Department of Computer Science and Engineering

CURRICULUM AND SYLLABUS

(2021-2025)

B.Tech. Computer Science and Engineering

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)

PEO_{01} Provide strong theoretical foundations to work with cutting edge computing technologies and design solutions to complex engineering problems to work in any competitive environments.

PEO_{02} 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.

PEO_{03} 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.

PEO_{04} Create ethically strong, professionally, and globally competent employees and entrepreneurs.

Department of Computer Science and Engineering

PROGRAMME OUTCOMES (POs)

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

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

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

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

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

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

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

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

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

PO_{10} **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO_{11} **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.

PO_{12} **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)

PSO_{01} Ability to understand the principles and working of computer systems and a good knowledge about the hardware and software aspects of computer systems.

PSO_{02} Ability to work in multidisciplinary teams in small- and large-scale projects by utilizing modern software engineering tools and emerging technologies.

PSO_{03} Ability to design and develop computer programs and understand the structure and development methodologies of software systems.

PSO_{04} 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.

Medi-Caps University Indore (M.P.)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Choice Based Credit System-Scheme of B.Tech CSE (2021 Batch)

Scheme for CSE- Core, Artificial Intelligence (AI), Data Science (DS), Internet of Things (IOT), Artificial Intelligence and Machine Learning (AI/ML), Cyber Security, Networks.

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	CS3ELXX	Elective-1	3	0	2	4
2	CS3CO35	Microprocessor and Interfacing	3	0	2	4
3	CS3CO36	Operating Systems	3	0	2	4
4	CS3CO37	Advanced Java Programming	2	0	2	3
5	CS3CO38	Theory of Computation	4	0	0	4
6	CS3CO39	Database Management Systems	3	0	2	4
7	EN3NG07	Sports	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

SEMESTER – V

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO40	Software Engineering	3	0	2	4
2	CS3CO41	Computer Networks	3	0	2	4
3	CS3CO42	Design and Analysis of Algorithms	3	0	2	4
4	CS3ELXX	Elective-2	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	EN3NG06	Open Learning Courses	1	0	0	1
8	OE000XX	Open Elective-1	3	0	0	3
		Total	**21**	**0**	**8**	**25**
		Total Contact Hours	**29**			

SEMESTER – VI

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO27	Compiler Design	3	0	2	4
2	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
3	CS3ES15	Research Methodology	3	0	0	3
4	CS3ELXX	Elective-3	3	0	2	4
5	CS3ELXX	Elective-4	3	0	2	4
6	OE000XX	Open Elective-2	3	0	0	3
7	CS3PC04	Mini Project	0	0	4	2
8	EN3NG05	Soft Skills-III	2	0	0	2
		Total	**19**	**0**	**10**	**24**
		Total Contact Hours	**29**			

SEMESTER – VII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3ELXX	Elective-5	3	0	2	4
2	CS3ELXX	Elective-6	3	0	2	4
3	OE000XX	Open Elective-3	3	0	0	3
4	CS3PC05	Project-I	0	0	8	4
5	CS3PC03	Industrial Training	0	2	0	2
		Total	**9**	**2**	**12**	**17**
		Total Contact Hours	**23**			

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**			

Total Credits 173

Summary of Credits

S.NO	Course Work	Total Credits	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)	56	30-40%(48-64)
5	Program Electives (EL)	24	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	13	(11-16)
		173	

Choice Based Credit System Scheme- B. Tech CSE

Batch 2021-2025

Medi-Caps University Indore (M.P.)

B.Tech. (I year)

Scheme (2021-25 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**			

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

Course Learning Objectives (CLOs):

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

CLO$_{02}$ To explain the concept of Differential Calculus.

CLO$_{03}$ To discuss the concept of Integral Calculus and its applications.

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

CLO$_{05}$ To impart basics of complex number and variables including concepts of analytical functions.

Unit I Matrices and Linear Systems

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

Unit II Differential Calculus

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

Unit III Integral Calculus

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

Unit IV Ordinary Differential Equations

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

Unit V Complex Variable

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

Text books:

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

References:

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

Web Source:

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

Course Outcomes (COs):

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

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

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

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

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

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

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

Course Learning Objectives (CLOs):

- **CLO01** They will be able to understand the concept of Laser devices.
- **CLO02** An ability to understand the phenomena occurs in optical fibre.
- **CLO03** Students came to know about the optical phenomenon like Interference, diffraction, and polarization with their use in daily life.
- **CLO04** They will be able to learn about the quantum physics.
- **CLO05** They will be able to understand the concept of modern physics
- **CLO06** An ability to recognise the crystal structure and their basics.
- **CLO07** An ability to adapt the classical concept of oscillations.
- **CLO08** They will be able to use the acoustics nature in practical applications.
- **CLO09** Students learn the advanced concept of the superconductivity.

Unit-I Laser and Fibre Optics

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

Unit-II Wave Optics

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

Unit-III Quantum mechanics

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

Unit-IV Solid State Physics

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

Type-II superconductors, Engineering applications of superconductivity.

Unit- V Oscillations and acoustics

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

Textbooks:

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

References:

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

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

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

List of Practical's

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

Laser and Fiber Optics

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

Wave Optics

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

Quantum Mechanics

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

Solid State Physics

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

Oscillations and Acoustics

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

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

Course Learning Objectives (CLOs):

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

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

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

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

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

Unit-I SEMICONDUCTOR DIODE

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

Unit-II BIPOLAR JUNCTION TRANSISTOR

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

Unit-III BASICS OF COMMUNICATION SYSTEMS

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

Unit-IV DIGITAL SYSTEM

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

Unit-V ELECTRONICS MEASUREMENT

Introduction, Basics of Measurements, Ammeter, Voltmeter, multimeter, Signal Generators, Cathode Ray Oscilloscope: Block diagram of CRO, Construction of CRT, Deflection sensitivity and various controls, Measurement of voltage, current frequency and phase angle using CRO

Textbooks:

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

References:

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

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

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

List of Experiments:

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

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

Course Learning Objectives (CLOs):

CLO_{01} To familiarize with the construction of geometrical figures.
CLO_{02} To familiarize with the projection of 1D, 2D and 3D elements
CLO_{03} To familiarize with the projection and sectioning of solids.
CLO_{04} To familiarize with the Preparation and interpretation of building drawing.
CLO_{05} 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.

Reference Books

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

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

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

List of Experiments

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

List of Drawing Sheets (Manual)

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

List of CAD Sheets

1. To study about special features, advantages and applications of CAD in detail.
2. To study and practice basic draw commands, modifying commands exist in the CAD.
3. To construct a diagonal scale.

4. To draw orthographic projection of given pictorial views.
5. To construct the isometric views of given geometries.

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

Course Learning Objectives (CLOs):

CLO_{01} To give the knowledge of various building and general construction materials such as bricks, stones, timber, cement, steel and concrete & their properties and application.

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

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

CLO_{04} To provide basic knowledge about principles of surveying for a location, and its application in execution of engineering projects, various instruments used for surveying such as chains, tapes, compass, theodolite and auto level.

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

Unit I Building Construction Material

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

Unit II Surveying and levelling

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

Unit III Building Components

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

Unit IV Forces & Properties of Material

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

Unit V Shear force and Bending moment

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

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

Text Books

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

References

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

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

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

List of Experiments

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

SEMESTER II

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.

Unit I Laplace Transform

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

Unit II Fourier Series and Fourier Transform

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

Unit III Partial Differential Equations

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

Unit IV Vector Calculus

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

Unit V Numerical Analysis

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

Textbooks:

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

References:

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

Web Source:

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

Course Outcomes (COs):

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

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

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

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

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

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

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

Course Learning Objectives (CLOs):

CLO_{01} To gain fundamental knowledge of the principles related to, so as to meet the challenging requirements of students in chemistry studies.

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

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

CLO_{04} To increase curiosity and give them awareness about practical knowledge of variouslaboratory methods among the students regarding the course.

Unit-I Lubricants

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

Unit -II Polymer

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

Unit -III New Engineering Materials

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

Unit -IV Instrumental Techniques in Chemical Analysis

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

Unit- V Electrochemistry

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

Text Books:

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

Reference Books:

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

Course Outcomes (COs):

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

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

List of Practicals:

Volumetric Analysis:

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

Fuel Testing:

1.Todeterminemoisturecontentingivensampleofcoalbyproximateanalysis.
2.Todeterminevolatilecontentingivensampleofcoalbyproximateanalysis.
3.Todetermineashcontentingivensampleofcoalbyproximateanalysis.
4.To determine percentage carbon content of coal by proximate analysis.

Lubricant Testing:

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

Electrochemistry:

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

Kinetics:

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

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

Course Learning Objectives (CLOs):

CLO_{01} To understand the properties of materials and their behavior with variation in temperature and Load. To understand different measuring instruments used in engineering applications.

CLO_{02} To understand the basic laws of thermodynamics and their applications in engineering, refrigeration cycles and properties of refrigerants.

CLO_{03} To understand Construction and Working of I. C. Engines.

CLO_{04} To understand Construction and Working of Steam Generators

CLO_{05} To understand the concepts of Centroid & Moment of Inertia and of plane areas and different theorems of moment of Inertia

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

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

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

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

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

Textbooks:
1. R.K. Rajput, Basic Mechanical Engineering, Laxmi Publication.
2. P.K. Nag, Engineering Thermodynamics, McGraw Hill.

3. R.K. Bansal, Engineering Mechanics, Laxmi publications.

References:

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

Course Outcomes (COs):

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

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

List of Experiments

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

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

Course Learning Objectives (CLOs):

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

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

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

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

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

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Text Books:

1. P.C,Wren and N.D.V. Prasada Rao, High School English Grammar & Composition, S Chand and Co Pvt Ltd.

2. S. Kumar and P. Lata, English for Effective Communication, Oxford UP, New Delhi.
3. A.J. Thompson and A. V. Martinet, A Practical English Grammar, Oxford UP, New Delhi.
4. U. S. Rai and S.M, Rai, Effective Communication, Himalaya Publishing House.

References:

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

Course Outcomes (COs):

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

CO_{01}	The students will be able to enhance confidence in their ability to read, comprehend, organize, and retain written and oral information.
CO_{02}	The students will be able to distinguish between general and technical communication and understand its importance
CO_{03}	The students will be able to improve upon their language skills, communication skills, group discussion, and personality development and confidence level.
CO_{04}	The students will be able to bridge the language gap which is vital to their success
CO_{05}	Students will be able to communicate effectively.

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

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

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

Course Learning Objectives (CLOs):

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

Unit-I: DC circuit analysis

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

Unit-II: AC Circuit Analysis

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

Unit-III: Electrical Machines

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

Unit-IV: Industrial Electrical Engineering

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

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

Unit-V: Electrical Energy Systems and Utilization

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

Textbooks:

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

References:

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

Course Outcomes (COs):

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

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

List of Experiments

1. To study various electric hazards and corresponding precautions.
2. To verify KCL and KVL.
3. To verify Thevenin’s and Norton’s theorem.
4. Determination of resistance, inductance, capacitance and power factor of R-L, R-C & R-L-C series circuits.

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

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

Course Learning Objectives (CLOs):

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

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

CLO_{03} To understand different primary manufacturing process.

CLO_{04} To understand different metal joining process.

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

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

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

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

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

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

Textbooks:

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

Reference Books:

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

Course Outcomes (COs):

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

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

CO_{02} Understand the primary manufacturing process.

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

CO_{04} Understand the basic process of forging.

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS01	History of Science and Technology	3	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 developmentin 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 ofIndia, 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, SterlingPublications (P) Ltd., New Delhi.

References:

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

Course Outcomes (COs):

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

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

SEMESTER – 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			
		L	T	P	Credits
CS3BS04	Discrete Mathematics	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.

CLO_{02} To understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.

CLO_{03} Equip the students with the knowledge of group theory and its application in computer science as coding theory.

CLO_{04} To study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.

CLO_{05} To develop the ability to solve the recurrence relations by using various methods.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit –V

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrence relation. Combinatorics: Introduction, Counting

Techniques -Basic theorems on permutations & combinations. Applications in Computer Science.

Text Books

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:

CO_{01} Understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.

CO_{02} Understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.

CO_{03} Equip the students with the knowledge of group theory and its application in computer science as coding theory.

CO_{04} Study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.

CO_{05} Develop the ability to solve the recurrence relations by using various methods.

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

Course Learning Objectives (CLOs):

CLO_{01} Understand the concepts of Object-Oriented Programming.
CLO_{02} Understand the concepts of Objects and Classes.
CLO_{03} Understand the concept of relationships between classes.
CLO_{04} Understand the concept of inheritance and polymorphism.
CLO_{05} 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:

CO_{01} Differentiate between OO Programming vs Procedural Programming.

CO_{02} Understand the OO Programming with its properties.

CO_{03} Understand the object-oriented programming paradigm specifically including abstraction, encapsulation, inheritance, and polymorphism.

CO_{04} Describe and explain the factors that contribute to a good object-oriented solution, reflecting in your own experiences and drawing upon accepted good practices.

CO_{05} 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			
		L	T	P	Credits
CS3CO31	Data Structures	3	0	2	4

Course Learning Objectives (CLOs):

- **CLO_{01}** To impart the basic concepts of Data structure and algorithm
- **CLO_{02}** To understand concept about Linked lists and and their types.
- **CLO_{03}** To understand concept about stacks, and Queue and recursion function
- **CLO_{04}** To know various Searching and sorting algorithm with all its complexity and favourable cases and to understand about hash function and storage management techniques
- **CLO_{05}** To understand about Tree and graph representation
- **CLO_{06}** 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:

CO_{01} Understanding to analyse linear and non-linear data structures and its application in computers science.
CO_{02} Evaluate the linked list implementation of stacks and queue.
CO_{03} 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.
CO_{04} Understanding the searching and sorting techniques.
CO_{05} 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 x 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):

CLO_{01} Understand the fundamental programming concepts of Java.
CLO_{02} Understand the object-oriented programming concepts.
CLO_{03} Understand the concept of multiprogramming and run time problems (exception).
CLO_{04} Understand the basic of graphical programming using AWT.
CLO_{05} 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 package, differentiate package from header file, importing package, creating package.

Unit III

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

Unit IV

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

Unit V

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

Text Books

1. E. Balagurusamy, Programming with java A Primer, 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:

CO_{01}	Understand the fundamental programming concepts and programming logic building.
CO_{02}	Understand the OO Programming with its properties.
CO_{03}	Understand the concept of multiprogramming and handling of exceptions.
CO_{04}	Design the graphical program to understand the GUI programming.
CO_{05}	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			
		L	T	P	Credits
CS3CO33	Digital Electronics	3	0	2	4

Course Learning Objectives (CLOs):

- **CLO_{01}** To understand the concept of number systems and Boolean Algebra. To learn minimization of Boolean function by different methods.
- **CLO_{02}** To understand the concept of Logic gates and other Combinational circuits and their designing.
- **CLO_{03}** 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.
- **CLO_{04}** 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.
- **CLO_{05}** 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, substractors, BCD adder, magnitude comparator, decoders and encoders, multiplexers and demultiplers, code converters. Analysis and design of combinational circuits. Implementation of combinational logic using multiplexers, decoders etc.

Unit-III

Sequential Circuits

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

Unit-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:

CO_{01}	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
CO_{02}	To understand and examine the structure of various number systems and its application in digital design.
CO_{03}	The ability to understand, analyze and design various combinational and sequential circuits using programmable logic.
CO_{04}	Ability to identify basic requirements for a design application and propose a cost effective solution.
CO_{05}	To develop skill to build and troubleshoot digital circuits.

