV

Searching and Sorting, Sequential search, Binary Search, Internal and external Sort, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Radix Sort, Quick Sort and Merge Sort. Hashing: Hash Function, Collision Resolution Strategies, Storage Management: Garbage Collection and Compaction

Unit-V

Trees, Basic terminology, Binary Trees, Binary Tree Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal, Threaded Binary trees, AVL tree, Heaps

Graphs, Basic terminology and types of Graph, Representations of Graphs, Graph Traversal

Text Books

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and Algorithms
2. Tenebaum, Langsam&Augenstein, Data Structures Using C, Pearson
3. DebasisSamanta, Classic Data Structures, PHI learning

References

1. Horowitz and Sahani, “Fundamentals of data Structures”, University Press
2. Trembley and Sorenson, “Data Structures”, TMH Publications
3. Venkatesan , Rose, “Data Structures” Wiley India Pvt.Ltd
4. Seymour Lipschutz, Data Structures, Schaum’s Outlines Series, TMH

NPTELReference:

1. <http://nptel.ac.in/courses/106102064/>
2. <http://nptel.ac.in/courses/106106133/>
3. <http://nptel.ac.in/courses/106106127/>

Course Outcomes (COs):

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

- CO₀₁** Understanding to analyse linear and non-linear data structures and its application in computers science.
- CO₀₂** Evaluate the linked list implementation of stacks and queue.
- CO₀₃** Understanding the concept of Stack and Queue data structure and how they are implemented and how we can apply their concepts in computer science field as well as in real life.
- CO₀₄** Understanding the searching and sorting techniques.
- CO₀₅** Analysing the knowledge of tree and graphs concepts and Solve problem involving graphs, trees.

Tentative List of Programs:

1. Write the algorithm and program for matrix multiplication of $n \times n$.
2. Write the algorithm and program to Copy Elements of Array in another Array.
3. Write the algorithm and program to insert, delete and search an element in an Array.
4. Write the algorithm and program using pointers to read in an array of integers and print its elements in reverse order.
5. Write the algorithm and program to implement Stack and perform PUSH and POP Operation.
6. Write the algorithm and program to reverse the string using stack.
7. Write the algorithm and program to implement circular queue through array.
8. Write the algorithm and program to insert and delete an element into the Queue.



9. Write the algorithm and program to implement Singly Linked List and Doubly Link List.
10. Write the algorithm and program to sort N numbers in ascending order using
 - a. Bubble sort
 - b. Insertion sort
 - c. Selection sort
 - d. Quick sort
 - e. Merge sort
 - f. Radix Sort
11. Write the algorithm for implementing trees and its operations.
12. Write the algorithm and program to represent graphs and its traversal.
13. Write the program to implement travelling salesperson problem.
14. Think of solving a 2x2x2 Rubik's Cube.
15. Make a list of cities close to Indore for a pilgrimage trip and assign the distances between the cities. Make a travel plan to cover these cities in minimum distance.
16. Make a study of keeping the library cards of issued books in the library. How do we define the data structure for it and its efficiency to find the card in minimum time.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO32	Java Programming	2	0	2	3

Course Learning Objectives (CLOs):

CLO₀₁ Understand the fundamental programming concepts of Java.

CLO₀₂ Understand the object-oriented programming concepts.

CLO₀₃ Understand the concept of multiprogramming and run time problems (exception).

CLO₀₄ Understand the basic of graphical programming using AWT.

CLO₀₅ Understand graphical programming using Swing and desktop application development.

Unit I

Basics of JAVA: Overview of Java, History and Evolution of Java, Feature of Java, Difference between Java, C++ and C, Structure of java program, Basics of JDK, JRE and JVM, Installation of JDK, Simple Java Program, Compilation and Execution of Java program. Elements of Java: keywords, data types, variable, declaration and initialization of a variable, the scope and life time of variable, constants, literals, identifiers, operators, types of java statements, Unicode System, Naming Convention, Comments, Arrays, type conversion and casting.

Unit II

Dynamic Method Dispatch: Garbage Collection, static and dynamic binding, Inheritance and its types, Interfaces. **Java Packages:** Definition of package, types of packages, differentiate package from header file, importing package, creating package.

Unit III

String in Java: Overview of string, Immutable String, String Comparison, String Concatenation, Substring, Methods of String class, String Buffer class, Creating Immutable class to String method.

Unit IV

Exception Handling: Defining exception, types of exception, exception class, try and catch block, multiple catch blocks, Nested try, finally block, throw keyword, Exception Propagation, throws Keyword. **Multithreading:** Overview of thread, thread types, Life Cycle of a thread, creating thread, sleeping a thread, joining a thread, thread Priority, Daemon thread.

Unit V

I/O Handling: File Output Stream & File Input Stream, Buffered Output Stream & Buffered Input Stream, Input from keyboard by Input Stream Reader, Input from keyboard by Console, Input from keyboard by Scanner, Print Stream class. **Java Applets:** Applet Basics, the Applet Class, Applet Architecture, Applet Initialization and Termination, the HTML APPLET Tag, Passing Parameters to Applets. **Introducing the AWT:** Introduction to Windows, Graphics, and Text, AWT Classes, Window Fundamentals, Component, Container, Panel, Frame.

Text Books

1. E. Balagurusamy, Programming with java A Primer, McGraw-Hill.
2. Herbert Schildt, The Complete Reference Java 2, Tata McGraw-Hill.

References

1. Horstmann& Cornell, Core Java 2 (Vol I & II), Pearson.
2. Sharanam Shah, Core Java 8 for Beginners, Shroff Publisher.
3. Joshua Bloch, Effective Java, Sun Microsystems.