Course Code	Course Name	Hours Per Week			
		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:

CO_{01}	Learn the functioning of physical layer, its components, and techniques
CO_{02}	Gain the concept of efficient BW utilization.
CO_{03}	Acquire knowledge of basic telephone network
CO_{04}	Come to know about reference model and IP addressing
CO_{05}	Learn various error detection and correction methods

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

Course Learning Objectives (CLOs):

- **CLO_{01}** To understand the structure, function and characteristics of computer system
- **CLO_{02}** To understand the design of the various functional units and components of computers
- **CLO_{03}** To identify the elements of modern instructions sets and their impact on processor design.
- **CLO_{04}** To explain the function of each element of a memory hierarchy
- **CLO_{05}** 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, ZvonkoVranesic and SafwatZaky, 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:

CO_{01}	Understand the evolution of computers and computer generations, measuring computer, technology trends, measuring computer performance, MIPS
CO_{02}	Learn about fundamental concepts of– execution of a complete instruction, design of basic computer, addressing modes, instruction formats, stack organization
CO_{03}	Solve questions on number systems, arithmetic operations on binary numbers, floating point representation
CO_{04}	Understand basics of storing data and program in memory, memory hierarchy in a computer, semiconductor RAMs–ROMs, cache memories, and virtual memory
CO_{05}	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++.

MEDI-CAPS
UNIVERSITY

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

Course Learning Objectives (CLOs):

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

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Text Books

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

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/lession/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:

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

SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3ELXX	Elective-1	3	0	2	4
2	CS3CO35	Microprocessor and Interfacing	3	0	2	4
3	CS3CO36	Operating Systems	3	0	2	4
4	CS3CO37	Programming-IV	2	0	2	3
5	CS3CO38	Theory of Computation	4	0	0	4
6	CS3CO39	Database Management Systems	3	0	2	4
7	EN3NG07	Sports	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

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

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:

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

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

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

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

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.
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 Squre test) in data.
21. Study various normal distribution functions in R with implementation.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EL12	Cloud Computing	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To provide students with fundamental and essentials of cloud

CLO_{02} Describe Application which are used in daily life regarding cloud

CLO_{03} To learn virtualization Techniques

CLO_{04} To understand collaboration between user and service provider

CLO_{05} To Explore area and working knowledge of cloud Provider

Unit-1 Introduction to cloud computing, characteristics of cloud computing as per NIST, cloudreference model, application of cloud computing ECG analysis, protein structure prediction, cloud deployment models.

Unit-2 Virtualization, virtualization advantages, Full virtualization, para-virtualization, hypervisors. Cloud interoperability, cloud service management, cloud analytics, Cloud broker,Capex, Opex, cloud architecture.

Unit-3 Platform as a service, Infrastructure as a service, software as a service, Desktop as a service, Backup as a service, DRaaS, Introduction to SLA, SLA lifecycle, SLA management,Business continuity plan.

Unit-4 Cloud security fundamentals, vulnerability assessment, security architecture, identitymanagement and access control, data at rest, data in flight, data in motion, security in virtualization.

Unit-5 Cloud application development platforms, Xen hypervisor, AWS, Google app engine,open stack.

Text Books:

1. S. Chand,R.Buyya, C. Vecchiola, S.T. Selvi, “Mastering Cloud Computing,”McGraw Hill Education
2. Velte, A. Velte and R. Estenpeter, “Cloud Computing –A practical approach,McGraw Hill Education

References:

1. K. Chandrasekaran, “Essentials of Cloud Computing,” CRC Press
2. Thomas Erl, Zaigham Mahmood, RichardoPuttini, Cloud Computing: Concepts, Technology & Architecture, ServiceTech press
3. K Jayaswal, J Kallakurchi, Donald Houde, Deven Shah, Cloud ComputingBlack Book, Dreamtech Press.

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

CO01	Analyze the requirements for a given organizational structure and select the mostappropriate cloud Application
CO02	Working with virtualization and understanding between user and corporation.
CO03	To Understand working knowledge of data and recovery process in virtual form
CO04	To understand working of security aspect ,privacy issue and cloud developmentplatform

List of Experiment:

1 Create Amazon Free Tier Account .

2 Create IAM Account in AWS .

3 Create your first EC2 instance .

4 Assigning Elastic IP address to Instance (Static IP address).

5 Configure AWS S3 Bucket.

6 Create VPC- Virtual Private Cloud with Internet Gateway and Route Table.

7 Create AWS Elastic Load Balancer.

8 Create a lambda Function and launch a new instance.

9 Launching RDS instance in AWS.

10 Case Study of Open Stack , Hypervisor and Google app Engine.

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)

2. 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)

Course Outcomes:

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

CO_{01}	To know about microprocessor (8-64 bits) families and understand the architecture of 8085 microprocessor.
CO_{02}	To understand assembly language and write down 8085 microprocessor programs including subroutines and time delays.
CO_{03}	To understand & apply the concepts of peripheral devices to implement 8085 based microcomputer system.
CO_{04}	To understand the internal operation and interrupt mechanism of 8085 microprocessor with the help of timing diagrams.
CO_{05}	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			
		L	T	P	Credits
CS3CO36	Operating System	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To learn the need and concepts of Operating systems, its functions and to distinguish different types of operating systems

CLO_{02} To learn various scheduling algorithms, problems of understanding multiple process executions with the concept of deadlock, its prevention and avoidance techniques.

CLO_{03} To understand the concept of memory management and to implement it with the applications of segmentations and paging.

CLO_{04} To learn the concept of virtual memory, page replacement algorithms and computational problems related to securities in operating systems.

CLO_{05} To understand the concept of file, file protection, file sharing in various types of operating systems.

Unit-1

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

Unit-2

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

Unit 3

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

Unit 4

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

Unit 5

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

Text Books:

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

References:

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

Course Outcomes (COs):

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

CO_{01} To understand the concepts of Operating systems and functions and to distinguish different types of operating systems and describe various types of process and its execution

CO_{02} To implement various types of scheduling algorithms, its evaluations, to understand the concept of deadlock, its prevention and avoidance techniques.

CO_{03} To understand the concept of memory management and to implement the concept of worst fit, best fit and and first fit memory allocations along with the applications of segmentations and paging in operating system.

CO_{04} To make the students familiar with concepts of virtual memory, page replacement algorithms and computational problems related to securities in operating systems.

CO_{05} To Involve students in designing, development and testing of file concept, file protection, file organisations and file sharing in various types of operating systems.

List of Experiments:

Lab No.	Name of Experiment	Unit
Week 1:	Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine. (Linux Installation) along with some latest operating system	1
Week 2:	Write a C/C++ program to simulate producer-consumer problem using Semaphores	1
Week 3:	Write a C/C++ program to implement classical inter process communication problem (Reader Writers).	1
Week 4:	Write a C/C++ program to implement classical inter process communication problem (producer consumer).	1
Week 5:	Write a Program to implement classical inter process communication problem (Dining Philosophers).	1
Week 6:	Write a C/C++ program to Bankers Algorithms for deadlock avoidance and dead lock prevention	2
Week 7:	Simulate the following First Come First Serve CPU scheduling algorithms	2
Week 8:	Simulate the Shortest Job First CPU scheduling algorithms	2
Week 9:	Simulate the Round Robin CPU scheduling algorithms .	2
Week 10:	Simulate the Priority based CPU scheduling algorithms	2
Week 12:	Write a C/C++ program to simulate the concept of Dining-philosophers problem.	2
Week 13:	Write a C/C++ program to simulate Worst fit contiguous memory allocation Techniques	3
Week 14:	Write a C/C++ program to simulate Best fit contiguous memory allocation Techniques.	3
Week 15:	Write a C/C++ program to simulate First fit contiguous memory allocation Techniques.	3
Week 16	Write a C/C++ program to simulate all page replacement algorithms using FIFO.	4
Week 17:	Write a C/C++ program to simulate all page replacement algorithms using LRU	4
Week 18	Write a C/C++ program to simulate all page replacement algorithms using Optimal method	4
Week 19	Write a C/C++ program to implement disk scheduling algorithm FCFS	5
Week 20	Write a C/C++ program to implement disk scheduling algorithm SSTF.	5

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

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

Course Learning Objectives (CLOs):

CLO_{01}	Have a broad understanding of Java collections and Generic
CLO_{02}	Have a high-level understanding of basic programming principles to the construction of websites using servlet
CLO_{03}	Be able to design user interactions on web pages, develop back-end website application and databases for functionality
CLO_{04}	Be able to design web page on Spring Framework.
CLO_{05}	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 demostrate 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			
		L	T	P	Credits
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-sensitivelanguages, Recursive and Recursively enumerable languages, Undecidability of Halting Problem and unsolvable problems about Turing Machines, the diagonalization language and proof that it is not Recursively enumerable.

Text Books:

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

References:

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

Course Outcomes (COs):

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

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3CO39	Database Management System	3	0	2	5

Course Learning Objectives (CLOs):

CLO_{01}	Have a broad understanding of database concepts and database management system software
CLO_{02}	Have a high-level understanding of major DBMS components and their function
CLO_{03}	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.
CLO_{04}	Be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
CLO_{05}	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 Forth 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 Silbershatz, 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

SEMESTER – V

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3ELXX	Elective-2	3	0	2	4
2	CS3CO40	Software Engineering	3	0	2	4
3	CS3CO41	Computer Networks	3	0	2	4
4	OE000XX	Open Elective-1	3	0	0	3
5	EN3NG04	Soft Skills-II	2	0	0	2
6	CS3CO42	Design and Analysis of Algorithms	3	0	2	4
7	EN3NG06	Open Learning Courses	1	0	0	1
8	EN3HS04	Fundamentals of Management, Economics & Accountancy	3	0	0	3
		Total	**21**	**0**	**8**	**25**
		Total Contact Hours	**29**			

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EA10	Artificial Intelligence	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} Introduce Artificial Intelligence and various search algorithms
CLO_{02} To teach the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
CLO_{03} To teach reasoning and learning in AI
CLO_{04} To teach the fundamentals of AI to solve real world problems.
CLO_{05} To demonstrate Game Playing Strategies.
CLO_{06} To introduce basics of Machine Learning and Deep Learning.

Unit 1: Introduction to artificial intelligence, various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search techniques.

Unit 2: Optimization Problems: Hill-climbing search Simulated annealing likehillClimbing, BestfirstSearch.A*algorithm*algorithms etc, and various types of control strategies, Heuristic Functions, Constraint Satisfaction Problem.

Unit 3: Knowledge Representation, structures, Predicate Logic, Resolution, Refutation, Deduction, Theorem proving, Inferencing, Semantic networks, Scripts, Schemas, Frames, Conceptual dependency.

Unit 4: Uncertain Knowledge and Reasoning, forward and backward reasoning, monotonic and nonmonotonic reasoning, Probabilistic reasoning, Baye's theorem, Decision Tree, Understanding, Common sense, Planning.

Unit 5: Game playing techniques like minimax procedure, alpha-beta cut-offs etc, Study of the block world problem in robotics.

Textbooks:

1. Elaine Rich, Kevin Knight and Nair, Artificial Intelligence, MH
2. S.Russel,PeterNorvig,ArtificialIntelligence:AModernApproach,Pearson.

References:

1. Saroj Kausik, Artificial Intelligence, Cengage Learning4
2. Padhy, Artificial Intelligence and Intelligent Systems, Oxford UniversityPress,
3. Nils Nilsson, Artificial Intelligence: A New Synthesis, MorganKaufmann.

Course Outcomes (COs):

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

CO_{01}	To understand strategies for solving various search problems in AI
CO_{02}	To get familiar with algorithms in AI.
CO_{03}	To understand the fundamentals of knowledge representation in AI
CO_{04}	To understand working knowledge of reasoning in the presence of incomplete and/or uncertain information
CO_{05}	To apply knowledge representation, reasoning, and natural language techniques to robotics problems.
CO_{06}	To understand the game theory and apply it in various applications

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.

Course Outcomes (COs):

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

CO_{01}	Demonstrate understanding of web technology concepts and protocols.
CO_{02}	Design and develop websites using HTML, CSS, JavaScript, and DOM manipulation.
CO_{03}	Create and manipulate XML documents, implement DTD, schemas, and transform XML.
CO_{04}	Develop dynamic web applications with PHP, Servlets, databases, and form handling.
CO_{05}	Apply JSP, JDBC, MVC, and frontend frameworks for advanced web development

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EL13	Data Science	3	0	2	4

Course Learning Objectives (CLOs):

CLO$_{01}$: Understand the definition, history, and components of Data Science, and its importance in the business world.

CLO$_{02}$: Apply probability theory and statistical concepts for analysing data, including random variables, distributions, and statistical inference.

CLO$_{03}$: Gain proficiency in Exploratory Data Analysis (EDA) techniques and the Data Science process.

CLO$_{04}$: Develop skills in data visualization principles, tools, and creating visualizations for complex datasets.

CLO$_{05}$: Utilize Python as a data science tool, including libraries like SciPy, scikit-learn, PyBrain, Pylearn, and Matplotlib.

Unit I:
Introduction to Data Science, Definition and description of Data Science, history and development of Data Science, terminologies related with Data Science, basic framework and architecture, importance of Data Science in today's business world, primary components of Data Science, users of Data Science and its hierarchy, overview of different Data Science techniques.

Unit II:
Sample spaces, events, Conditional probability, and independence. Random variables. Discrete and continuous random variables, densities and distributions, Normal distribution and its properties, Introduction to Markov chains, random walks, Descriptive, Predictive, and prescriptive statistics, Statistical Inference, Populations and samples, Statistical modelling,

Unit III:
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs, and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study

Unit IV:
Data Visualization: Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset.

Unit V:
NoSQL, use of Python as a data science tool, Python libraries: SciPy and sci-kitLearn, PyBrain, Pylearn, Matplotlib, challenges and scope of Data Science project management.

Textbooks:
1. Joel Grus, "Data Science from Scratch: First Principles with Python".
2. Principles of Data Science by Sinan Oz Demir, PACKT.

References:

1. Lillian Pierson,"Data Science for Dummies".
2. Foster Provost, Tom Fawcett, "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking".

Course Outcomes (COs):

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

CO_{01}: Demonstrate knowledge and understanding of the key concepts and components of Data Science.

CO_{02}: Apply probability and statistical techniques to analyse and interpret data.

CO_{03}: Perform Exploratory Data Analysis (EDA) and follow the Data Science process for effective data analysis.

CO_{04}: Create meaningful and informative data visualizations using appropriate tools and principles.

CO_{05}: Utilize Python and relevant libraries for data science tasks, showcasing proficiency in project management and addressing challenges in Data Science projects.

List of Experiments

1. Installation, configure and run R Complier.
2. a) Write a Program to Calculate Mean of a given dataset using R.
b) Write a Program to Calculate Mode of a given dataset using R.
c) Write a Program to Calculate Median of a given dataset using R.
3. a) Perform cleaning of a given data set (EDA) using R.
b) Perform transformation of a given data set (EDA) using R.
4. Perform Data Visualization using Pie Chart Plotting Framework using R .
5. Perform Data Visualization using Bar Chart Plotting Framework using R.
6. Perform Data Visualization using Boxplot Plotting Framework using R.
7. Perform Data Visualization using Histogram Plotting Framework using R.
8. Perform Data Visualization using Line Graph Plotting Framework using R.
9. Perform Data Visualization using Scatterplot Plotting Framework using R.
10. Perform reading data using Pandas library of Python.
11. . Perform any operation of Numpy library of Python.
12. . Perform data Visualization using Matplotlib library of Python.
13. Case study to realize storage of big data using H base, Mongo DB.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO40	Software Engineering	3	0	2	4

Course Learning Objectives (CLOs):

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

Unit 1

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

Unit 2

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

Unit 3

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

Unit 4

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

Unit 5

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

Textbooks:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill.
2. Ian Sommerville, Software Engineering, Pearson Education Inc., New Delhi

References:

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

Course Outcomes (COs)

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

CO01	Students will have thorough understanding of the basic structure and operation of software & various SDLC models.
CO02	Students will be able to trace out requirements of a software to be build and also learn to prepare SRS.
CO03	They will be able to draw the different types design models (UML Diagrams).
CO04	Students will be able to understand the role & importance of SQA & software testing.
CO05	They learnt different ways of maintenance in software and measuring project.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO41	Computer Networks	3	0	2	4

Course Learning Objectives (CLOs):

- **CLO$_{01}$** Describe how computer networks are organized with the concept of layered approach.
- **CLO$_{02}$** Implement a simple LAN with hubs, bridges, and switches
- **CLO$_{03}$** Describe how packets on the Internet are delivered
- **CLO$_{04}$** Analyse the contents in each Data Link layer packet, based on the layer concept.
- **CLO$_{05}$** Design logical sub-address blocks with a given address block
- **CLO$_{06}$** Describe how routing protocols work and decide routing entries given a simple example of network topology

Unit-1

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

Unit-2

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

Unit-3

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

Unit-4

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

Unit-5

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

Textbooks:

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

Practical Understanding

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

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

- **CO_{01}** *Analyse* the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
- **CO_{02}** *Understanding* of the use of various networking devices such as L-2 switch, L-3 Switch and Routers.
- **CO_{03}** *Understanding* of data link layer protocols, multi-channel access protocols and IEEE 802 standards for LAN
- **CO_{04}** *Apply* the routing and congestion in network layer with routing algorithms using simulators and classify IPV4 and IPV6 addressing scheme
- **CO_{05}** *Describe* the elements and protocols of transport layer.
- **CO_{06}** *Understanding of* network security and define various protocols such as FTP, HTTP, Telnet, DNS

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

Course Learning Objectives (CLOs):

CLO$_{01}$ To understand why Python is a useful scripting language for developers.
CLO$_{02}$ To learn how to use lists, tuples, dictionaries, indexing and slicing to access data in Python programs.
CLO$_{03}$ To learn how to read and write files in Python.
CLO$_{04}$ To learn how to design object-oriented programs with Python classes.
CLO$_{05}$ To learn how to use exception handling in Python applications for error handling

Unit-1 Basic Introduction
Introduction to Python, History, Features, command interpreter and development environment-IDLE, Application of Python, Python 2/3 differences, Basic program structure-quotation and indentation, Operator, Basic data types and In-built objects.

Unit-2 Function and Sequence
Functions: definition and use, Arguments, Block structure, scope, Recursion, Argument passing, Conditionals and Boolean expressions, Lambda Function, inbuild functions (str(),globals(),locals(),vars(),eval(),exec(),execfile(),repr(),ascii()) Sequences: Strings, Tuples, Lists Iteration, looping and control flow, String methods and formatting.

Unit-3 File Operation & OOPS concepts
Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek.

Unit-4 OOPS Concepts
Object Oriented concepts- Encapsulation, Polymorphism**,** Classes, Class instances, Constructors & Destructors__init__, __del__, Multiple inheritance, Operator overloading Properties, Special methods, Emulating built-in types.

Unit-5 Mutable data types, Exception and Standard modules
Dictionaries, Sets and Mutability, Exceptions, List and Dict Comprehensions, Standard Modules-math, random Packages.

Text Book:

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

References:

1.Mark Luiz, Learning Python, O'REILLY.
2.Jamie Chan, Learn Python in One Day, LCF Publishing.

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

CO_{01}	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
CO_{02}	Express different decision-making statements and Function
CO_{03}	Interpret Object oriented programming in Python
CO_{04}	Understand and summarize different File handling operations
CO_{05}	Student will be able to distinguish between mutable and immutable data types.
CO_{01}	Students are able to work with standard libraries and pre define module.

List of Experiments (if applicable)

- WAP to find product of two numbers using command line arguments?
- WAP to Given the string 'hello', give an index command that returns 'e'.
- WAP to Reverse the string 'hello' using slicing.
- WAP to Given the string 'hello', give two methods of producing the letter 'o' using indexing.
- WAP to Ask the user for a string and print out whether this string is a **palindrome** or not. (A **palindrome** is a string that reads the same forwards and backwards.)
- WAP to create a byte type array, read and display the elements of the array.
- WAP to accept a numeric digit from keyboard and display in words.
- WAP to display a group of messages when the condition is true?
- WAP to accept a number from keyboard and test whether a number is even or odd.
- WAP to test whether a given number is in between 1 and 10.
- WAP to display even numbers between m and n
- WAP to display characters of a string using for loops
- WAP to display odd numbers from 1 to 10 using range ().
- WAP to display and sum of a list of numbers using loop.
- WAP to display the stars in an equilateral triangular form using a loop.
- WAP to display numbers from 1 to 100 in a proper format
- WAP to search for an element in the list of elements.
- WAP to display prime number series.
- WAP to generate Fibonacci number series.
- Write a Python program to combine each line from first file with the corresponding line in second file
- Write a Python program to copy the contents of a file to another file
- WAP to define Student class and create an object to it. Also, we will call the method and display the student's details.
- WAP to create a static method that counts the number of instances created for a class.
- WAP to create a Bank class where deposits and withdraw can be handled by using instance methods.
- WAP showing single inheritance in which two sub classes are derived from a single base class.

- WAP to implement multiple inheritance using two base classes.
- WAP to show method overloading to find sum of two or three numbers.
- WAP to Create a 3×3 numpy array of all True's
- WAP to Replace all odd numbers in arr with -1
  a. Input ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
- WAP to Convert a 1D array to a 2D array with 2 rows
  a. Input: np. arrange (10)
- WAP to Get the common items between a and b
  Input:
  a = np. array ([1,2,3,2,3,4,3,4,5,6])
  b = np. array ([7,2,10,2,7,4,9,4,9,8])
  Desired Output:
  array ([2, 4])

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00051	R-Programming	3	0	0	3

Course Learning Objectives (CLOs):

- **CLO01** To understand importance and advantages of R Programming and IDE for programming.
- **CLO02** To understand and implement program on various data Structures in R.
- **CLO03** To understand basic programming fundamentals like Objects, Classes, Functions in R, debugging tools etc
- **CLO04** Work with the Data Sets of various formats, Training algorithms and plotting.
- **CLO05** To become proficient in writing a fundamental program and perform Data Analytics with R wit use of R strings, date etc.

Unit 1 - R basics
Introduction: Basic features of R, advantages of using R, Limitations, R resources, Arithmetic and objects, Math, Variables, and Strings, Vectors and Factors, Vector operations.

Unit 2 - Data structures in R
Data types, Arrays, Tables, Matrices: operations, Lists: operations, Data frames: creation, factors, reading.

Unit 3 - R programming fundamentals
Conditions and loops, Functions in R, Objects and Classes, Recursion, Debugging

Unit 4 - Working with data in R
Reading CSV and Excel Files, Reading text files, Writing and saving data objects to file in R, Reading in larger, Datasets, Exporting data. Interface to outside world.

Unit 5 – String & Dates in R, Graphics
String operations in R, Regular Expressions, Dates in R, Time in R, Graphics: one dimension plot, legends, function plot, box plot.

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

- **CO01** Implement basics of R Programming using built-in functions.
- **CO02** Understand fundamentals and Data Structures used in R Programming.
- **CO03** apply fundamentals and Data Structures, functions, debugging tools in writing R-script
- **CO04** Work with the Data Sets of various formats, Training algorithms and plotting.
- **CO05** R-Programming languages for different applications like Machine Learning, Data Science etc.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00016	Blockchain Architecture	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Students with understand the fundamental concepts of Block Chain
CLO02 They will able to understand the difference between Crypto currency and Blockchain.
CLO03 They will able to understand of various Consensus algorithms
CLO04 Students will apply their technical knowledge and skills to develop and implement Blockchain
CLO05 Students will learn about various Applications and methods used for Blockchain

Unit I: Cryptocurrency: History, electronic cash, double spending problem, Bitcoin protocols, Mining strategy and rewards, Types of crypto currency wallets, Legal aspects of crypto currency, Crypto currency exchanges.

Unit II: Introduction to Blockchain: History of blockchain, Hash functions, SHA-256, Symmetric cryptography, Asymmetric cryptography, Keys & Digital signatures, benefits and limitation of block chain, features of blockchain.

Unit III: Consensus: Nakamoto consensus, Proof of work, Proof of stake, Proof of burn, Difficulty Level, Sybil attack, Energy utilization, collision of energy utilization, Introduction to ethereum.

Unit IV: Blockchain Architectures: Blockchain network, Merkle patricia Tree, Soft & hard fork, Private and public blockchain, Tokenized blockchain.

Unit V: Blockchain Applications: Financial Sector, Medical record management system, domain name service and future of block chain, case study: Government on blockchain. Introduction to hashgraph and tangle.

Text Books:

1. Andreas Antonopoulos “Mastering Bitcoin Unlocking Digital Cryptocurrencies” O’Reilly publication.
2. Imran Bashir “Mastering Blockchain: Distributed ledger technology, decentralization, Packt publishing”.

Reference Books:

1. Wattenhofer, The Science of the Blockchain
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction” Princeton University.

Course Outcomes (COs):

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

CO_{01}	Student will understand the basic terminology used in Blockchain and Bitcoin.
CO_{02}	Students will be able to explore Blockchain and classification of various cryptocurrency.
CO_{03}	Students will learn about various Consensus algorithms.
CO_{04}	Students will able to understand basic Blockchain Architecture.
CO_{05}	Students will able to use and understand application of Blockchain.

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

Course Learning Objectives (CLOs):

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

UNIT I

Introducing

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

UNIT II

Professional writing skills

Job application, resume, email etiquettes, netiquettes.

UNIT III

GD and Interviews

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

UNIT IV

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

UNIT V

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

Text Books:

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

References:

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:

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

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO42	Design and Analysis of Algorithms	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 Teach to analyse algorithms with respect to time and space. Teach techniques for effective problem solving in computing.

CLO02 Demonstrate various computational models (e.g., divide and conquer), order notation and various complexity measures (e.g., running time, disk space) to analyse the complexity/performance of different algorithms.

CLO03 Teach to apply important algorithmic design paradigms & methods of analysis and to synthesize efficient algorithms in common engineering design situations.

CLO04 Introduce concept of P, NP, NP Complete and NP Hard problems to the students and to bring the capability of proving the belongingness of some problems in P/NP sets

Unit-1 Introduction to Algorithms

Algorithms, Analysis, Performance issues: Time and Space complexity; Asymptotic Notations. Mathematical preliminaries: functions & their growth rates; Recurrence relations, Methods for solving recurrences. Elementary Sorting techniques and its analysis: Selection, Bubble, Insertion sort

Unit-2 Sorting and Divide & Conquer

Advance sorting techniques and its analysis: Heap sort, Radix sort and Bucket sort, Divide and Conquer techniques and its analysis - Binary search, Merge Sort, Quick sort, Strassen's Matrix multiplication.

Unit-3 Greedy Algorithms

Greedy problems and its complexity analysis: Optimal merge patterns, Huffman coding, Minimum spanning trees, Knapsack problem, Job sequencing with deadlines, Single source shortest path problem - Dijkstra's Algorithm

Unit-4 Dynamic Programming

Dynamic programming problems and its complexity analysis: 0/1 Knapsack, Multistage graph, Bellman Ford Algorithm, Reliability design, Floyd-Warshall algorithm, Matrix Chain Multiplication, Longest Common subsequence.

Unit-5 Backtracking and Branch & Bound

Backtracking Approach: N-Queen's problem, Hamiltonian cycle, Graph coloring problem, Sum of Subset problem. Introduction to branch & bound method, examples of branch and bound method like15 puzzle traveling salesman problem, 0/1 knapsack. An introduction to P, NP, NP Complete and NP hard problems.

Textbooks:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction toAlgorithms, Second Edition, MIT Press/McGraw-Hill

2. E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications

References:

1. Saara Base, Computer Algorithms: Introduction to Design and Analysis, Addison Wesley.
2. A. V.Aho, J E Hopcroft & J D Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley.

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

- **CO_{01}** Analyse best case, worst-case and average running times of algorithms using asymptotic analysis.
- **CO_{02}** Compare and analyse various sorting techniques and to find the efficient sorting technique with respect to specific case
- **CO_{03}** Derive and solve recurrences for recursive algorithms. Apply various recurrence solving techniques depending upon specific cases
- **CO_{04}** Understand the divide-and-conquer paradigm and will have knowledge, when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms and analyse them.
- **CO_{05}** Understand the greedy paradigm and will have knowledge, when an algorithmic design situation calls for it. Synthesize greedy algorithms and analyse them.
- **CO_{06}** Understand the dynamic-programming paradigm and will have knowledge, when an algorithmic design situation calls for it. Synthesize dynamic-programming algorithms and analyse them.
- **CO_{07}** Understand the backtracking and branch & bound strategy and will have knowledge, when an algorithmic design situation calls for it. Synthesize algorithms for both and analyse them.
- **CO_{08}** Understand concept of P, NP, NP Complete and NP hard problems. Prove some problems NP complete or not.

S No.	Experiment List
1	To implement the following using array as data structure and analyse its time complexity: a. Insertion sort b. Selection sort c. Bubble sort d. Quick sort e. Merge sort f. Bucket sort g. Shell sort h. Radix sort i. Heap sort
2	To implement Linear and Binary search and analyse its time complexity
3	To implement Matrix Chain Multiplication and analyse its time complexity
4	To implement Longest Common Subsequence problem and analyse its time complexity
5	To implement Optimal Binary Search Tree problem and analyse its time complexity

6	To implement Huffman coding and analyse its time complexity
7	To implement Dijkstra’s algorithm and analyse its time complexity
8	To implement Bellman Ford algorithm and analyse its time complexity
9	To implement DFS and BFS and analyse their time complexities.
10	To implement string matching algorithms and analyse time complexities

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

Course Learning Objectives (CLOs):

CLO01 To introduce with the Fundamental knowledge of Management.
CLO02 To give knowledge about the Marketing and Human Resource Management.
CLO03 To provide basic information of Applied Economics.
CLO04 To get acquainted with the knowledge of Financial Accounting.
CLO05 To give sufficient knowledge of Financial Management.

Unit-1 Concepts of Management

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

Unit-3 Fundamentals of Marketing and Human Resource Management

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

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

Unit-3 Fundamentals of Economics

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

Unit-4 Basic Accounting Principles

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

Unit -5 Fundamentals of Financial Management

Introduction of Business Finance: Meaning, Definition of Financial Management, Goals of

Financial Management (Profit Maximization and Wealth Maximization), Modern approaches toFinancial Management — (Investment Decision, Financing Decision and Dividend Policy Decisions).

Course Outcomes (COs):

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

CO01	Students will be able to understand Basics of Management Theory.
CO02	Student will be gaining knowledge of Marketing & Human Resource Management.
CO03	Students will be able to understand basic information for Economics.
CO04	Students will be able to get acquainted with the Financial Accounting System.
CO05	Students will be able gain sufficient knowledge of Financial Management

SEMESTER – VI

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3CO27	Compiler Design	3	0	2	4
2	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
3	CS3ES15	Research Methodology	3	0	0	3
4	CS3ELXX	Elective-3	3	0	2	4
5	CS3ELXX	Elective-4	3	0	2	4
6	OE000XX	Open Elective-2	3	0	0	3
7	CS3PC04	Mini Project	0	0	4	2
8	EN3NG05	Soft Skill-III	2	0	0	2
		Total	**19**	**0**	**10**	**24**
		Total Contact Hours	**29**			

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3CO27	Compiler Design	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To teach the design of a compiler including all its phases and components.

CLO_{02} To develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer.

CLO_{03} To identify the similarities and differences among various parsing techniques and grammar transformation techniques.

CLO_{04} To provide knowledge about current developments in compiler design and implementation.

CLO_{05} To develop an understanding of the compilation process

Unit-1

Compiler structure: Pass Structure of compiler, Translators, Interpreter, Assembler, Phases of Compilers, Symbol Table, Error Handling, Lexical Analyzer: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens and input Buffering, The Syntactic Specification of Programming Languages, Cross Compiler, bootstrap Compiler.

Unit-2

Ambiguous Grammar, LL(0) and LL(1) grammar, Parsing, Basic Parsing Techniques: Top Down parsers, Recursive Descent Parsers, First() and Follow(), Recursive and Non- Recursive Predictive Parsers.