Course Outcomes (COs):

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

- CO01** Understand the fundamental programming concepts and programming logic building.
- CO02** Understand the OO Programming with its properties.
- CO03** Understand the concept of multiprogramming and handling of exceptions.
- CO04** Design the graphical program to understand the GUI programming.
- CO05** Develop the graphical user interface forms to perform basic operations like Arithmetic, click event etc.

List of Experiments:

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

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO33	Digital Electronics	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** To understand the concept of number systems and Boolean Algebra. To learn minimization of Boolean function by different methods.
- CLO₀₂** To understand the concept of Logic gates and other Combinational circuits and their designing.
- CLO₀₃** To learn about Sequential circuits and their implementation using concept of State machine and To gain awareness of digital circuits and its applications in day to day life.
- CLO₀₄** To learn about Programmable Logic Devices & Memory: Architecture and characteristics and Analyse, design, and evaluate digital circuits of medium complexity that are based on SSIs, MSIs, and programmable logic devices.
- CLO₀₅** To understand the concept of Logic families. Relation between them with respect to advancement in technology.

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 demultiplexers, code converters. Analysis and design of combinational circuits. Implementation of combinational logic using multiplexers, decoders etc.

Unit-III

Sequential Circuits

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

Unit-IV

Memories

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



Unit-V

Logic Families

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

Text Books

1. D Roy Chudhury, Digital Circuits, Vol-I & II, Eureka Publication.
2. M. Mano, Digital and Computer Design, Pearson Education.

References

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

Course Outcomes (COs):

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

- CO01** Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- CO02** To understand and examine the structure of various number systems and its application in digital design.
- CO03** The ability to understand, analyze and design various combinational and sequential circuits using programmable logic.
- CO04** Ability to identify basic requirements for a design application and propose a cost effective solution.
- CO05** To develop skill to build and troubleshoot digital circuits.



Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO28	Data Communication	3	0	0	3

Course Learning Objectives (CLOs):

- CLO₀₁** Student will be able to understand basic data communication concepts.
- CLO₀₂** Student will be able to understand about digital to digital and digital to analog conversion techniques.
- CLO₀₃** Student will get knowledge about telephone network.
- CLO₀₄** Student will get knowledge about various internetworking devices.
- CLO₀₅** Student will get information about LRC,CRC,VRC, Checksum, Hamming code.

Unit-I

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

Unit-II

Encoding of Signals -Analog to Digital Conversion, Digital to Digital conversion, - Unipolar, Polar, Bipolar line & block codes, Digital to Analog, Analog to Analog conversion, Spread Spectrum-FHSS, DHSS, CDMA. Modulation and Demodulation of Signals. Multiplexing: FDM, TDM, and WDM, QAM.

Data compression-Frequency dependent codes Run length encoding, Relative encoding, LZ Compression.

Unit-III

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

Unit-IV

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



Unit-V

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

Text Book

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

References

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

Course Outcomes (COs):

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

- CO01** Learn the functioning of physical layer, its components, and techniques
- CO02** Gain the concept of efficient BW utilization.
- CO03** Acquire knowledge of basic telephone network
- CO04** Come to know about reference model and IP addressing
- CO05** Learn various error detection and correction methods

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO34	Computer System Architecture	3	0	0	3

Course Learning Objectives (CLOs):

- CLO₀₁** To understand the structure, function and characteristics of computer system
- CLO₀₂** To understand the design of the various functional units and components of computers
- CLO₀₃** To identify the elements of modern instructions sets and their impact on processor design.
- CLO₀₄** To explain the function of each element of a memory hierarchy
- CLO₀₅** To identify and compare different methods for computer I/O.

Unit- I

Difference Between Computer Organization and Computer Architecture, Computer Types, Functional Units, Basic Operational Concepts: Bus Structures, Generation of computer, Introduction to computer operation with a simple 8bit -instruction computer illustrating assembly and machine language. Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Microoperations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Unit-II

Instruction codes, Registers, Buses, Design of computer Instructions, Timing and control, Instruction Cycle, Memory-Reference Instructions, Input-Output Interrupt, Design of Basic Computer, Accumulator logic. Programming the basic Computer-Machine Language, Assembly Language, Assembler. Address Sequencing, Microprogram Instructions Format, Addressing Modes.

Unit- III

Computer Arithmetic- Addition and Subtraction with signed magnitude, Multiplication and Division Algorithms, Divide Overflow Booth Multiplication Algorithm, Hardware implementation for signed -Magnitude and hardware algorithms.

UNIT-IV

Input -Output Organization. Input-Output Interface, Synchronous vs Asynchronous Data Transfer, Modes of Transfer- Interrupt and its Priority, DMA. Memory Hierarchy- Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Unit-V

Flynn's Classification, RISC and CISC Processor, Pipelining and Vector Processing, Parallel Processing, Array processor, Multiprocessor Architectures Organization, Multi-core Architectures, Inter-processor Communication, System-on-Chips.

Text Books

1. Computer System Architecture-M.Morris Mano- Pearson Education.

2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill.
3. William Stallings, Computer Organization and Architecture – Designing for Performance, Pearson Education.

Problem and Assignments Book

1. Nicholas Carter and Raj Kamal, Computer Architecture and Organization, Schaum Outlines, Tata McGraw-Hill Ed.

References

1. John P. Hayes, Computer Architecture and Organization, McGraw Hill.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The hardware software interface, Morgan Kaufmann, 3rd Edition.