Unit-3

LR Grammar, Operator Grammar, Bottom Up Parsing: Operator precedence parsing, LR(0) parsers, Construction of SLR, Canonical LR and LALR parsing tables.

Unit-4

Syntax Directed Definition, Translation Scheme, Synthesized and inherited attributes, dependency graph, Construction of syntax trees, S-attributed and L-attributed definitions, Three address codes, quadruples, triples and indirect triples, Translation of assignment statements.

Unit-5

Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation, Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations.

Text Book:

1. Alfred V. Aho, and J.D. Ullman, Principle of Compiler Design, Narosa Publication.
2. A.Barret William and R.M. Bates, Compiler construction (Theory and Practice), Galgotia Publication.

References:

1. A.C. Holub, Compiler design in C, PHI.
2. O.G. Kakde, Compiler Design, Laxmi Publications

Course Outcomes (COs):

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

CO_{01}	Specify and analyse the lexical, syntactic and semantic structures of advanced language features
CO_{02}	Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
CO_{03}	Write a scanner, parser, and semantic analyser without the aid of automatic generators
CO_{04}	Turn fully processed source code for a novel language into machine code for a novel computer
CO_{05}	Know about techniques for intermediate code and machine code optimisation

S. No.	Experiment List
1	Write a program to Design Lexical Analyzer to recognize keyword
2	Write a program to Design Lexical Analyzer to recognize identifier.
3	Write a program to compute First of a CFG
4	Write a program to compute Follow of a CFG
5	Write a program for implementation of Predictive Parsing Table for LL (1) grammar.
6	Write a program for implementation of Predictive Parser
7	Write a program to develop an operator precedence parser.
8	Write a program to design LALR Bottom-up Parser.
9	Write a program for generating various intermediate code forms-Polish notation: a. Infix to prefix b. Infix to postfix
10	Write a program to perform heap storage allocation strategies such as – • Creation • insertion • Deletion • Display

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

Course Learning Objectives (CLOs):

- **CLO_{01}** Student will able to understand about the process of value education.
- **CLO_{02}** Student will able to understand harmony in human being.
- **CLO_{03}** Student will able to understand Harmony in the Family and Society
- **CLO_{04}** Student will able to understand Harmony in the Nature and Existence
- **CLO_{05}** Student will able to understand Holistic Understanding of Harmony

Unit-1

Introduction-Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration – what is it ?-its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self - exploration, Continuous Happiness and Prosperity-A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities-the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit-2

Understanding Harmony in the Human Being-Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body'- Sukhand Suvidha, Understanding the Body as an instrument of 'I'(I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyamand Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Unit-3

Understanding Harmony in the Family and Society-Harmony in Human- Human Relationship

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

Unit-4

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

Understanding the harmony in the Nature, Inter connectedness and mutual fulfilment among the four orders of nature –recyclability and self-regulation in nature, Understanding Existence as Co-existence(Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Unit-5

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order,
b) Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistictechnologies,managementmodelsandproductionsystems,Strategyfor transition from the present state to Universal Human Order:
a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers,
b) At the level of society :as mutually enriching institutions and organizations.

TextBooks:

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

References:

1. IvanIllich,1974,Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F.Schumacher,1973, Smallis Beautiful: a sudy of economics as if people mattered, Blond & Briggs, Britain.
3. SussanGeorge,1976,HowtheOtherHalfDies,PenguinPress.Reprinted 1986, 1991
4. Donella H .Meadows, DennisL. Meadows,JorgenRanders, WilliamW. BehrensIII, 1972, Limits to Growth–Club of Rome's report, UniverseBooks.
5. ANagraj, 1998, JeevanVidyaEkParichay, DivyaPathSansthan, Amarkantak.
6. PLDhar, RRGaur,1990,Science and Humanism,Commonwealth Publishers.
7. A NTripathy, 2003, Human Values, New Age International Publishers. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantraShodh, Amravati.
8. EGSeebauer&RobertL.Berry,2000,FundamentalsofEthicsforScientists&Engineers , Oxford University Press
9. MGovindrajran,SNatrajan&V.S.SenthilKumar,EngineeringEthics(includingHumanValues),EasternEconomyEdition,PrenticeHallofIndia Ltd.

10. BP Banerjee,2005, Foundations of Ethics and Management, Excel Books. BLBajpai,2004,Indian Ethosand Modern Management, NewRoyal Book Co., Lucknow. Reprinted 2008.

Course Outcomes (COs):

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

- **CO_{01}** Students get knowledge about the process of value education.
- **CO_{02}** Understand human being as a co-existence
- **CO_{03}** Understanding values in human -human relationship
- **CO_{04}** Understanding Existence as Co-existence(Sah-astitva) of mutually interacting units in all-pervasive space
- **CO_{05}** Understanding Natural acceptance of human values

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hr	Credit
CS3ES15	**Research Methodology**	**3**	**0**	**0**	**3**	**3**

Unit-I: Introduction to Research Techniques
Meaning of research, objectives of research, motivation in research, types of research: Descriptive vs Analytical, Fundamental vs Applied, Quantitative vs Qualitative, Conceptual vs Empirical. characteristics and prerequisites of research, significance of research, research process, Research methods vs Methodology.

Unit-II: Research Formulation:
Defining and formulating the research problem, Selecting the problem, Necessity of the defining the problem, Importance of literature review in defining a problem, Primary and secondary sources, Critical literature review, Identifying gap areas from literature review

Unit-III Publication Ethics:
Introduction, Moral Philosophy, Nature of moral judgements and reactions, Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP), Redundant publications: duplicate and overlapping publications, Use of plagiarism software tools like Turnitin, Urkund, Drillbit and others.

Unit-IV Data Collection and Analysis
Observation and Methods of data collection, Data Processing and Analysis strategies, Data Analysis with Statistical Packages, Hypothesis testing, Method Execution of the research,

Unit-V Research Report, Database and Research Metrics
Structure of the research report, Formulation rules for writing the report, Guidelines for presenting tabular data, Guidelines for visual representation, Bibliography, referencing and footnotes
Indexing Database, Citation database, Web of Science, Scopus, Research Metrics, Use References Management tools like Mendeley, Endnote, Zotero

Text Books:

1. R. Panneerselvam, Research Methodologies, PHI.
2. C.R. Kothari: Research methodology, Methods and Techniques, New Age Publication.
3. B.L. Garg, R. Karadia, F. Agarwal, U.K. Agarwal An introduction to Research Methodology, RBSA Publishers

References:

1. Best John V. and James V Kahn: Research in Education, Wiley eastern.
2. S.P. Sukhia, P.V. Mehrotra, and R.N. Mehrotra: Elements of Educational Research, PHI publication.
3. K. Setia, Methodology of Research Education, IEEE publication.
4. Jerry Banks, John S. Carson, Barry.L. Nelson David. M. Nicol, Discrete-Event System Simulation, Prentice-Hall India.
5. V.K. Rohatgi, A.K. Md.E.Saleh, An Introduction to Probability and Statistics, John Willey.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
CS3ED07	Big Data Engineering	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO 01 To understand the basic concepts of evolution of Big Data.
CLO 02 To understand the importance of Distributed algorithm design.
CLO 03 To understand the importance of Big Data storage, processing, analysis and visualization methodologies and tools.
CLO 04 To understand the different algorithms for distributed computing just like Map Reduce.
CLO 05 To understand the concept of ETL and Batch Processing
CLO 06 To understand the concepts of Data Warehousing and its relevance for Big Data
CLO 07 To understand the concepts of ingesting Big Data into Big Data Platforms, processing real time and streaming Big Data

Unit -1

Foundations of Big Data Systems

Introduction to Big Data and its Applications Data Abstraction Linear data structures like Hashtables, Hashmaps, Bloom Filters Non-linear data structures like Binary Search Trees, KD Trees Distributed Algorithm Design Algorithm Design using MapReduce

Unit -2

Platforms for Big Data

Distributed Computing Environment for Big Data NoSQL databases for Big Data Storage Applications (HBase) Distributed Processing of data using MapReduce & Pig In-memory distributed processing using Apache Spark Data Storage on Cloud (Amazon S3 & Dynamo DB)

Unit-3

Processing Big Data – ETL & Batch Processing

Performing ETL Operations Concepts in Data Warehousing and its relevance for Big Data Ingesting data into Big Data Platforms using Sqoop & Flume Workflow management for Hadoop using OOZIE Batch Processing on Cloud

Unit-4

Processing of Real Time Data & Streaming Data

Applications of Streaming Data in Industry Sourcing Streaming data using Apache Flume Building real-time data pipelines using Apache Storm Streaming on Apache Spark

Unit-5

Big Data Analytics

Regression, Clustering & Classification using Spark MLLib Building visualizations using Big Data Case Studies on applications of Big Data Analytics

Text Books

1. Mayank Bhushan, Big Data and Hadoop- Learn by Example, BPB Publications

2. Erl/Khattak/Buhler, Big Data Fundamentals: Concepts Drivers and Techniques, Prentince Hall

References

1. Jeffrey Aven , Hadoop in 24 Hours, Sams Teach Yourself, SAMS Publications.
2. DT Editorial Services, Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization, Dream Tech Publications

Course Outcomes (COs):

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

CO $_{01}$ Understand the different Big Data tools and techniques.

CO 02 Understand the importance of Distributed computing.

CO $_{03}$ Understand the applications and components of Big Data.

CO $_{04}$ Understand the architecture of Big Data.

CO $_{05}$. Understand the concept of Real Time and Streaming data processing,

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3EA12	Natural Language Processing	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 How key concepts from NLP are used to describe and analyze language

CLO02 Describe the formal language and their representation using grammars.

CLO03 POS tagging and context free grammar for natural language (english).

CLO04 Understanding semantics and pragmatics of natural language(english) for processing.

CLO05 Writing programs in Python to carry out natural language processing .

Unit-1 Introduction

Human languages, Main approach of NLP, Knowledge in speech and language processing, Ambiguity, Models and algorithms, Formal language and Natural Language, Regular Expression and automata.

Unit-2 Text Pre-processing

Text Pre-processing, Tokenization, Feature Extraction from text, Morphology: Inflectional and Derivational, Finite state morphological parsing, Finite state transducer

Part of Speech Tagging: Rule based, Stochastic POS, Transformation based tagging.

Unit-3 Speech Processing

Speech and phonetics, Vocal organ, Phonological rules and Transducer, Probabilistic models: Spelling error, Bayesian method to spelling, Minimum edit distance, Bayesian method of pronunciation variation.

Unit-4 N-Grams

Simple N-Gram, perplexity, Smoothing, Backoff, Entropy, Parsing: Statistical Parsing, Probabilistic parsing, TreeBank.

Unit-5 Application

Sentiment analysis, Spelling correction, Word sense disambiguation, Machine translation, Text Classification, Question answering system

Text Books:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Pearson Education.
2. James Allen, “Natural Language Understanding”, Pearson Education.

References:

1. Christopher D. Manning and Hinrich Schutze, “Foundation of statistical Natural Language Processing”, MIT Press.
2. Mary Dee Harris “Introduction to Natural language Processing” ,Reston

Course Outcomes (COs):

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

CO01	Understand natural language processing and to learn how to apply basic algorithms in this field.
CO02	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics
CO03	Understand various resources of natural language data – corpora and word net.
CO04	To conceive basics of model representation of natural language.
CO05	Apply NLP concepts in different applications.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
CS3EA11	Soft Computing	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO_{01} Understand the concepts of Soft Computing.
CLO_{02} Understand the concepts of Neural Network Architectures.
CLO_{03} Understand the concept of Fuzzy Logic.
CLO_{04} Understand the Genetic Algorithms.
CLO_{05} Understand the concept of Hybrid Systems.

Unit- 1 Concept of Computing Systems, Introduction to Soft Computing, Soft Computing vs. Hard Computing, Components of Soft Computing, Neural Networks: Structure and function of Biological Neuron and Artificial Neuron, Definition and characteristics of ANN, Training techniques in different ANNs, Activation functions, Different ANNs architectures, Introduction to basic ANN architectures: McCulloch & Pitts model, Perceptron Model, Linear separability, ADALINE and MADALINE.

Unit-2 Neural Network Architectures: Supervised Learning: Backpropagation Network architecture, Backpropagation algorithm, Limitation, Characteristics and Application of EBPA, Bidirectional associative memories (BAM), Unsupervised Learning: Hebbian Learning, Generalizd Hebbian learning algorithm,e Competitive learning, Self- Organizing Computational Maps: Kohonen Network, Applications of ANN to solve real world's problems.

Unit-3 Fuzzy Logic: Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.

Unit-4 Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc, solving single-objective optimization problems using GAs.

Unit-5 Hybrid Systems: Genetic Algorithm based Backpropagation Network, Fuzzy – Backpropagation, Fuzzy Logic Controlled Genetic Algorithms. Case studies. Case studies in Engineering

Text Book:

1. Sinha, N.K. and Gupta, M. M.: "Soft Computing and Intelligent Systems - Theory and Applications", Academic Press.
2. S. Rajasekaran and G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis, and Applications" , Prentice Hall of India, 2007.

References:

1. D. K. Pratihar, “Soft Computing”, Narosa, 2008.
2. Jang, J-S. R., Sun,C-T, Mizutani, E.: “Neuro–Fuzzy and Soft Computing”, Prentice Hall of India.

Course Outcomes (COs):

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

CLO_{01}	Understand the concepts of Soft Computing.
CLO_{02}	Understand the concepts of Neural Network Architectures.
CLO_{03}	Understand the concept of Fuzzy Logic.
CLO_{04}	Understand the Genetic Algorithms.
CLO_{05}	Understand the concept of Hybrid Systems.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
CS3ED08	Database Application and Tools	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO_{01} To understand the concept of database Environment and Database Development Process.
CLO_{02} To learn fundamental concepts of database design, data Models and Enhanced ER Modelling.
CLO_{03} Ability to develop logical database design.
CLO_{04} To gain knowledge of Normalization.
CLO_{05} To gain knowledge of modern technologies such as Data Mining, Data Warehousing.

Unit-1

Database Environment: Data versus information, traditional file processing, disadvantages,
database approach, range of database application, advantages of database approach. Cost and risk factors, components of database environment, evolution of database system.
Database Development Process: Information engineering, information architecture, enterprise data model, planning, SDLC, CASE etc. Steps of planning, strategic planning factors, corporate planning objects. Developing preliminary data model, and use of planning matrices, SDLC steps, CASE role, people in database development, three-schema architecture for database development. Examples to demonstrate the development process.

Unit-2

Modeling Data in the Organization: Modeling of the rules of organization, data names and definitions, ER model constructs entities and its types, attributes, relationships, degree, unary, binary, ternary, n-ary, cardinalities constraints, ER modeling examples.
Enhanced ER modeling: supertype, subtypes, specialization, generalization, specifying constraints in EER models, completeness, Disjointness, discriminators, defining super/sub type hierarchies, EER modeling examples, live demos modelling for few scenarios.

Unit-3

Logical database design: and relational model development, Relational model properties, keys, primary, secondary, composite, properties of relations. Codd's rules, integrity constraints, creating relational tables, Transform EER diagrams into relations, seven different steps for mapping EER model into relations.

Unit-4

Introduction to normalization: steps, functional dependencies, basic normal forms, definition of first, second, third normal form and removing anomalies from the relations. De-normalization and merging relations.

Unit- 5

Special Topics (Overview): Data Warehousing, Data Mining, Distributed Databases, Object oriented modeling, definitions, activities in phases of model development, advantages of OOM, UML class diagrams, Example of a model development.

Text Book:

1. Hoffer, Prescott, "Modern Database Management", Seventh Edition, McFadden Pearson Education.

References:

1. Thomas M. Connolly, Carolyn E. Begg, "Database Systems", Pearson Education.
2. Raghu R and Johannes G., "Database management Systems", Mc Hill 3rd Edition,
3. Elmasri R, Navathe S, "Fundamentals of Database Systems", Addison Wesley 4th Edition.

Course Outcomes (COs):

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

CO_{01}	Understand the basic concepts of databases and learn the database development process.
CO_{02}	Apply knowledge to develop different database models and EER model on practical databases.
CO_{03}	Apply design principles for logical design of databases.
CO_{04}	Understands how to apply normalization technique on different databases and develop a database application system
CO_{05}	Learns modern technologies such as data mining and warehousing, distributed databases.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
CS3EL16	Programming with XML	3	0	2	5	4

Unit-I: Introduction to XML

XML overview, Markup languages, Comparison with HTML, Usage, Rules for writing XML, XML syntax, Creating notebook XML, Tree structure of XML, Elements, Attributes and values, Root element, Child element, Nesting of elements, Empty elements, Adding attributes, Elements and Attributes uses, Writing comments, Predefined entities, XML tools, XML validation.

Unit-II: XML-DTDs (Document Type Definitions)

Document Type Definition, DTD syntax, Creating a DTD for notebook XML, Defining elements with children, Empty element, Number of occurrences, Defining choices, Attribute definitions, Internal and external DTD's, Validating XML with DTD, Pros and cons of using DTD.

Unit-III: XML-Schema

Introduction to Schema, Namespace, Schema definition, Data types, Simple and complex data types, Attributes definition, Restrictions on values, Creating schema definition for notebook XML, Link and Validate XML with schema.

Unit-IV: XSLT

Introduction to XSL, Layout of an XSL Document and Templates, Linking XSL to your XML Source, Transforming XML with XSLT, xsl:output, xsl:template, xsl:apply-templates, Looping over nodes using xsl:for-each, Apply conditions using xsl:if, Processing and output using xsl:value-of, Sorting nodes, Create a XSLT for notebook and XML file and generate output in different conditions.

Unit-V: XPath and Project

Introduction to XPath, Using XPath to navigate an XML document, Predicates.
Sample Project: Store the information of students in XML file, validate it using XML schema and display the information of students in HTML using XSLT with proper formatting and conditions like having enrollment number, name start with, having CGPA between, in sorted order, etc.

Text Books:

1. Introduction to XML V.1, O'Reilly Publication.
2. Deitel H.M., XML How to Program, Pearson Publication.
3. Uttam K. Roy, Web Technologies, Oxford University Press.

References

1. Michael J. Young, XML Step by Step, Microsoft Press; 2nd edition
2. Elliotte Rusty Harold, XML Bible Second Edition, Hungry Minds Publication.

Course Code	Course Name	Hours Per Week			
CS3EL14	Internet of Things	L	T	P	Credits
		3	0	2	4

Course Learning Objectives (CLOs):

CLO01 Describe IOT, its applications
CLO02 Make a small working model of Project based on IOT
CLO03 Different Communication Models of IoT and the API's available
CLO04 Analyze the different levels of IOT like Functional View/ Operational View.
CLO05 Describe about the security issues in IOT and layer attack model in IOT
CLO06 Describe how the IOT helps the human being by easing life.

Unit-1

Introduction : Definition, Characteristics of IoT, IoT Architectural view, Physical design of IoT, IoT Protocols, Communication Models of IoT, IoT Communication APIs, IoT Enabling Technologies.

Unit-2

IoT and M2M: Machine-to-Machine (M2M), Difference between M2M and IoT, SDN (Software Defined Networking) and NFV (Network Function Virtualization) for IoT, Data Storage in IoT, IoT Cloud Based Services.

Unit –3

IoT Platform Design Methodology: Specifications of Purpose and Requirement, Process, Domain Model, Information Model, Service, IoT Level, Functional View, Operational View, Device and Component Integration, Application Development.

Unit –4

Security issues in IoT: Introduction, Vulnerabilities, Security requirements and threat analysis, IoT security Tomography, layered attacker model, identity management and establishment, access control.

Unit-5

Application areas of IoT: Home Automation, smart lighting, home intrusion detection, smart cities, smart parking, environment, weather monitoring system, agriculture.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press.

2. Rajkamal,"Internet of Things", Tata McGraw Hill publication

References:

1. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley

2. Donald Norris "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

Open Learning Source:

1. https://nptel.ac.in/courses/106105166/
2. https://github.com/connectIOT/iottoolkit

Course Outcomes (COs):

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

CO01 *Analyse* the requirements of an IOT and M2M.

CO02 *Understanding* of the use of various sensors/ actuators and micro-controllers

CO03 *Understanding layered* architecture of the IOT model.

CO04 *Apply* the different views of the IOT Model.

CO05 *Describe* the layered attack model of IOT and security issues.

CO06 *Understanding* the application areas of IOT.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EL15	Machine Learning	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To introduce machine learning with some of its problems and its types

CLO_{02} To provide detailed knowledge about classification technique under supervised learning

CLO_{03} To explore different unsupervised learning algorithms to solve any problem

CLO_{04} To study various ensemble methods including statistical learning theory

CLO_{05} To study advance type of machine learning including deep learning techniques

Unit-1 Introduction to machine learning, Applications, Classification; Supervised Learning: Linear Regression: Cost function, Gradient descent; Logistic Regression, Nearest-Neighbors, Gaussian function.

Unit-2 Overfitting and Underfitting, Regularization, Bias and Variance, Decision Trees, Naï ve Bayes, Support Vector Machines, Kernel Methods.

Unit-3 Unsupervised Learning: Clustering: K-means, Dimensionality Reduction: PCA, Matrix Factorization and Matrix Completion, Ranking, Recommender System.

Unit-4 Introduction to Neural Network, Perceptron, Feed forward, Back Propagation, Recurrent Neural Network. Introduction to Python machine learning libraries: Keras, Tensorflow and Theano.

Unit-5 Evaluating Machine Learning algorithms and Model Selection, Ensemble Methods: Boosting, Bagging, Random Forests, Deep learning Semi-supervised Learning, Reinforcement Learning.

Text Book:

1. Machine Learning, Tom Mitchell, McGraw Hill.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer (freely available online)

Reference Books:

4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.
5. Hal Daumé III, A Course in Machine Learning (freely available online)
6. Sebastian Raschka,Vahid Mirjalili, Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow, Packt Publishing.

Course Outcomes (COs):

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

CO_{01} Analyze the problems where machine learning can be used effectively.

CO_{02} Understand various classification techniques and where it can be used

CO_{03} Understand the unsupervised learning including clustering algorithms

CO_{04} Understanding the concept of Neural Networks and its application areas

CO_{05} Understanding various ensemble methods and advance machine learning methods including deep learning

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EL16	Information Storage and Management	3	0	2	4

Unit-I Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

Unit-II Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

Unit –I V Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

Unit-V Information storage on cloud :Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Text Books:

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained : Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.

References:

1. John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.
2. Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3PC04	Mini Project	0	0	4	2

Course Learning Objectives (CLOs):

CLO01 Apply computer science and engineering principles to design and develop software solutions.

CLO02 Develop project management skills, including planning, scheduling, and resource allocation.

CLO03 Enhance teamwork and collaboration abilities by working in a group setting

CLO04 Demonstrate effective communication skills through project documentation and presentations.

CLO05 Gain hands-on experience in utilizing programming languages, software development tools, and methodologies.

CLO06 Analyse and evaluate software project outcomes to identify areas for improvement.

Course Description:

The Mini Project Development course in Computer Science and Engineering is designed to provide students with practical experience in developing software solutions. Through this project, students will gain hands-on experience in problem-solving, software development, and project management. Students will work in groups to complete a software project within the given time frame.

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

CO01 Demonstrate the ability to apply computer science and engineering principles to develop functional software solutions.

CO02 Develop project management skills through effective planning, scheduling, and resource allocation in software development projects.

CO03 Enhance teamwork and collaboration abilities by working effectively in a group setting to complete a software project.

CO04 Demonstrate effective communication skills through documentation and presentations of the software project.

CO05 Gain hands-on experience in utilizing programming languages, software development tools, and methodologies for real-world software development.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3NG05	Soft Skill-III	2	0	0	2

Unit-1

Introduction to Computational Thinking: -What is Computational Thinking? - The four pillars of Computational Thinking: Decomposition, Pattern Recognition, Abstraction, and Algorithm Design. - Real-world examples and applications.
Introduction to C++ Programming & Development Environment: - History and significance of C++. - Overview of the C++ development environment. - Installing and setting up a C++ compiler (e.g GCC). - Writing, compiling, and running your first C++ program.

Unit-2
Basic Syntax and Data Types: - Structure of a C++ program. C- Variables and data types (int, float, char, etc.). - Constants and enumerations. - Basic input and output using `cin` and `cout`.
Control Structures: - Conditional statements (`if`, `else-if`, `else`). - Switch case. - Loops (`for`,`while`, `do-while`). - Break, continue, and goto.

Unit-3
Functions and Modularity: - Introduction to functions. - Defining and calling functions.

- Function parameters and return types. - Scope and lifetime of variables. - Recursive functions. **Data Structures Arrays and Strings: -** Introduction to arrays: declaration, initialization, and accessing. - Multidimensional arrays. - Introduction to C++ strings and string library functions.
- Introduction to vectors (briefly, as an advanced array type). **Pointers and Dynamic Memory: -** Basics of pointers: declaration, initialization, and dereferencing. - Pointers with arrays and functions. - Dynamic memory allocation (`new` and `delete`).

Unit-4
Object-Oriented Programming (OOP) Basics: - Introduction to OOP and its principles.

- Classes and objects. - Constructors and destructors. - Member functions and encapsulation. - Introduction to inheritance. **File Handling: -** Basics of file input and output. - Reading from and writing to text and binary files.

Unit-5
Aptitude Refresher: - Must do questions. - Advance Problem Solving. - Most asked questions in placements round. - Important Tips and Tricks to remember. - Review of important topics.

Reference Book: Let Us C++ by Yashavant Kanetkar

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00051	R-Programming	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand importance and advantages of R Programming and IDE for programming.
CLO02 To understand and implement program on various data Structures in R.
CLO03 To understand basic programming fundamentals like Objects, Classes, Functions in R, debugging tools etc
CLO04 Work with the Data Sets of various formats, Training algorithms and plotting.
CLO05 To become proficient in writing a fundamental program and perform Data Analytics with R wit use of R strings, date etc.

Unit 1 - R basics
Introduction: Basic features of R, advantages of using R, Limitations, R resources, Arithmetic and objects, Math, Variables, and Strings, Vectors and Factors, Vector operations.

Unit 2 - Data structures in R
Data types, Arrays, Tables, Matrices: operations, Lists: operations, Data frames: creation, factors, reading.

Unit 3 - R programming fundamentals
Conditions and loops, Functions in R, Objects and Classes, Recursion, Debugging

Unit 4 - Working with data in R
Reading CSV and Excel Files, Reading text files, Writing and saving data objects to file in R, Reading in larger, Datasets, Exporting data. Interface to outside world.

Unit 5 – String & Dates in R, Graphics
String operations in R, Regular Expressions, Dates in R, Time in R, Graphics: one dimension plot, legends, function plot, box plot.

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

CO01 Implement basics of R Programming using built-in functions.
CO02 Understand fundamentals and Data Structures used in R Programming.
CO03 apply fundamentals and Data Structures, functions, debugging tools in writing R-script
CO04 Work with the Data Sets of various formats, Training algorithms and plotting.
CO05 R-Programming languages for different applications like Machine Learning, Data Science etc.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00015	Agile Development	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To Introduce the concept of development agility and the Agile Manifesto and to learn how and why agile practices centred around small, cross-functional teams that self-organize to work collaboratively.

CLO_{02} To understand how both time boxed (Scrum) agile methods increasethroughput and decrease cycle time, Understand how Scrum can be used to deliver quality products

CLO_{03} To Understand how agile methods reduce risk via incremental learning and delivery

CLO_{04} To understand the levels of planning and how agile practices shift the focus from managing to a plan to planning continuously and steering toward results.

CLO_{05} To understand how agile's inspect and adapt cycles continuously improve both product and process.

Unit-1

Understanding Agile: Introduction to Agile Project Management, Agile Manifesto, Agile Principles, Agile Benefits: Product Development and customers, Development teams etc.

Unit-2

Agile Frameworks: Agile approaches, reviewing the big three: Lean, Extreme programming and Scrum. Putting Agile in action: Environment, Behaviours-Agile roles, New values, Team philosophy.

Unit-3

Working in Agile: Planning in Agile, product vision, creating the product roadmap, refining requirement and estimates, release planning and Sprint planning.

Unit-4

Managing in Agile: Managing Scope and procurement, managing time and cost, team dynamics and communication, managing quality and risk

Unit-5

Ensuring Agile Success: Building a foundation- Commitment, choosing the right project team members-Development team, scrum master etc. Being a change agent, Key benefits and key resources for agile project management.

Text Books:

1. Mark C. Layton, Agile Project Management For Dummies, Wiley publishers

2. Jim Robert Highsmith, Agile Project Management: Creating Innovative Products,Pearson education
3. Hitzler, Markus, Rudolph , Foundations of Semantic Web Technologies, Chapman &Hall/CRC
4. Allemang , Hendler , Semantic Web for the working Ontologist, Elsevier Pub

References:

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

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

CO_{01} Distinguish between agile software development and traditional software development and Appraise the business value of adopting Agile approaches and development practices.

CO_{02} Design and provide measurement, metrics necessary for problems involving agile software development and apply a thorough understanding of Agile principles and specific practices

CO_{03} Suggest agile software development approaches for any real-time problem, Select the most appropriate way to improve results for a specific circumstance or need.

CO_{04} Integrate best practices of traditional and agile software development and use in real-time problem solving

CO_{05} Evaluate likely successes and formulate plans to manage likely risks or problems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00073	Cyber Security Fundamentals	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization
CLO02 Analyse the cyber security needs of an organization
CLO03 Understand key terms and concepts in Cryptography and Learn to apply Cyber Security with Public key encryption and Hash function.
CLO04 Develop cyber security strategies and policies
CLO05 Understand principles of web security and to guarantee a secure network by monitoring
CLO06 Analysing the nature of attacks through cyber/computer forensics software/tools.
CLO07 Practice with an expertise in academics to design and implement security solutions.

Unit-1

Symmetric Ciphers

Symmetric Cipher model, Substitution techniques, Transposition techniques, Steganography, Block cipher principles, Data Encryption Standard, Confidentiality using symmetric encryption: Potential locations for confidentiality attacks, Link versus End-to-End Encryption.

Unit-2

Public key encryption and HASH functions

Public key Cryptosystems: Principles, applications and requirements, RSA algorithm Key Management: Distribution of Public keys and Secret keys, Diffie-Hellman key exchange. Message Authentication: Authentication requirements, Authentication Functions like Message Encryption, Message Authentication code and Hash Function. Requirement for a Hash function, simple hash function, Block chaining techniques, Brute-force attack.

Unit-3

Cybercrimes-I

Introduction and classification of Cybercrimes, Cyberattack and its types viz Passive attacks, Active attacks, Type of Malware and malware attack, Vulnerability and threads: Classification of Vulnerability(Technology weakness, Configuration weakness, Security policy weakness) , Types of threat (Unstructured, structured, external, internal etc), common cyber attack terms: Hacker, Cracker, Phreaker, Spammer, Phisher, white hat, black hat etc.

Unit-4

Cybercrimes-II

Proliferation of mobile and wireless devices, attacks on mobile phone, Security challenges in mobile devices, Registry setting and RAS security for Mobile devices, Credit card fraud. Tools and Methods used in cybercrimes: Proxy anonymizers, Phishing, Password creaking, Keyloggers, Spywares, Virus, worms, Trojan Horses, Backdoors.

Unit-5

Cyberlaws and Forensics

Need of cyber laws, Basic Indian IT Act-2000 and its various sections, Amended IT Act-2000, Digital signature, Public key certificate . Digital forensics : Basics, investigation methods, reporting and management of evidence.