Web Resources

- <http://www.cs.mcgill.ca/~mhawke1/cs208/02a-ComputerStructureNotes.pdf>
- <http://www.stat.auckland.ac.nz/~dscott/782/Computers.pdf>
- www-csag.ucsd.edu/teaching/cse141-w00/lectures/Introduction.pdf –
- www.cise.ufl.edu/~prabhat/Teaching/cda5155-su09/lecture.html
- www.ecl.incheon.ac.kr/courses/ca6/ca00.syllabus.pdf

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

- CO₀₁** Understand the evolution of computers and computer generations, measuring computer, technology trends, measuring computer performance, MIPS
- CO₀₂** Learn about fundamental concepts of– execution of a complete instruction, design of basic computer, addressing modes, instruction formats, stack organization
- CO₀₃** Solve questions on number systems, arithmetic operations on binary numbers, floating point representation
- CO₀₄** Understand basics of storing data and program in memory, memory hierarchy in a computer, semiconductor RAMs–ROMs, cache memories, and virtual memory
- CO₀₅** Understand pipelining, vector processing, multiprocessor architecture organization, performance, characteristics of multiprocessors.

List of Practical

1. Hardware configuration of Desktop-case, Power Supply, Motherboard- Processor, Memory, Drive Controllers, Monitor, Keyboard, Mouse, Dismantling and assembly of Desktops.
2. Detailed study of motherboard-Memory Slot, RAM, Expansion Slot, CPU Socket, Processor, Heat Sink, Processor FAN, SATA Connectors, North Bridge and South Bridge chip, ROM BIOS, CMOS Battery, I/O Controller, Chipsets, FDD Header, IDE Header, AGP Slot, PCI Slot,
3. Types of RAM-SDR, DDR-1, DDR-2, DDR-3, DDR-4. Expansion Slot,
4. Instructions of 8085 microprocessor, Address, opcode, operand, Hex code.

5. Simulation of ALU using C/C++.
6. a) Write a program using 8085 microprocessor assembly language for decimal, hexadecimal addition and subtraction of two number. Store the result at memory location XXXX.
b) Write a program using 8085 microprocessor assembly language to find the largest no in a given array. Store the result at memory location XXXX.
c) Write a program using 8085 microprocessor assembly language to find the smallest no. in a given array. Store the result at memory location XXXX.
7. a) Write a program using 8085 microprocessor assembly language to arrange the given array in ascending and descending order.
b) Write a program using 8085 microprocessor assembly language to find no. of 1's in given data byte. Store the result at memory location XXXX.
8. a) Write a program using 8085 microprocessor assembly language to calculate the sum of series of even number. Store the result at memory location XXXX.
b) Write a program using 8085 microprocessor assembly language to convert binary to ASCII Hex code. Store the result at memory location XXXX and XXXX+1 location.
c) Write a program using 8085 microprocessor assembly language to multiply two 8 bit numbers and Store the result at memory location XXXX and XXXX+1 location.
9. a) Write a program using 8085 microprocessor assembly language to add and subtract numbers in BCD. Store the result at memory location XXXX and XXXX+1 location.
b) Write a program using 8085 microprocessor assembly language to divide and multiply 16 bit no. Store the result at memory location XXXX and XXXX+1 location.
10. Write a program to Implement Booth's Multiplication Algorithm for Multiplication of 2 signed Numbers in C/C++.



Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EN3NG03	Soft Skills I	2	0	0	2

Course Learning Objectives (CLOs):

CLO₀₁ Master communication processes and models.

CLO₀₂ Develop active listening and feedback skills.

CLO₀₃ Apply emotional intelligence and adaptability in the workplace.

CLO₀₄ Utilize non-verbal communication effectively.

CLO₀₅ Demonstrate competence in interpersonal communication, group dynamics, and team communication.

Unit-I

Introduction to Communication: - Definition and importance of communication. - Communication processes and models. - Types of communication: verbal, non-verbal, written, and visual. **Listening and Feedback:** - The significance of active listening. - Barriers to effective listening. - Feedback: types, importance, and effective feedback strategies.

Unit-II

Emotional Intelligence and Adaptability: - Understanding one's Emotions: Self-awareness and self-regulation. - Interpersonal Skills: Building relationships and understanding others. – The Role of Empathy: Connecting with colleagues and superiors. - **Adaptability in the Workplace:** - Embracing change and learning agility.

Unit-III

Non-verbal Communication: - Types of non-verbal communication: body language, facial expressions, gestures. - Importance of tone and voice. - Cultural variations in non-verbal communication. **Interpersonal Communication:** - Nature and importance. - Strategies for effective interpersonal communication. - Barriers and overcoming barriers. **Group Communication and Team Dynamics:** - Role of communication in group settings. - Group norms and dynamics. - Strategies for effective group communication.

Unit-IV

Introduction to Quantitative and Logical Reasoning: - Importance and real-world applications. - Differences between quantitative and logical reasoning. **Number Systems** - Whole numbers, decimals, fractions. - Prime numbers, factors, and multiples. - Arithmetic operations and properties.

Unit-V

Modern Communication Technologies: - Introduction to digital communication. Social media and its impact on communication. - Electronic communication tools and their appropriate use. **Crisis Communication and Conflict Resolution:** - Role of communication during crises. - Strategies for crisis communication. - Communication in conflict resolution and negotiation.

Text Book:

1. Soft Skills: Know Yourself and Know The World By Dr. K. Alex, S Chand Publishing
2. A Modern Approach to Logical Reasoning by RS Aggarwal
3. R C Sharma, Krishna Mohan. Business Correspondence and Report Writing. Mc Graw Hill Education.
4. M Ashraf Rizvi. Effective Technical Communication. Mc Graw Hill Education.

References

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

Web Source

<http://study.com/academy/lesson/communication-skills-definition-examples.html>

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

Open Learning Source:

<https://onlinecourses.nptel.ac.in>

Course Outcomes (COs):

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

- CO₀₁** Understand the importance of communication.
- CO₀₂** Identify and overcome barriers to effective listening.
- CO₀₃** Develop emotional intelligence and adaptability.
- CO₀₄** Enhance non-verbal communication skills.
- CO₀₅** Apply quantitative and logical reasoning in real-world situations.
- CO₀₆** Explore modern communication technologies and their impact.
- CO₀₇** Develop crisis communication and conflict resolution strategies.



SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO35	Microprocessor and Interfacing	3	0	2	4
2	CS3CO36	Operating Systems	3	0	2	4
3	CS3CO37	Advanced Java Programming	2	0	2	3
4	CS3CO38	Theory of Computation	4	0	0	4
5	CS3CO39	Database Management Systems	3	0	2	4
6	CS3ELXX	Elective-1	3	0	2	4
7	EN3NG04	Soft Skills-II	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
CS3CO35	Microprocessor & Interfacing	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** To learn internal architectural concept and family of microprocessors (8-64 bit).
CLO₀₂ To learn assembly language programming of 8085 microprocessor.
CLO₀₃ To learn hardware interfacing and programming of various Peripheral devices with 8085 microprocessors.
CLO₀₄ To learn instruction timing and interrupts of 8085 microprocessor System.
CLO₀₅ To learn architectural features of Intel's advanced microprocessors (Core 2 Duo, Core i7, Atom).

UNIT-1

Introduction to 8-bit microprocessor: Microcomputers and microprocessors, 8/ 16/ 32/ 64-bit microprocessor families; Internal architecture of Intel 8085 microprocessor: Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address / Data bus multiplexing, De-multiplexing, Serial communication and DMA features, Intel 8086, x86 and Pentium microprocessors Block diagrams.

UNIT-2

Assembly Language Programming: 8085 instructions set: Instructions, Classifications, Addressing modes, Stack and Subroutines, Delay routines, Counters etc., Programming examples.

UNIT-3

Interfacing concepts and devices: Memory interface: Concept of memory chip/ chips interface to 8085 with appropriate examples, / IO mapped I/ O, and memory mapped I/ O techniques. Programmable interfacing devices: - Programmable peripheral interface (Intel 8255), Programmable timer interface (Intel 8253/ 54), Programmable display / Keyboard interface (Intel 8279), Programmable serial communication interface (Intel 8251) -(their architecture, register organization, initialization, hardware, and software interface to 8085.

UNIT- 4

Instruction Timing and Interrupts: Timing Diagrams (of various instructions): T- state, Machine cycle (Opcode fetch, Read / Write, Interrupts, Interrupt Acknowledge, Bus Idle, etc), Interrupts: -types (h/ w and s/ w), Maskable / Non maskable and their organization.

UNIT 5

Introduction to Intel Architecture, How an Intel Architecture System works, Internal architecture of Basic Components of the Intel Core 2 Duo Processor: The CPU, Memory Controller, I/O Controller; Intel Core i7: Architecture, The Intel Core i7 Processor, Intel QuickPath Interconnect, The SCH; Intel Atom Architecture. Introduction to Texas Instruments' Multi-Core Multilayer SoC architecture for communications, infrastructure equipment.

Text-Books:

1. Gaonkar: Microprocessors, Architecture, Programming and Applications, Wiely Eastern, 4th ed.
2. K. UdayaKumar, B.S. Umasankar, "The 8085 Microprocessor-Architecture, Programming and Interfacing", 5e, ISBN: 978 – 81 – 7758 – 455 - 4



3. Nagoor Kani, Microprocessors, architecture and programming, RBA Publications.
4. Douglas V. Hall, Microprocessors, Interfacing and Peripherals, Tata McGraw Hill, 2nd ed.

References:

1. Calvin Lin. Lawrence Snyder: Principles of Parallel Programming, Pearson Education.
2. Michael J. Quinn: Parallel Programming in C with MPI and Open MP, Tata McGraw Hill.
3. Reinders: Intel Threading Building Blocks, O'Reilly.
4. David Culler et. Al.: Parallel Computer Architecture: A Hardware/Software Approach, Elsevier.

Web Source:

1. [Microprocessor Lab | Indian Institute of Information Technology Bhagalpur \(iiitbh.ac.in\)](http://Microprocessor Lab | Indian Institute of Information Technology Bhagalpur (iiitbh.ac.in))
2. [CS330/390: Microprocessors and Interfaces/Lab \(iitb.ac.in\)](http://CS330/390: Microprocessors and Interfaces/Lab (iitb.ac.in))

Open Learning Source:

1. <https://swayam.gov.in/>
2. [Microprocessors and Interfacing - Course \(nptel.ac.in\)](http://Microprocessors and Interfacing - Course (nptel.ac.in))

Course Outcomes:

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

- CO₀₁** To know about microprocessor (8-64 bits) families and understand the architecture of 8085 microprocessor.
- CO₀₂** To understand assembly language and write down 8085 microprocessor programs including subroutines and time delays.
- CO₀₃** To understand & apply the concepts of peripheral devices to implement 8085 based microcomputer system.
- CO₀₄** To understand the internal operation and interrupt mechanism of 8085 microprocessor with the help of timing diagrams.
- CO₀₅** To understand the working of Intel's advanced processor architectures (Core 2 duo, i7, Atom) and illustrate the concepts of multi-core & multilayer SoC.

List of Experiments:

1. To study the architecture of 8085 microprocessor.
2. To study the Architectural block diagram of 8086.
3. Write a program using GNU 8085 simulator for addition of two 8/16-bit numbers.
4. Write a program using GNU 8085 simulator for subtraction of two 8-bit numbers.
5. Write a program using GNU 8085 simulator for multiplication of two 8-bit numbers.
6. Write a program using GNU 8085 simulator for division of two 8-bit numbers.
7. Find 1's and 2's complement of a 8 bit numbers using GNU 8085 simulator.
8. Write a program using GNU 8085 simulator to find largest/ smallest number from an array.
9. Write a program using GNU 8085 simulator to transfer block of data from one memory locations to another.
10. Write a program using GNU 8085 simulator to arrange data in ascending/descending order.
11. Calculate instruction cycle time and find the number of Machine cycles for the following instruction. LXI H, 1000h, LDA 1000h if the given clock frequency is 3 MHz
12. Calculate execution time for interrupt INTR and TRAP.
13. Write a program to interface 8255 PPI with the 8085 microprocessors.
14. Write a program to interface IC 8257 with the 8085 microprocessors.
15. Write a program to interface stepper motor with 8085 microprocessors.
16. Write a program to interface temperature control device with microprocessor.
17. Study of Intel dual core Processor
18. To study Intel i7 core processor.