Text Books:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Prentice Hall
2. Mark Rhodes- Ousley, "Information Security: The Complete Reference", Tata McGraw Hill

References:

1. Rajkumar Buyya, James Broberg and Anderzej Goscinski, "Cloud Computing Principles and Paradigms", Willey
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill

Course Outcomes (COs):

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

CO_{01} Analyse and evaluate the cyber security needs of an organization

CO_{02} Determine and analyse software vulnerabilities and security solutions to reduce the risk of exploitation.

CO_{03} Design and develop a security architecture for an organization.

CO_{04} Measure the performance and troubleshoot cyber security systems.

CO_{05} Design operational cyber security strategies and policies

CO_{06} Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EO05	Sensors & Transducer	3	0	2	4

UNIT I Science of Measurement

Generalized Measurement System, Errors in Measurements, Definition and Classification of Errors. Gross, Systematic and Random Errors. Accuracy and Precision, Calibration of the Instrument.

UNIT II Sensors and Transducers:

Introduction, Classification of Transducers, Advantages and Disadvantages of Electrical Transducers, Criteria for transducer selection, Static and dynamic characteristics of transducers, Generalized Performance of Zero Order and First Order Systems.

UNIT III Electrical Measurements

Resistive transducers: Potentiometer, RTD, Thermistor, Inductive transducer: LVDT, Use in displacement measurement Capacitive transducer: Piezoelectric transducer,

UNIT IV Signal Conditioning & Converters:

Signal Condition: Introduction, Functions of Signal Conditioning Equipment, Amplification, Filtering.

Converters: Analog to Digital converters, BCD to 7-Segment Display Decoder.

UNIT V Data Acquisition & Telemetry

Data Acquisition Systems: Introduction, Objectives and Configuration of Data Acquisition System, Block Diagram of Data Acquisition Systems, Single channel and multi-channel data acquisition.

Telemetry: Introduction, Block diagram and classification telemetry system. landline and RF telemetry, Current and voltage telemetry.

Text Books

1. Ernest O Doebelin, “Measurement Systems, Applications and Design”, Tata McGraw Hill.
2. A K Sawhney, “A Course in Electrical and Electronic Measurement and Instrumentation”, Dhanpat Rai and Co (P) Ltd.

3. D Patranabis, “Sensors and Transducers”, 2nd edition PHI, New Delhi.

Reference Books

1. D. Roy Choudhary, Sheil Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd.
2. H S Kalsi, “Electronic Instrumentation”, Tata McGraw Hill, New Delhi.

Subject Code	Courses	L	T	P	Credit
CS3EO06	Microprocessors & Microcontrollers	3	0	2	4

Unit-I BASICS OF MICROPROCESSOR SYSTEM:

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

Unit-II 8086 MICPROCESSOR:

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

Unit-III INTERFACING OF DEVICES WITH 8086:

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

Unit-IV 8051 MICRO-CONTROLLERS:

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

Unit-V INTERFACING AND APPLICATIONS OF 8051 MIRCO-CONTROLLERS:

Interfacing of micro-controllers with external memory, interfacing of microcontrollers with stepper motor, interfacing of microcontrollers with ADC 0808 and DAC0808, interfacing of microcontroller with seven segment display.

Text Books:

1. R.S. Goankar, “Microprocessor Architecture, Programming and Applications with the 8085”. 6th edition, Penram International Publishing.
2. A.K. Ray and K. M. Bhurchandi, “Advanced Microprocessoprs and Peripherals- Architecture , Programming and Interfacing” ,Tata McGraw-Hill
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi, “The 8051 Microcontroller and Embedded System”, Pearson Education.

Reference Books

1. Hall Douglas V, “Microprocessor and Interfacing”, McGraw-Hill Education (India) Pvt Limited.
2. Kenneth J. Ayala, “The 8051 Microcontroller Architecture the III Edition”- Cengage Learning.
3. James L. Antonakos , “The Intel Family of Microprocessors: Hardware and Software Principles and Applications”, Cengage Learning.

Experiment List

1. Write an assembly language for performing following using 8086 microprocessor kit,
    a. Perform addition of two 8 bit numbers
    b. Perform subtraction of two 8-bit numbers
    c. Perform multiplication of two 8-bit numbers
    d. Perform division of two 8-bit numbers
2. Write 8086 assembly language program to exchange the contents of memory location 1000H and 2000H.
3. Write 8086 assembly language program to find largest from given ten numbers.
4. Write 8086 microprocessor assembly language program to add the numbers stored in memory location 1000:200H and 1000:300H and store the result at 2000:100H.
5. Write 8086 microprocessor assembly language program to find count of even and odd numbers from a given array of ten numbers.
6. Write 8086 microprocessor assembly language program to toggle LEDs connected at Port A of 8255 PPI after a delay of 1 second.
7. Write 8086 microprocessor assembly language program to display numbers 0 to 9 on seven segment displays connected at Port A of 8255 PPI after a delay of 1 second.
8. Write 8086 microprocessor assembly language program to implement traffic light controller.
9. Write 8051 microcontroller ALP/C program to drive stepper motor in clock wise and anti-clockwise direction.
10. Write 8051 microcontroller ALP/C program to display “Welcome” on Seven segment display.
11. Write 8051 microcontroller ALP/C program to interface ADC0808 with 8051 Micro-controllers.

SEMESTR-VII (Batch-2021) CSE-Core, AI, IOT,DS

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CS3ELXX	Elective-5	3	0	2	4
2	CS3ELXX	Elective-6	3	0	2	4
3	OE000XX	Open Elective-3	3	0	0	3
4	CS3PC03	Industrial Training	0	2	0	2
5	CS3PC05	Project-I	0	0	8	4
		Total	**9**	**2**	**12**	**17**
		Total Contact Hours	**23**			

Elective-5, Elective-6
Track AI: CS3EA12 Natural Language Processing, CS3EA14 Digital Image Processing
Track DE: CS3ED10 Data Visualization, CS3EL17 No SQL Databases
Track WT: CS3EW05 Distributed System, CS3EL17 No SQL Data bases
CSE-AI: CS3EA12 Natural Language Processing, CS3EA14 Digital Image Processing
CSE-DS: CS3ED10 Data Visualization, CS3EL17 No SQL Database
CSE-IOT: CS3EO07 Edge Computing, CS3EO08 Network Security
Open Electives-3:
OE00018 Python Essential
OE00056 Cloud Security
OE00075 Exploratory Data Analysis

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
CS3PC05	Project-I	0	0	8	0	4

A project encourages students to learn new techniques and technology which will be required in their professional place / industry and gain experience in the professional employment world. This program is an essential component in the curriculum of Engineering Bachelor Degrees at Medi-Caps University.

This course is also essential to keep in pace with the advancements and expectations of industry. The development life cycle of any project is essential component of learning in this course. Broadly, the objectives of the course may be defined as follows:

i. To implement his knowledge to realistic and practical problems
ii. To encourage students to work in synergetic collaboration within teams
iii. To develop professional attitude and critical thinking
iv. To learn organizational ethics and work culture
v. To apply his skills in the actual development scenario

Prerequisites: Nil

Procedure: Project Completion Stages

Project Analysis and design Plan

Stages	Concern	Timeline
Topic Selection	• Interest in a domain • Interest in technology • Research interest • Availability of resources • Time feasibility • Course / Skill sufficiency	
Finalizing the Choice	• Finalize Title • Finalize supervisor	1st week
Pre-Project Planning	• Synopsis • Estimations – Time and Features	2nd week
Analysis	• Software Requirement Specification • Presentation I	4th week
Design	• Software Design Specification • Presentation II	8th week
Implementation	Presentation – III	14th week
	Dissertation – I Report + Viva – Voce	End Sem exam (Evaluation by External examiner must)

Course Code	Course Name	Hours Per Week			Total
		L	T	P	Credits
CS3PC03	Industrial Training	0	2	0	2

Industrial training is a training program that helps students to gain experience in the professional employment world at the Industry. This program is an essential component in the curriculum of Engineering Bachelor Degrees at Medi-Caps University.

It is also essential in the stream to keep in pace with the expectations of industry. Broadly, the objectives of the course are as follows:

To motivate students to apply his knowledge to realistic and practical problems

i. To encourage students to work in synergetic collaboration within teams
ii. To develop professional attitude and critical thinking
iii. To learn organizational functioning and decision making
iv. To set a stage for future recruitments and placements for students by potential employers

Prerequisites: Nil

Minimum days of Training: 4 weeks

Training Locations: Industry- Student's have choice to go Industry/Company/Educational Institution of Repute of their preferences. Permission of the University is necessary before the commencement of training. In case of training is opted by the students from the options provided by University, Students will not be allowed to change.

Procedure:

i. Internal and external guide from the department and the industry/ institutions respectively will be finalised within a week of commencement of training. In case of training given in University campus only the internal guide is required.
ii. Daily log book must be maintained by the student, duly signed by the industry/ internal guide. This log book will be considered as attendance record. Student will report weekly to the departmental guide about the progress of training.
iii. Confidential report of the student's attitude and learning in the organization should be provided by the external guide to the internal guide through mail or sealed and signed hard copy.
iv. Student will submit Training completion certificate in the department before applying for examination.
v. Well formatted summary of work and report is required to be submitted in the department as per the prescribed format.
vi. The student are required to give the Presentation during the semester in which they register for the industrial training course.
vii. Reports must be submitted during the presentation.

viii. During end semester examination a viva voce along with written examination will be conducted. Evaluation will be based on 60 marks internal and 40 marks external total 100 (60+40).

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

x. Professor incharge Training/HOD must verify the company details from www.mca.gov.in before granting the permission.

Note : For the session 2019-20 those who are already permitted before 31st May, 2019 to a company which is not registered with Ministry of corporate affairs will be acceptable. After this date no permission will be granted for such companies.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3EA12	Natural Language Processing	3	0	2	4

Course Learning Objectives (CLOs):

CLO01	How key concepts from NLP are used to describe and analyze language
CLO02	Describe the formal language and their representation using grammars.
CLO03	POS tagging and context free grammar for natural language (english).
CLO04	Understanding semantics and pragmatics of natural language(english) for processing.

Unit-1 Introduction

Human languages, Main approach of NLP, Knowledge in speech and language processing, Ambiguity, Models and algorithms, Formal language and Natural Language, Regular Expression and automata.

Unit-2 Text Pre-processing

Text Pre-processing, Tokenization, Feature Extraction from text, Morphology: Inflectional and Derivational, Finite state morphological parsing, Finite state transducer
Part of Speech Tagging: Rule based, Stochastic POS, Transformation based tagging.

Unit-3 Speech Processing

Speech and phonetics, Vocal organ, Phonological rules and Transducer, Probabilistic models: Spelling error, Bayesian method to spelling, Minimum edit distance, Bayesian method of pronunciation variation.

Unit-4 N-Grams

Simple N-Gram, perplexity, Smoothing, Backoff, Entropy, Parsing: Statistical Parsing, Probabilistic parsing, TreeBank.

Unit-5 Application

Sentiment analysis, Spelling correction, Word sense disambiguation, Machine translation, Text Classification, Question answering system

Text Books:

3. Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Pearson Education.
4. James Allen, “Natural Language Understanding”, Pearson Education.

References:

3. Christopher D. Manning and Hinrich Schutze, “Foundation of statistical Natural Language Processing”, MIT Press.
4. Mary Dee Harris “Introduction to Natural language Processing”, Reston

Course Outcomes (COs):

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

CO01	Understand natural language processing and to learn how to apply basic algorithms in this field.
CO02	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics
CO03	Understand various resources of natural language data – corpora and word net.
CO04	To conceive basics of model representation of natural language.
CO05	Apply NLP concepts in different applications.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EA14	Digital Image Processing	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 Comprehend the basics of imaging, digital image processing, and the components and steps involved in image processing systems.

CLO02 Learn the principles of imaging geometry, digital geometry, and various image acquisition systems, along with the basics of Fourier Transform and its properties.

CLO03 Master grey level transformations, histogram processing, and spatial filtering techniques for smoothing and sharpening images.

CLO04 Understand color models, color representation, and techniques for color image enhancement, segmentation, and edge detection.

CLO05 Learn various image compression schemes, including lossy and lossless methods, prediction-based compression, vector quantization, and standards like JPEG.

Unit I

Imaging, Digital Image Processing, Fundamental Steps in Image Processing, Components of Image Processing System, Elements of Visual Perception, Structure of Human Eye, Image Sensing and Acquisition, Image Sampling and Quantization

Unit II

Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh – Hadamard, Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

Unit III

Basic Grey Level Transformations, Histogram Processing, Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Filter Methods, Segmentation of Grey Level Images, Water Shade Algorithm, Fuzzy Techniques for Intensity Transformation and Spatial Filtering

Unit IV

Color Image Processing, Color Models and Representation, Laws of Color Matching, Chromaticity Diagram, Color Enhancement, Color Image Segmentation, Color Edge Detection

Unit V

Image Compression: Lossy and Lossless Compression Schemes, Prediction Based Compression Schemes, Vector Quantization, Sub-Band Encoding Schemes, JPEG Compression Standard, Fractal Compression Scheme, Wavelet Compression Scheme, Fundamentals of Redundancies, Basic Compression Methods: Huffman Coding, Arithmetic Coding, LZW Coding, JPEG Compression Standard

Text Book:

1. Rafael C. Gonzalez, Richard E Woods, Digital Image Processing, Prentice Hall

2. Maria Petrou and Costas Petrou , Image Processing the Fundamentals, John-Wiley and Sons

Reference Book:

1. Tinku Acharya and Ajoy K. Ray, “Image Processing Principles and Applications”, John Wiley & Sons

Course Outcomes (COs):

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

CO_{01}	Students will demonstrate understanding of imaging, image sensing and acquisition, and visual perception components relevant to digital image processing.
CO_{02}	Students will apply principles of imaging geometry, digital geometry, and use Fourier and other image transforms for image processing tasks.
CO_{03}	Students will effectively use grey level transformations and spatial filtering techniques to enhance and segment images.
CO_{04}	Students will utilize color models and apply techniques for color enhancement, segmentation, and edge detection in color images.
CO_{05}	Students will implement and evaluate various image compression methods, including Huffman coding, arithmetic coding, and the JPEG compression standard.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3ED10	Data Visualization	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} To understand and learn about basics of data visualization, Data sources, principles of visualization as well as basic approaches to visually map data on to aesthetics in visualization.

CLO_{02} To Learn about Methods of Non linear Magnification and Abstraction in computer graphics.

CLO_{03} To learn types of visualization, Encoding of data and To identify appropriate data visualization tools for a particular scenario. To learn various techniques given particular requirements imposed by the data.

CLO_{04} To learn Textual and Temporal Data visualization, To Learn Interactive 3D illustrations with text and images.

CLO_{05} To understand the various abstraction mechanisms and common Visualization Idioms.

Unit-1: Foundations For Data Visualization

Introduction to data visualization, Look at Data, Data source, Visualizing data: Mapping data onto aesthetics, Data visualization: basic principles, Coordinate systems and axes, time series, and statistical data graphics.

Unit-2: Computer Visualization

Computer Visualization: Exploring Complex Information Spaces , Fisheye Views – Applications, Comprehensible Fisheye Views ,Fisheye Views for 3D data, Non Linear Magnification , Comparing Visualization of Information Spaces , Abstraction in Computer Graphics , Abstraction in User Interfaces.

Unit-3: Multidimensional Visualization And Using Color, Size InVisualization

Visualization in 1D, 2D, 3D , Trees , Web Works , Data Mapping , Encoding Data using Color , Encoding Data using Size, Data Visualization tools and its Applications, Stacked & Grouped Bar Chart , Stacked Area Chart & Streamgraph , Line Chart with Multiple Lines.

Unit-4: Textual And Temporal Data Visualization

Words and text visualization , Document visualization , Interactive 3D illustrations with Images and Text, Consistency of rendered – Images and their Textual labels , Zoom Techniques for Illustration Purpose, Interactive Handling of Images and Text, Continuous time-series visualization , Discrete event visualization.

Unit-5: Abstraction In Time And Common Visualization Idioms

Introduction to D3 Scales , Loading and Parsing Data with D3.js , Encoding Data with

Marks and Channels , Rendering Marks and Channels with D3.js and SVG(Scalable Vector Graphics) , Reusable Dynamic Components using the General Update Pattern , Reusable Scatter Plot , Common Visualization Idioms with D3.js , Bar Chart, Vertical & Horizontal , Pie Chart and Coxcomb Plot, Line Chart , Area Chart.

Text books:

1. Tamara Munzner , Visualization Analysis & Design (ISBN 9781466508910)
2. Thomas Strothotte, Computer Visualization–Graphics Abstraction and Interaction

References:

1. Scott Murray , Interactive Data Visualization for the Web
2. Colin Ware ―Information Visualization Perception for Design, Morga.
3. Stuart.K. Card, Jock.D. Mackinlay and Ben Shneiderman, ―Readings in InformationVisualization Using Vision to Think, Morgan Kaufmann Pub.
4. Elijah Meeks , D3.js in Action
5. Jacques Bertin , Semiology of Graphics
6. Leland Wilkinson , The Grammar of Graphics
7. Hadley Wickham , ggplot2: Elegant Graphics for Data Analysis

Course Outcomes (COs):

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

CO_{01} To know about basic principles of Data visualization and mapping of data on to aesthetics

CO_{02} To Understand the working of non linear magnification, principles of Abstraction.

CO_{03} To Apply data visualization best practices to their work, including choosing the right chart type for the situation and avoiding visualization techniques that can mislead an audience

CO_{04} To understand document and interactive 3D visualization with images and text, Learn interactive handling of images and text.

CO_{05} To know about encoding of data with marks, visualization idioms

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EL17	NoSQL Database	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} **Comprehensive NoSQL Understanding**: By the end of this course, students should have a comprehensive understanding of NoSQL databases, including their history, fundamental features, scalability considerations, and the flexibility they offer in handling different types of data.

CLO_{02} **Comparison Skills**: Students will be able to compare and contrast NoSQL databases with traditional relational databases (RDBMS), evaluating their respective strengths, weaknesses, and suitability for various use cases.

CLO_{03} **Classification and Taxonomy Proficiency**: Students will gain proficiency in classifying and categorizing NoSQL databases based on their characteristics, allowing them to select the appropriate database type for specific data management needs.

CLO_{04} **Technical and Business Evaluation**: Upon completion of the course, students will be equipped with the skills to technically evaluate NoSQL databases, considering factors like search features, scalability, and data safety. Additionally, they will be able to perform business evaluations, assessing the strategic importance of NoSQL in different contexts.

CLO_{05} **Practical Application of NoSQL**: By the end of the course, students will be able to apply NoSQL databases effectively. They will have practical knowledge of key-value, document, column-oriented, and graph databases, including their features, consistency models, and real-world use cases. Students will also be able to make informed decisions about deploying and securing NoSQL databases in various scenarios.

Unit I: Introduction to NoSQL

Understanding NoSQL Databases, History of NoSQL, Features of NoSQL, Scalability, Cost, Flexibility, NoSQL Business Drivers, Classification and Comparison of NoSQL Databases, Consistency – Availability - Partitioning (CAP), Limitations of Relational Databases, Comparing NoSQL with RDBMS Managing Different Data Types, Columnar, Key-Value Stores, Triple and Graph Stores, Document, Search Engines, Hybrid NoSQL Databases, Applying Consistency Methods, ACID, BASE, Polyglot persistence

Unit II: Evaluating NoSQL

The Technical Evaluation, Choosing NoSQL, Search Features, Scaling NoSQL, Keeping Data Safe, Visualizing NoSQL, Extending Data Layer, Business Evaluation, Deploying Skills, Deciding Open Source versus commercial software, Business critical features, Security

Unit III: Key-Value & Document Based Databases

Introduction to Key-Value Databases, Key Value Store, Essential Features, Consistency, Transactions, Partitioning, Scaling, Replicating Data, Versioning Data, how to construct a Key, Using Keys to Locate Values, Hash Functions, Store data in Values, Use Cases.

Introduction to Document Databases, Supporting Unstructured Documents, Document Databases Vs. Key-Value Stores, Basic Operation on Document database, Partition, Sharding, Features, Consistency, Transactions, Availability, Scaling, Use Cases.

Unit IV: Column-Oriented & Graph Based Databases

Introduction to Column Family Database, Features, Architectures, Differences and Similarities to Key Value and Document Database, Consistency, Transactions, Scaling, Use Cases**.** Introduction to Graph Databases, Advantages, Features, Consistency, Transactions, Availability, Scaling, Graph & Network Modelling, Properties of Graphs and Noes, Types of Graph, Undirected and directed Graph, Flow Network, Bipartite Graph, Multigraph, Weighted Graph.

Unit V: Search Engine

Common Feature of Search Engine, Dissecting a Search Engine, Search versus query, Web crawlers, Indexing, Searching, indexing Data Stores, Altering, Using Reverse queries, Use Cases, Types of Search Engine, Elastic Search

Text Books:

1. Adam Fowler, NoSQL for Dummies, John Wiley & Sons, Inc.
2. Dan Sullivan, NoSQL for Mere Mortals, Pearson Education, Inc.

References:

1. Pramod J. Sadalage & Martin Fowler, NoSQL Distilled, Pearson Education, Inc.
2. Dan McCreary& Ann Kelly, Making Sense of NoSQL, Manning Shelter Island

Course Outcomes (COs):

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

CO_{01}	**Comprehensive NoSQL Understanding:** Graduates of this course will have a deep understanding of NoSQL databases, including their history, features, scalability, and business drivers. They will recognize the limitations of relational databases and effectively compare NoSQL with RDBMS.
CO_{02}	**Effective Database Management:** Students will develop proficiency in managing different data types, including columnar, key-value, triple, graph, document, and hybrid NoSQL databases. They will apply various consistency methods (ACID, BASE) and understand polyglot persistence.
CO_{03}	**Strategic NoSQL Evaluation:** Graduates will be equipped with the skills to evaluate NoSQL databases from both technical and business perspectives. They will make informed decisions regarding the choice of NoSQL solutions, considering factors like search features, scalability, security, and open-source vs. commercial software.
CO_{04}	**Proficiency in Key-Value and Document Databases:** Students will be proficient in working with key-value and document databases, understanding key features, data consistency, transactions, partitioning, and replication. They will apply this knowledge to real-world use cases.
CO_{05}	**Graph and Columnar Database Proficiency:** Graduates will gain a strong understanding of column-oriented and graph databases, including their features, architectures, and use cases. They will also develop expertise in graph modeling, graph properties, and the handling of different types of graphs.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CS3EW05	Distributed Systems	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} Grasp the basic concepts, design issues, goals, and types of distributed systems, and distinguish them from centralized computing systems.

CLO_{02} Comprehend communication between distributed objects, remote procedure calls, and the operating system layer in distributed environments.

CLO_{03} Understand clock synchronization, logical clocks, distributed mutual exclusion, election algorithms, and multicast communication in distributed systems.

CLO_{04} Learn the architecture, implementation, naming systems, and transaction management in distributed file systems, with a focus on concurrency control and deadlocks.

CLO_{05} Gain knowledge of scheduling, load distributing algorithms, fault-tolerant services, and the basics of distributed databases and multimedia systems.

Unit I

Introduction: Definition, Design Issues, Goals, Types of distributed systems, Centralized Computing, Advantages of Distributed systems over centralized system .Limitation of Distributed systems Architectural models of distributed system, Client-server communication, Introduction to DCE

Unit II

Distributed Objects and Remote Invocation: Communication between distributed objects Remote procedure call, Events and notifications, operating system layer Protection, Processes and threads, Operating system architecture. Introduction to Distributed shared memory, Design and implementation issue of DSM.Case Study: CORBA and JAVA RMI.

Unit III

Clock synchronization: Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Lamport's Logical Clock, Global states, Distributed mutual exclusion algorithms: centralized, decentralized, distributed and token ring algorithms, election algorithms, Multicast communication.

Unit IV

Distributed File Systems: File service architecture, Distributed File Systems Implementation, Naming System, Network File System (NFS), Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks.

Unit V

Scheduling -Issues in Load Distributing, Components for Load Distributing Algorithms, Different Types Distributed of Load Distributing Algorithms, Fault-tolerant services Highly available services, Introduction to Distributed Database and Multimedia system

Text Book:

1. G. Coulouris, J. Dollimore and T. Kindberg, Distributed Systems: Concepts and design, Pearson.

2. P K Sinha, Distributed Operating Systems: Concepts and design, PHI Learning.

Reference Book:

1. Tanenbaum and Steen, Distributed systems: Principles and Paradigms, Pearson.
2. Sunita Mahajan & Shah, Distributed Computing, Oxford Press.

Course Outcomes (COs):

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

CO_{01}	Students will demonstrate understanding of the fundamental concepts, goals, and design issues of distributed systems and compare them with centralized systems.
CO_{02}	Students will be able to implement and manage communication between distributed objects, including remote procedure calls and event notifications.
CO_{03}	Students will effectively apply clock synchronization methods, logical clocks, and distributed mutual exclusion and election algorithms in distributed environments.
CO_{04}	Students will understand and implement distributed file systems, manage distributed transactions, and handle concurrency control and deadlocks.
CO_{05}	Students will design and implement load distributing algorithms, and understand fault-tolerant and highly available services in distributed systems, including basics of distributed databases and multimedia systems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3EO07	Edge Computing	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} Grasp the fundamental definitions, purposes, and use cases of IoT and edge computing, and differentiate between edge and fog computing.

CLO_{02} Comprehend IoT architecture and core modules, including connected ecosystems, SCADA, and the role of an architect in IoT and edge implementations.

CLO_{03} Understand the hardware and software aspects of RaspberryPi, including operating systems, configuration, programming, and remote access.

CLO_{04} Learn to implement microcomputers and device interfacing using RaspberryPi, and understand edge to cloud protocols with a focus on MQTT.

CLO_{05} Study the integration of edge computing with RaspberryPi in industrial and commercial IoT applications, and explore edge computing solutions.

UNIT I

IoT and Edge Computing Definition and Use Cases Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.

UNIT II

IoT Architecture and Core IoT Modules-A connected ecosystem, IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beckstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

UNIT III

RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi.

UNIT IV

Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud Protocols, Protocols MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1 working example. UNIT V Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Edge computing and solutions.

TEXT BOOKS

1. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806.
2. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.

REFERENCES

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama,

wiley publication, 2019, ISBN: 9781119524984.
2. David Jensen, “Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE

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

CO_{01}	Students will demonstrate a comprehensive understanding of IoT and edge computing definitions, purposes, use cases, and communication models.
CO_{02}	Students will be able to implement and analyze IoT architectures and core modules, and apply these in real-world use cases and deployments.
CO_{03}	Students will develop proficiency in configuring RaspberryPi, programming it, and using it for various applications like web servers and image processing.
CO_{04}	Students will effectively implement device interfacing with RaspberryPi and understand MQTT protocol details, including publish-subscribe architecture and communication formats.
CO_{05}	Students will apply edge computing concepts using RaspberryPi in industrial and commercial IoT scenarios, and understand practical edge computing solutions.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CS3EO08	Network Security	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} Learn the basics of security attacks, services, mechanisms, and cryptography, including classical encryption techniques and secret key cryptography.

CLO_{02} Grasp the principles of public key cryptography, including RSA, Diffie-Hellman, elliptic curve cryptography, and key management and distribution.

CLO_{03} Understand authentication requirements, message authentication codes, hash functions, and digital signatures, including protocols like Kerberos.

CLO_{04} Study IP security, transport-level security protocols such as SSL/TLS, HTTPS, SSH, and email security to protect data in transit.

CLO_{05} Learn about various types of malicious software, firewalls, intrusion detection systems, and IoT security concepts to defend against cyber threats.

UNIT I

Introduction: Security Attacks, Services and Mechanisms, Introduction to cryptography, terminologies, Classical encryption techniques: substitution techniques, transposition techniques, steganography- .Secret Key Cryptography: stream cipher ,Block cipher, design principles ,Block cipher mode of operation, DES rounds, S-Boxes ,S-DES algorithm, IDEA: Overview, comparison with DES, Key expansion, IDEA rounds. Introduction to AES.

UNIT II

Public key Cryptography: Algorithms, examples, Modular arithmetic (addition, multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption. Diffie-Hellman key exchange algorithm. Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III

Message Authentication and Integrity: Authentication requirement – Authentication function, MAC , Hash function – Security of hash function .MD5 and SHA-1 algorithms. Digital signature and authentication protocols – DSS Entity Authentication: Biometrics, Passwords, Authentication applications – Kerberos system.

UNIT IV

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange (IKE). Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS standard, Secure Shell (SSH) application. Electronic mail security, and Network management security.

UNIT V

Malicious Software: Viruses, Worms, System Corruption, Attack Agents, Information Theft , Keyloggers, Phishing, Spyware Payload Stealthing, Backdoors, Distributed Denial of Service Attacks. Firewalls and Intrusion Detection Systems, Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Location and Configurations. Concepts of IoT security.

Text Books:

1. Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, 2014, Pearson, ISBN13:9780133354690.

Reference books:

1. Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.
2. The Network Security Test Lab: A Step-By-Step Guide, Michael Gregg, Dreamtech Press, 2015, ISBN-10:8126558148, ISBN-13: 978-8126558148.

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

CO_{01}	Students will demonstrate understanding of security attacks, classical encryption techniques, and secret key cryptography including DES, S-DES, IDEA, and AES
CO_{02}	Students will be able to implement public key cryptographic algorithms such as RSA and Diffie-Hellman, and manage key distribution using PKI and X.509 certificates.
CO_{03}	Students will effectively use MACs, hash functions like MD5 and SHA-1, and digital signatures to ensure message integrity and authentication.
CO_{04}	Students will understand and apply security protocols at the IP and transport layers, including IPsec, SSL/TLS, HTTPS, SSH, and email security measures.
CO_{05}	Students will identify and mitigate threats from viruses, worms, and other malware, implement firewalls and intrusion detection systems, and apply IoT security measures.

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

Course Learning Objectives (CLOs):

CLO$_{01}$ To understand why Python is a useful scripting language for developers.
CLO$_{02}$ To learn how to use lists, tuples, dictionaries, indexing and slicing to access data in Python programs.
CLO$_{03}$ To learn how to read and write files in Python.
CLO$_{04}$ To learn how to design object-oriented programs with Python classes.
CLO$_{05}$ To learn how to use exception handling in Python applications for error handling

Unit-1 Basic Introduction
Introduction to Python, History, Features, command interpreter and development environment-IDLE, Application of Python, Python 2/3 differences, Basic program structure-quotation and indentation, Operator, Basic data types and In-built objects.

Unit-2 Function and Sequence
Functions: definition and use, Arguments, Block structure, scope, Recursion, Argument passing, Conditionals and Boolean expressions, Lambda Function, inbuild functions (str(),globals(),locals(),vars(),eval(),exec(),execfile(),repr(),ascii()) Sequences: Strings, Tuples, Lists Iteration, looping and control flow, String methods and formatting.

Unit-3 File Operation & OOPS concepts
Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek.

Unit-4 OOPS Concepts
Object Oriented concepts- Encapsulation, Polymorphism**,** Classes, Class instances, Constructors & Destructors__init__, __del__, Multiple inheritance, Operator overloading Properties, Special methods, Emulating built-in types.

Unit-5 Mutable data types, Exception and Standard modules
Dictionaries, Sets and Mutability, Exceptions, List and Dict Comprehensions, Standard Modules-math, random Packages.

Text Book:

3. Dr.R.Nageswara Rao, Core Python Programming, dreamtech press.
4. Paul Barry, Head First Python, O'REILLY.

References:

3.Mark Luiz, Learning Python, O'REILLY.
4.Jamie Chan, Learn Python in One Day, LCF Publishing.

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

CO_{01}	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
CO_{02}	Express different decision-making statements and Function
CO_{03}	Interpret Object oriented programming in Python
CO_{04}	Understand and summarize different File handling operations
CO_{05}	Student will be able to distinguish between mutable and immutable data types.
CO_{01}	Students are able to work with standard libraries and pre define module.