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO36	Operating System	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** To learn the need and concepts of Operating systems, its functions and to distinguish different types of operating systems
- CLO₀₂** To learn various scheduling algorithms, problems of understanding multiple process executions with the concept of deadlock, its prevention and avoidance techniques.
- CLO₀₃** To understand the concept of memory management and to implement it with the applications of segmentations and paging.
- CLO₀₄** To learn the concept of virtual memory, page replacement algorithms and computational problems related to securities in operating systems.
- CLO₀₅** To understand the concept of file, file protection, file sharing in various types of operating systems.

Unit-1

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

Unit-2

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

Unit 3

Memory Management: Concepts of Memory Management, Logical and Physical Address Space, Swapping, Fixed and Dynamic Partitions, Best Fit, First Fit and Worst Fit Allocation, Paging, Segmentation, and Paging Combined With Segmentation.

Unit 4

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

Unit 5

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

Text Books:

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

References:

1. Terrence Chan, UNIX System Programming Using C++, Prentice Hall India.
2. W. Richard Stevens, Advanced Programming in UNIX Environment, Pearson Education.

3. William Stallings, Operating Systems, Pearson Education Asia.

Course Outcomes (COs):

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

- CO₀₁** To understand the concepts of Operating systems and functions and to distinguish different types of operating systems and describe various types of process and its execution
- CO₀₂** To implement various types of scheduling algorithms, its evaluations, to understand the concept of deadlock, its prevention and avoidance techniques.
- CO₀₃** To understand the concept of memory management and to implement the concept of worst fit, best fit and first fit memory allocations along with the applications of segmentations and paging in operating system.
- CO₀₄** To make the students familiar with concepts of virtual memory, page replacement algorithms and computational problems related to securities in operating systems.
- CO₀₅** To Involve students in designing, development and testing of file concept, file protection, file organisations and file sharing in various types of operating systems.

Course Learning Objectives (CLOs):

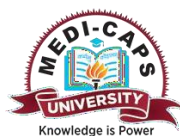
- CLO₀₁** Understand the concepts of Process Scheduling, Banker's algorithm and dining philosopher problem.
- CLO₀₂** Understand the concepts of Inter-process communication and its related problems.
- CLO₀₃** Understand the concept of Memory allocation techniques and problems related to it.
- CLO₀₄** Understand the concept of page replacement algorithms and its implementations.
- CLO₀₅** Understand the concept of Disk scheduling algorithms and problems related to it.

List of Experiments:

Lab No.	Name of Experiment	Unit
Week 1:	Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine. (Linux Installation) along with some latest operating system	1
Week 2:	Write a C/C++ program to simulate producer-consumer problem using Semaphores	1
Week 3:	Write a C/C++ program to implement classical inter process communication problem (Reader Writers).	1
Week 4:	Write a C/C++ program to implement classical inter process communication problem (producer consumer).	1
Week 5:	Write a Program to implement classical inter process communication problem (Dining Philosophers).	1
Week 6:	Write a C/C++ program to Bankers Algorithms for deadlock avoidance and deadlock prevention	2
Week 7:	Simulate the following First Come First Serve CPU scheduling algorithms	2
Week 8:	Simulate the Shortest Job First CPU scheduling algorithms	2
Week 9:	Simulate the Round Robin CPU scheduling algorithms .	2
Week 10:	Simulate the Priority based CPU scheduling algorithms	2



Week 12:	Write a C/C++ program to simulate the concept of Dining-philosophers proble.	2
Week 13:	Write a C/C++ program to simulate Worst fit contiguous memory allocation Techniques	3
Week 14:	Write a C/C++ program to simulate Best fit contiguous memory allocation Techniques.	3
Week 15:	Write a C/C++ program to simulate First fit contiguous memory allocation Techniques.	3
Week 16	Write a C/C++ program to simulate all page replacement algorithms using FIFO.	4
Week 17:	Write a C/C++ program to simulate all page replacement algorithms using LRU	4
Week 18	Write a C/C++ program to simulate all page replacement algorithms using Optimal method	4
Week 19	Write a C/C++ program to implement disk scheduling algorithm FCFS	5
Week 20	Write a C/C++ program to implement disk scheduling algorithm SSTF.	5
Week 21	Write a C/C++ program to implement disk scheduling algorithm SCAN.	5
Week 22	Write a Program to implement disk scheduling algorithm C-SCAN	5
Week 23	Write a Program to implement disk scheduling algorithm C-LOOK	5



Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO37	Advanced Java Programming	2	0	2	3

Course Learning Objectives (CLOs):

CLO₀₁ Have a broad understanding of Java collections and Generic

CLO₀₂ Have a high-level understanding of basic programming principles to the construction of websites using servlet

CLO₀₃ Be able to design user interactions on web pages, develop back-end website application and databases for functionality

CLO₀₄ Be able to design web page on Spring Framework.

CLO₀₅ Be able to develop web project using spring boot and JDBC.

Unit-1 Collection and Generic

Introduction to Generics, Generics Types and Parameterized Types, Wildcards, Java Collection Framework, Collections (Basic Operations, Bulk Operations, Iteration) List, Set, Maps Lambda Expressions - Lambda Type Inference, Lambda Parameters, Lambda Function Body, Returning a Value, From a Lambda Expression, Lambdas as Objects.