List of Experiments (if applicable)

- WAP to find product of two numbers using command line arguments?
- WAP to Given the string 'hello', give an index command that returns 'e'.
- WAP to Reverse the string 'hello' using slicing.
- WAP to Given the string 'hello', give two methods of producing the letter 'o' using indexing.
- WAP to Ask the user for a string and print out whether this string is a **palindrome** or not. (A **palindrome** is a string that reads the same forwards and backwards.)
- WAP to create a byte type array, read and display the elements of the array.
- WAP to accept a numeric digit from keyboard and display in words.
- WAP to display a group of messages when the condition is true?
- WAP to accept a number from keyboard and test whether a number is even or odd.
- WAP to test whether a given number is in between 1 and 10.
- WAP to display even numbers between m and n
- WAP to display characters of a string using for loops
- WAP to display odd numbers from 1 to 10 using range ().
- WAP to display and sum of a list of numbers using loop.
- WAP to display the stars in an equilateral triangular form using a loop.
- WAP to display numbers from 1 to 100 in a proper format
- WAP to search for an element in the list of elements.
- WAP to display prime number series.
- WAP to generate Fibonacci number series.
- Write a Python program to combine each line from first file with the corresponding line in second file
- Write a Python program to copy the contents of a file to another file
- WAP to define Student class and create an object to it. Also, we will call the method and display the student's details.
- WAP to create a static method that counts the number of instances created for a class.
- WAP to create a Bank class where deposits and withdraw can be handled by using instance methods.
- WAP showing single inheritance in which two sub classes are derived from a single base class.

- WAP to implement multiple inheritance using two base classes.
- WAP to show method overloading to find sum of two or three numbers.
- WAP to Create a 3×3 numpy array of all True's
- WAP to Replace all odd numbers in arr with -1
  a. Input ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
- WAP to Convert a 1D array to a 2D array with 2 rows
  a. Input: np. arrange (10)
- WAP to Get the common items between a and b
  Input:
  a = np. array ([1,2,3,2,3,4,3,4,5,6])
  b = np. array ([7,2,10,2,7,4,9,4,9,8])
  Desired Output:
  array ([2, 4])

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00075	Exploratory Data Analysis	3	0	0	3

Unit I: Introduction to Data and its types

Definition and importance of data, classification of data : based on observation – Cross Sectional, times series and panel data, based on measurement – ratio, interval, ordinal and nominal, based on availability – primary, secondary, tertiary, based on structural form – structured, semi structured and unstructured, based on inherent nature – quantitative and qualitative, concepts on sample data and population, small sample and large sample, statistic and parameter, types of statistics and its application in different business scenarios, frequency distribution of data.

Unit II: Introduction to Exploratory Data Analysis (EDA)

Definition of EDA, Basic EDA assumptions, importance of underlying assumptions, techniques for testing assumptions, interpretation of 4-Plot, consequences of non-randomness, non-fixed parameters like location and variation parameters, consequences related to distributional assumptions, difference between EDA with classical and Bayesian Analysis, comparison of EDA with Classical data summary measures, goals of EDA, Underlying assumptions in EDA, importance of EDA in data exploration techniques, introduction to different techniques to test the assumptions involved in EDA, role of graphics in data exploration, introduction to unidimensional, bidimensional and multidimensional graphical representation of data.

Unit III: Data Analysis Tools

EDA techniques, analysis questions, graphical techniques, auto correlation plot for random data, moderate correlation, strong and autoregressive correlation, sinusoidal correlation, Various Plot, Introduction to data exploration process for data preparation, data discovery, issues related with data access, characterization of data, consistency and pollution of data, duplicate or redundant variables, outliers and leverage data, noisy data, missing values, imputation of missing and empty places, with different techniques, missing pattern and its importance, handling non numerical data in missing places.

Unit IV: EDA – Graphical Representation

Introduction to graphical representation of data, dot plot, stem and leaf plot, bar chart, stacked bar chart, multiple bar chart, percentage bar chart, histogram, bimodal and symmetric interpretation of histogram, frequency polygon, bihistogram, pie chart and its legends, block plot, bootstrap plot, Box-Cox linearity plot, Box-Cox Normality Plot, Box Plot, contour plot, mean plot, normal probability plot – Normally distributed data, probability plot, probability correlation coefficient plot, Quantile- Quantile plot, percentile plot, run sequence plot, Standard deviation plot, star plot, Youden plot, correlogram, spectral plot : random data, sinusoidal model and auto correlated data, dendrogram, interpretation of dendrogram, autocorrelation plot – sinusoidal model, lag plot – random data, autocorrelated data, Weibull Plot and its importance in manufacturing industry production, heat map, tree map.

Unit V: Bivariate Data Analysis

EDA case studies – Random distribution, Random walk, standard resistor, Heat flow meter, Introduction to bivariate distributions, association between two nominal variables, contingency tables, Chi-Square calculations, Phi Coefficient, scatter plot and its causal interpretations, correlation coefficient, regression coefficient, relationship between two ordinal variables – Spearman Rank

correlation, Kendall's Tau Coefficients, measuring association between mixed combination of numerical, ordinal and nominal variables.

Text Books

1. Exploratory Data Analysis – John W Tukey, Addison Wesley Publishing Company
2. Exploratory Data Analysis in Business and Economics - An Introduction Using SPSS, Stata and Excel – Thomas Cleff, Springer Publication

Reference Books

1. Graphical Exploratory Data Analysis - S.H.C. du Toit A.G.W. Steyn R.H. Stumpf, Springer Publication
2. Hand book of Data Visualization – Chun-houh Chen, Wolfgang Härdle, Antony Unwin, Springer Publication.

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hr	Credit
OE00056	Cloud Security	3	0	0	3	3

Unit- I : Security Concepts

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defense in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS.e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures,

Unit-II: Security Fundamentals and Risk Issues in the Cloud

Cloud Information Security Objectives, Cloud Security services, Cloud Security Design Principles, Secure Cloud Software Requirements, Security Policy Implementation and decomposition, Cloud Computing and Business Continuity/Disaster Recovery, CIA triad, Privacy and compliance risk. Infrastructure Security: Infrastructure Security: The Network Level, Infrastructure Security: The Host Level, Infrastructure Security: The Application Level. Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

Unit- III: Identity and Access Management

Introduction, Definitions, Trust Boundaries, Challenges, Architecture and Practices, Getting Ready for the Cloud, Relevant IAM Standards and Protocols for Cloud Services, Cloud Authorization Management, Cloud Service Provider IAM Practice.

Unit-IV: Security Management in the Cloud

Security Management Standards, Security Management, Availability Management, SaaS Availability Management, PaaS Availability Management, IaaS Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.

Unit- V: Legal and Compliance Issues

Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg.PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Text Books

1. Tim Mather, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy, O'Reilly.
2. Raghu Yeluri, Enrique Castro-Leon, Building the Infrastructure for Cloud Security A Solutions view, Apress open.
3. Ronald L. Krutz, Russell Dean Vines, Cloud Security A Comprehensive Guide to Secure Cloud Computing, Wiley.

References

1. John Rittinghouse, James Ransome, Cloud Computing, CRC Press.
2. J.R. ("Vic") Winkler, Securing the Cloud, Syngress.
3. Cloud Security Alliance, Security Guidance for Critical Areas of Focus in Cloud Computing.
4. Vmware, VMware Security Hardening Guide, White Paper.
5. Cloud Security Alliance 2010, Top Threats to Cloud Computing, Microsoft.

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**			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3PC06	Project Work II	0	0	24	12

Course Learning Objectives (CLOs):

CLO_{01} Ability to defined objective of real-life problems, plan, design, develop and execute.

CLO_{02} Ability to work in team at component level, system level and troubleshoot of problems.

CLO_{03} Ability to reuse, integrate with existing components to develop the solution for different client to help the society.

CLO_{04} Ability to derive performance metrics and assess quantitatively the performance of system.

CLO_{05} Ability to prepare the report and present the findings to the client.

MEDI-CAPS UNIVERSITY
Knowledge is Power

Computer Science Engineering (Batch – 2016) Fourth Year Even Semester

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
CS3PC[redacted]	Project Work-II	0	0	[redacted]	0	[redacted]

Project Implementation Plan

Finalizing the Choice for New Project/ Continuation of Old Project	• Finalize Title • Finalize supervisor • Presentation I	1st week
Implementation	• Interfaces • Databases • Full Implementation • Presentation II	6th week
Testing and Deployment	• Test Cases • Test Reporting • Presentation III	10th week
Report in Format (Spiral Binding)	• Evaluation by supervisor and 2 additional teachers	
Final Presentation	• Presentation IV • Assessment by Departmental Project Evaluation Committee	14th week At least one paper must be presented in an International Conference or Publication in referred Journal.
Final Report Binding	• Assessment by Departmental Project Evaluation Committee with one external member. At least three members including External Member will make the Quorum. • Viva – Voce	End semester Examination

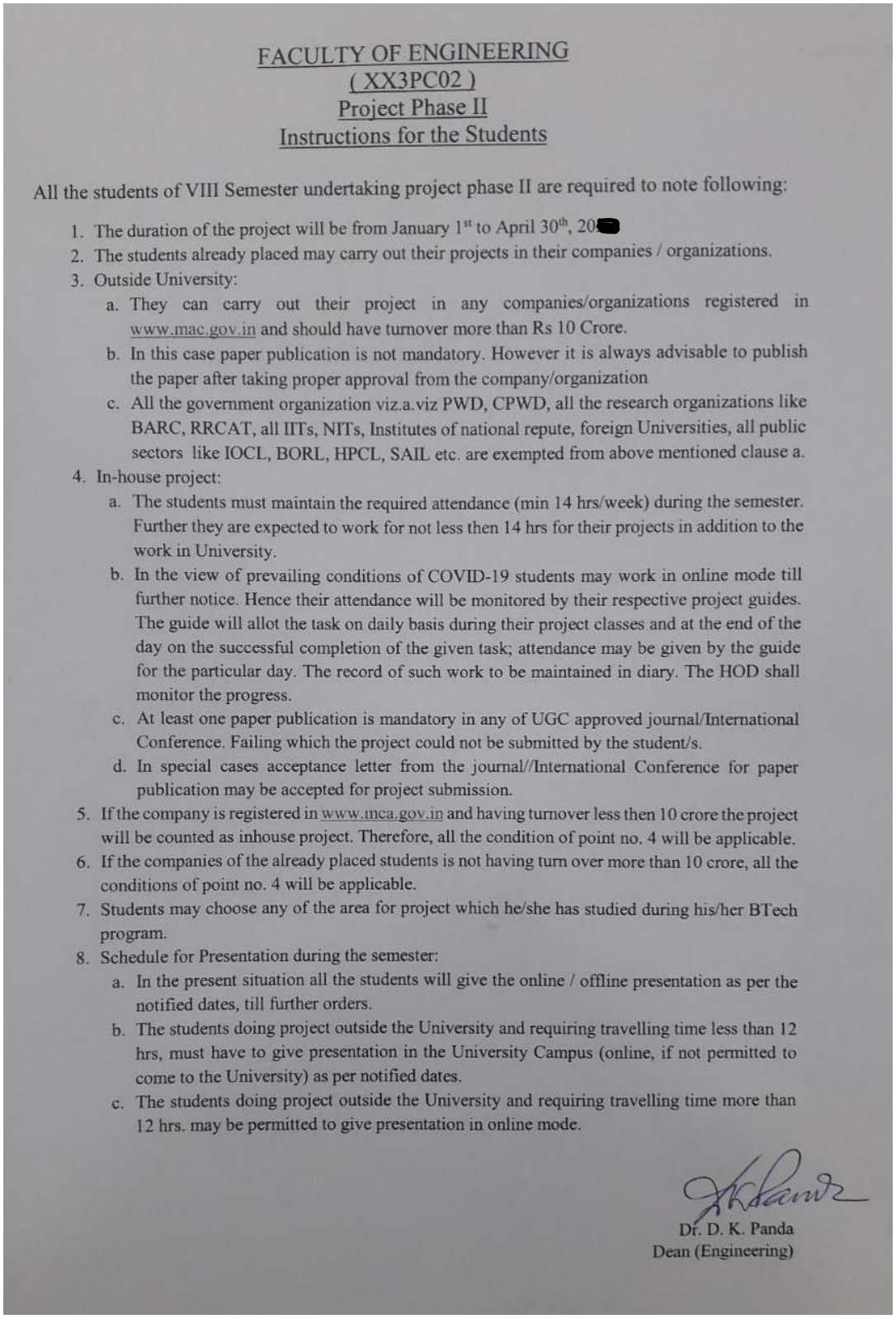
1. For external projects there will be an external guide in addition to the allotted guide from the department.
2. The schedule of meeting with the supervisor shall be depending on the nature of project execution.

3. Interdisciplinary projects will have guided from concerned departments duly approved by the Dean (Engineering).

4. The project conducted in the location of the industries with more than 10 crores Turn Over will be accepted for valuation of project. Professor in charge Training / HoDs must verify the company details from www.mca.gov.in before accepting the report for valuation. It is not mandatory have publications for these students for the evaluation of project.

5. For Project– I Total marks is 200 (80+ 120).
Project-II Total marks 500 (200+300).

Old notice of 2020 batch for the reference of students.



FACULTY OF ENGINEERING
(XX3PC02)
Project Phase II
Instructions for the Students

All the students of VIII Semester undertaking project phase II are required to note following:

1. The duration of the project will be from January 1st to April 30th, 20[redacted]
2. The students already placed may carry out their projects in their companies / organizations.
3. Outside University:
   a. They can carry out their project in any companies/organizations registered in www.mac.gov.in and should have turnover more than Rs 10 Crore.
   b. In this case paper publication is not mandatory. However it is always advisable to publish the paper after taking proper approval from the company/organization
   c. All the government organization viz.a.viz PWD, CPWD, all the research organizations like BARC, RRCAT, all IITs, NITs, Institutes of national repute, foreign Universities, all public sectors like IOCL, BORL, HPCL, SAIL etc. are exempted from above mentioned clause a.
4. In-house project:
   a. The students must maintain the required attendance (min 14 hrs/week) during the semester. Further they are expected to work for not less then 14 hrs for their projects in addition to the work in University.
   b. In the view of prevailing conditions of COVID-19 students may work in online mode till further notice. Hence their attendance will be monitored by their respective project guides. The guide will allot the task on daily basis during their project classes and at the end of the day on the successful completion of the given task; attendance may be given by the guide for the particular day. The record of such work to be maintained in diary. The HOD shall monitor the progress.
   c. At least one paper publication is mandatory in any of UGC approved journal/International Conference. Failing which the project could not be submitted by the student/s.
   d. In special cases acceptance letter from the journal//International Conference for paper publication may be accepted for project submission.
5. If the company is registered in www.mca.gov.in and having turnover less then 10 crore the project will be counted as inhouse project. Therefore, all the condition of point no. 4 will be applicable.
6. If the companies of the already placed students is not having turn over more than 10 crore, all the conditions of point no. 4 will be applicable.
7. Students may choose any of the area for project which he/she has studied during his/her BTech program.
8. Schedule for Presentation during the semester:
   a. In the present situation all the students will give the online / offline presentation as per the notified dates, till further orders.
   b. The students doing project outside the University and requiring travelling time less than 12 hrs, must have to give presentation in the University Campus (online, if not permitted to come to the University) as per notified dates.
   c. The students doing project outside the University and requiring travelling time more than 12 hrs. may be permitted to give presentation in online mode.

Dr. D. K. Panda
Dean (Engineering)

Course Outcomes (COs):

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

CO_{01}	Define objective of real life problems, plan, design, develop and execute.
CO_{02}	Work in team at component level, system level and troubleshoot of problems.
CO_{03}	Reuse, integrate with existing components to develop the solution for different client to help the society.
CO_{04}	Derive performance metrics and assess quantitatively the performance of system.
CO_{05}	Report and present the findings to the clients.