Unit-2 Introduction Java EE Programming and Servlets

Basics of Web Application, web client and web server, Servlets, HTTP Methods; GET, POST, PUT, DELETE, TRACE, OPTIONS, MVC design pattern, Init Parameters, Servlet Context, Inter Servlet Communication, Servlet Listeners, Servlet Filters.

Unit-3 JDBC and JSP

Managing JDBC Connection, Configuring Data Source to obtain JDBC Connection, Data Access operations with JDBC Template, RDBMS operation classes, JSP Architecture, JSP building blocks, Scripting Tags, implicit object, Introduction to Bean, standard actions, session tracking types and methods. Custom Tags, Introduction to JSP Standard Tag Library (JSTL) and JSTL Tags.

Unit-4 Spring Frameworks

Introduction to Spring Framework, OJO Programming Model, Lightweight Containers (Spring IOC container, Configuration Metadata, Configuring and using the Container) Dependency Injection with Spring- Setter Injection, Constructor Injection

Unit-5 JDBC and Spring Boot

Data Access operations with JDBC Template and Spring , Modelling JDBC Operations as Java Objects, Spring Boot and Database, Spring Boot Web Application Development

Text Books:

1. "Core Java for Impatients", Cay S. Horstman
2. "Java: The Complete Reference", Herbert Schildt

References:

1. "Head First Java", Kathy Sierra, Bert Bates
2. "Java for Dummies", Barry A. Burd
3. "Effective Java", Joshua Bloch

Course Outcomes (COs):

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

CO₀₁ Identify the basic concepts collection class and generic method and class.



- CO02** Apply basic design principles to present ideas, information, products, and services on websites
- CO03** Apply basic programming principles to the construction of websites and database connectivity.
- CO04** Apply basic programming principles to the construction of websites using Spring frameworks.
- CO05** Design and develop Application Programming Interfaces.

List of Practical :

1. Write a Java Program to demonstrate a Generic Class, Generic methods and wildcards.
2. Write a Java program to create List containing list of items of type String and use for-each loop , Iterator interface, ListIterator interface to print the items of the list.
3. Write a Java program using Set interface containing list of items and perform the following operations:
 - a. Add items in the set.
 - b. Insert items of one set in to other set.
 - c. Remove items from the set
 - d. Search the specified item in the set
4. Write a Java program using Map interface containing list of items having keys and associated values and perform the following operations:
 - a. Add items in the map.
 - b. Remove items from the map
 - c. Search specific key from the map
 - d. Get value of the specified key
 - e. Insert map elements of one map in to other map.
 - f. Print all keys and values of the map.
5. Write a Java program using Lambda Expression with multiple parameters to add two numbers and to concatenate two strings.
6. Write a JSP page to display the Registration form (Make your own assumptions).
7. Write a JSP program to add, delete and display the records from StudentMaster (RollNo, Name, Semester, Course) table.
8. Write a JSP program that demonstrates the use of JSP declaration, scriptlet,directives
9. Write a JSP program that demonstrates the use of JSP expression, header and footer.
10. Design loan calculator using JSP which accepts Period of Time (in years) and Principal Loan Amount. Display the payment amount for each loan
11. Write a program to demonstrate get and post method using servlets?
12. Write a program to implement servlet listeners and servlet filters methods.
13. Write a program to print “Hello World” using spring framework.
14. Write a program to demonstrate dependency injection via setter method.
15. Write a program to demonstrate dependency injection via Constructor.
16. 1. Write a program to demonstrate Spring AOP – before advice, after advice, around advice.
17. 4. Write a program to demonstrate Spring AOP – after returning advice, after throwing advice and pointcuts.
18. Write a program to insert, update and delete records from the given table.
19. Write a program to demonstrate PreparedStatement in Spring JdbcTemplate.
20. Write a program in Spring JDBC to demonstrate ResultSetExtractor Interface.
21. Write a program to demonstrate RowMapper interface to fetch the records from the database.
22. Write a program to create a simple Spring Boot application that prints a message.

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO38	Theory of Computation	4	0	0	4

Course Learning Objectives (CLOs):

- CLO₀₁** To make student understand science behind computation theoretically.
- CLO₀₂** To make student understand formal languages namely Regular language, context free language, Recursively enumerable language and its grammar
- CLO₀₃** To define and design abstract mathematical methods of various computing machine, namely Finite Automata, Pushdown Automata, and Turning Machines.
- CLO₀₄** To make student understand relationship between abstract machine with formal language and grammar.
- CLO₀₅** To understand the concept of computability and decidability of computational problems

Unit-1

Finite Automata and Regular Languages

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

Unit-2

Nondeterminism and Minimization

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

Unit-3

Grammars and Context-Free Languages

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

Unit-4

Pushdown Automata

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

Unit-5

Turing Machines and Computability

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

Text Books:

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



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References:

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

Course Outcomes (COs):

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

- CO₀₁** Design Deterministic Finite Automata and its relationship with Regular Languages and Regular expression and Properties of regular Languages.
- CO₀₂** Design Non-Deterministic Finite Automata and its relationship with Regular Languages
- CO₀₃** Describe Context free grammar, Context Free Language, properties of CFL.
- CO₀₄** Design of push down automata and describe relationship with CFG and CFL.
- CO₀₅** Design Turing machines, Its language. Describe computability problems

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
CS3CO39	Database Management System	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** Have a broad understanding of database concepts and database management system software
- CLO₀₂** Have a high-level understanding of major DBMS components and their function
- CLO₀₃** Be able to model an application's data requirements using conceptual modelling tools like ER diagrams and design database schemas based on the conceptual model.
- CLO₀₄** Be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- CLO₀₅** Be able to program a data-intensive application using DBMS APIs.

Unit-1

Basic Concepts: Data Vs Information, Definition of Database, Advantages of Database Systems, Components of DBMS, DBMS Architecture and Data Independence, Data modelling, Entity Relationship Model, Relational, Network, Hierarchical and Object-Oriented Models. Data Modelling Using the Entity Relationship Model.

Unit-2

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

Unit-3

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

Unit-4

Database Transactions Processing: Introduction to Transaction Processing, Transaction Concepts, Desirable Properties of Transactions, Schedules, Concepts of Recoverability and Serializability, Concurrency control: introduction, locking protocols.

Unit-5

Query Processing and Optimization, File organization and indexes, hashing techniques, B tree, B+ tree etc. Introduction to advanced databases: Distributed databases, Object oriented databases, mobile and web databases, Introduction to data warehousing and mining.

Text Books:

1. F.R. Mcfadden, J. Hoffer, M.Prescott, Modern Database Management, Addison Wesley.
2. Elmasri, Navathe, Fundamentals of Database System, Pearson Education Asia.

Reference Books:

1. C.J. Date, An Introduction to Database Systems, Pearson Education Asia.
- Henry F Korth, Abraham Silberschatz, Database System Concepts, Mc Graw Hill.

Course Outcomes (COs):

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

- CO₀₁** Identify the basic database concepts, architecture and understanding of various data model used in database design.
- CO₀₂** Apply relational database concepts using SQL,PL/SQL and be able to describe relational algebra expression, tuple and domain relation expression from queries.
- CO₀₃** ***Recognize and Apply*** database design concepts using integrity constraints, functional dependency and normalization.
- CO₀₄** ***Apply*** and ***relate*** the concept of transaction, concurrency control and recovery in database.
- CO₀₅** ***Analyze*** query processing and optimization techniques and understanding indexing and hashing technique and advance databases concepts.

List of Experiments:

- 1 Installation of various Database systema like Oracle, MYSQL
- 2 SQL Basics: Apply SQL SELECT statements including where, order by clauses on predefined tables.
- 3 Apply Following Compound condition and use relational operators (IN, BETWEEN, LIKE, NULL, NOT NULL etc) in SQL statements and apply different aggregate functions on predefined tables.
- 4 Study of different commands used in Data Definition and Data Manipulation Languages.
- 5 Creating new tables, adding data, updating data, altering tables, deleting data.
- 6 Implementation of different integrity constraints like Referential Integrity Constraint, entity integrity constraint and domain Constraints.
- 7 Perform operations like Natural Join, equijoin, left outer join, right outer join, full outer join, intersection, union, union all and minus on given relations.
- 8 For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions, Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause
- 9 Sub-queries: Single-Row Sub-queries, Multiple row Sub-queries, Scalar Sub-queries, Sub queries in other DML statements., nested queries.
- 10 Creating views, modifying views, dropping views, inserting and updating data using views.
- 11 Study and apply different Data Control Language commands like grant, revoke, create user roles and privileges, remove privileges.
- 12 Design a database of a car insurance company and perform the SQL queries on that database also Construct an E-R diagram for the same.
- 13 Introduction to PL/SQL.
- 14 Write following programs in PL/SQL:
 1. Print 'Hello World' in PL/SQL.
 2. learn how to declare a character type variable.
 3. Insert data to a table using character type variable.
 4. Update the data value of a table.
 5. Delete the data value of a table.
- 15 Introduction to triggers and cursors.
- 16 Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table

Course Code	Course Name	Hours per Week			Credit
		L	T	P	
CS3EL11	Statistical Analysis	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** To illustrate with the basic knowledge of measure of central tendency and dispersion.
- CLO₀₂** Elaborate the concept of random variables and distributions.
- CLO₀₃** Apply the knowledge of different distribution to find mean and variance.
- CLO₀₄** To prioritize the concept of correlation, regression and curve fitting.
- CLO₀₅** To illustrate with the concept of testing of hypothesis and its applications.

Unit -1 Summarizing Data using Statistical Measures:

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

Unit -2 Theory of Random variables and Probability:

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

Unit-3 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 -4 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 -5 Testing of Hypothesis and Analysis of variance:

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

Text Books:

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

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

Course Outcomes (COs):

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

- CO₀₁** Understanding the basic concept of central tendency, dispersion, and probability distribution for discrete and continuous random variable and remembering the formula for correlation, regression and testing of hypothesis.
- CO₀₂** Apply the theoretical methods for testing and comparison of the sample and population for mean, variance, standard deviation.
- CO₀₃** Analyze and organize the statistical data to examine the facts under view.
- CO₀₄** Evaluate the mean, median, mode on the basis of observation and compare it with the theoretical distribution and evaluate the relation between the different variates on the basis of correlation, regression.

List of Experiments:

1. Getting and using R and rstudio
2. Write a R program to take input from the user (name and age) and display the values. Compare the different forms of data types.
3. What do you mean by type conversion. Write a R program to implement datatype conversion.
4. Write a R program to create a vector of a specified type and length.- Create vector of numeric, complex, logical and character types of length 10.
5. Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
6. Write a R program to create a 5 x 4 matrix , 3 x 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns.
7. Write R script to create and display list object of stores items having:
 {Fruits:{orange,mango,apple,watermelon,banana}Juices:{appy,fruty,slice}
 Milkshakes:{Mango, papaya, sapota,pineapple} }.
8. Write R program with the implementation of base package functions.
9. Name some functions available in "dplyr" package? (minimum 5 with syntax and implementation).
10. Write about the following with example:
 a)Mean b)Max c)Median d)Cumulative Sum e)Cumulative Max
 f)Cumulative Min g)Cumulative Product
11. How we can implement Conditional statements in R. Write a R script with IF-ELSE implementation.
12. Write a R program to draw an empty plot and specify the axes limits of the graphic with limiting values 60 and 40.
13. Write a R program to create a simple bar plot of five subjects marks.



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14. How to plot the word (text) data based on frequency of words.
15. Describe barplot() of iris\$petal length attribute. Specify the observations of plot.
16. Draw a pie chart for the following data: with(main, sub , legend attribute)

Section I, II, III , IV, V

No.of workers 220,370, 190, 70, 250

17. Create correlogram for mtcars dataset by using all three methods
18. Apply linear regression on iris data set.
19. Apply hypothesis testing (T test) in data.
20. Apply hypothesis testing (Chi Square test) in data.
21. Study various normal distribution functions in R with implementation.



CourseCode	Course Name	HoursPerWeek			
		L	T	P	Credits
CS3EW04	Internet and Web Technology	3	0	2	4

Course Learning Objectives (CLOs):

- CLO₀₁** Understand WWW architecture, HTTP protocol, Web 2.0, and basics of DNS, SMTP, and POP3.
- CLO₀₂** Develop web design skills using HTML, CSS, JavaScript, and DOM manipulation.
- CLO₀₃** Gain proficiency in XML, DTD, schemas, and transforming XML with CSS, XSL, and XSLT.
- CLO₀₄** Acquire PHP and Servlet scripting skills for dynamic web development with databases.
- CLO₀₅** Explore JSP, JDBC, MVC, and frontend frameworks like Bootstrap and AngularJS.

Unit – I Introduction: Concept of WWW, HTTP Protocol: Request and Response, Web browser architecture and Web servers and Application servers, Features of Web 2.0, Internetworking with TCP/IP, basics of DNS, SMTP, POP3.

Unit - II Web Design: Concepts of effective web design, Planning and publishing website, Introduction to web architecture, HTML: list, tables, images, frames, forms, Document type Definition (DTD), Document Object Model (DOM), Cascading Style Sheets and their types, Java Script: Introduction, documents, forms, statements, functions, objects.

Unit - III Introduction to XML, XML vs HTML uses of XML, simple XML, XML key components, DTD, and Schemas, embedding XML into HTML documents, Transforming XML using CSS, XSL, and XSLT.

Unit - IV PHP: working with variables and constants, controlling program flow, working with functions, arrays, files, and directories, working with forms and databases, Introduction to Servlet, Lifecycle, API, and Servlet Packages.

Unit - V Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, declaring variables and methods, sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, web application framework, MVC framework, Introduction to bootstrap, angular JS.



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Course Outcomes (COs):

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

- CO01** Demonstrate understanding of web technology concepts and protocols.
- CO02** Design and develop websites using HTML, CSS, JavaScript, and DOM manipulation.
- CO03** Create and manipulate XML documents, implement DTD, schemas, and transform XML.
- CO04** Develop dynamic web applications with PHP, Servlets, databases, and form handling.
- CO05** Apply JSP, JDBC, MVC, and frontend frameworks for advanced web development



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

Course Learning Objectives (CLOs):

- CLO₀₁** Master effective presentation techniques.
CLO₀₂ Apply business communication principles.
CLO₀₃ Solve arithmetic and algebraic problems.
CLO₀₄ Demonstrate proficiency in geometry and spatial reasoning.
CLO₀₅ Enhance business writing and visual communication skills.

Unit-I

Presentation Skills: - Structure of effective presentations. - Visual aids in presentations. - Tips for engaging and impactful presentations. **Introduction to Business Communication:** - Overview and importance of business communication. - Differences between business communication and general communication. - The flow of communication within an organization.

Unit-II

Arithmetic and Algebraic Reasoning: - Ratios, proportions, and percentages. - Averages, medians, modes. - Basic algebra: equations, inequalities, and functions. Geometry and Spatial Reasoning - Basic geometric shapes and their properties. - Area, volume, and perimeter calculations. - Coordinate geometry. - Spatial visualization.

Unit-III

Business Writing Skills: - The importance of clarity and conciseness. - Writing effective emails and memos. - Report and proposal writing. - Proofreading and editing. **Visual Communication in Business:** - Importance of visual communication. - Infographics, charts, and data visualization. - Principles of design in business documents and presentations.

Unit-IV

Data Interpretation: - Graphs: bar graphs, pie charts, line graphs. - Tables and case lets, making decisions based on data insights. Probability and Statistics - Basic concepts of probability. - Combinatory: permutations and combinations. – Descriptive statistics: mean, median, mode, standard deviation. Logical Sequencing - Ordering and ranking. - Sequencing events. - Time-based puzzles.

Unit-V

Professionalism: - Vertical Career Planning: Understanding the growth trajectory in a chosen career. - Goal Setting: Crafting achievable and measurable professional goals. - Employer's Expectations: What employers look for in potential employees - Domain Specific Soft Skills: -Tailoring soft skills to specific industries and roles - Professional Grooming: Presenting oneself in a professional and appropriate manner.

Text Books:

1. Personality Development and Soft Skills By Barun K. Mitra, Oxford University Press
2. Data Interpretation & Data Sufficiency – Arihant Expert
3. Rizvi, Ashraf M. *Effective Technical Communication* Tata Mc Graw-Hill Publishing Company Limited
4. K Alex, *Soft Skills: Know yourself and know the world*, S Chand & Company Ltd. New Delhi.

References:



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

Course Outcomes (COs):

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

- CO₀₁** Understand presentation structure.
- CO₀₂** Differentiate business communication nuances.
- CO₀₃** Apply ratios and proportions in business contexts.
- CO₀₄** Analyse geometric shapes and spatial concepts.
- CO₀₅** Develop polished business writing and visual communication.