Department of Information Technology

CURRICULUM AND

SYLLABUS (2021-2025)

B.Tech. Information Technology

Information Technology

B.Tech. (IT)

CURRICULUM AND SYLLABUS

Vision Statement of University

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

Mission Statement of University

- Establish state-of-the-art facilities for world class education and research.

- Conduct scholarly research and creative endeavours that impact quality of life.

- Attract quality staff and students to cater for diverse needs and preferences and widen participation.

- Build a foundation for students to be successful at all levels through high-quality, innovative programs.

- Collaborate with institute, industry, and society to address current issues through research and align curriculum.

- Involve in societal outreach programs to identify concerns and provide sustainable ethical solutions.

- Encourage life-long learning and team-based problem solving through an enabling environment.

Vision of the Department:

To be recognized globally for imparting outstanding education and doing research leading to well qualified engineers who are innovative, entrepreneurial and successful in advanced fields of Information Technology and allied engineering to cater the ever-changing industrial demands and social needs.

Mission of the Department:

1. Imparting the highest quality education to the students to become more capable and competitive in the global IT market by enabling them with the use of newest technologies.
2. Maintaining cutting-edge research facilities in the field of Information Technology to offer a collaborative setting that inspires students, academic support staff and educators by giving them opportunity to generate, analyze, apply, and distribute knowledge.
3. Developing partnerships with top industry and academia involved in R&D for achieving excellence in teaching, research, and consulting practices for the worldwide IT market.
4. Providing the students with an academic environment of getting excellence in leadership, ethical guidelines and lifelong learning needed for a long productive career.
5. Providing resources and expertise required to incorporate technologies into the curriculum.
6. Developing partnership with alumni to advice and conduct activities that shall motivate and upgrade student skill sets.

Department of Information Technology

Program Education Objectives (PEOs)

PEO$_{01}$	To prepare students for the development and implementation of Information Systems as a solution to complex problems of the industry and society to design appropriate systems to handle the real-time / online problems.
PEO$_{02}$	To provide fundamental knowledge of mathematics, computer science and electronic communication to enable graduates to apply these fundamentals in Information Technology.
PEO$_{03}$	To train students not only about the fundamentals of scientific and engineering disciplines but also to impart more and more (in breadth) knowledge in these areas, so as to comprehend, analyze, design, and create novel products and solutions as required by the IT industry in India and abroad.
PEO$_{04}$	To inculcate among students, the professional and ethical attitude, effective teamwork skills, effective communication, multidisciplinary approach, and an ability to relate engineering issues to broader social context.
PEO$_{05}$	To prepare students with strong fundamentals in engineering and excel in postgraduate programs, competitive examinations or to succeed in industry / technical professions through global and rigorous education.

Department of Information Technology

PROGRAMME OUTCOMES (POs)

PO01	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO02	**Problem analysis:** Identify, formulate, review, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO03	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO04	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO05	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO06	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO07	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO08	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO09	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Department of Information Technology

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO$_{01}$	Design, develop and test software systems for world-wide network of computers to provide solutions to real world problems.
PSO$_{02}$	Apply current technical concepts and practices in the core Information Technologies of human computer interaction, data management, programming, networking.
PSO$_{03}$	Integrate effectively IT-based solutions into the user environment.
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.

SEMESTER I

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

SEMESTER II

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3BS12	Engineering Mathematics-II	3	0	0	3
2	EN3BS14	Engineering Chemistry	2	0	2	3
3	EN3ES16	Basic Electronics Engineering	3	0	2	4
4	EN3ES18	Basic Mechanical Engineering	3	0	2	4
5	EN3ES20	Engineering Workshop - I	0	0	2	1
6	EN3ES22	Programming-II	0	0	4	2
7	EN3HS01	History of Science and Technology	2	0	0	2
8	EN3HS02	Communication Skills	2	0	2	3
		Total	**15**	**0**	**14**	**22**
		Total Contact Hours		**29**		

SEMESTER III

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
2	IT3BS01	Discrete Mathematics	3	0	0	3
3	IT3CO02	Data Structures	3	1	2	5
4	IT3CO26	Digital Electronics	3	0	2	4
5	IT3CO27	Information Theory and Data Communication	3	0	0	3
6	IT3CO28	Object Oriented Programming	3	0	2	4
7	IT3ES01	Web Programming	0	0	2	1
8	IT3ES02	Java Programming	0	0	2	1
		Total	**18**	**1**	**10**	**24**

		Total Contact Hours		29		

SEMESTER IV

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3CO05	Database Management Systems	3	1	2	5
2	IT3CO21	Operating System	3	1	2	5
3	IT3CO29	Computational Statistics	3	0	0	3
4	IT3CO30	Artificial Intelligence	3	0	0	3
5	IT3CO31	Computer System Architecture	3	0	0	3
6	IT3CO32	Microprocessor & Microcontroller	3	0	2	4
7	IT3ES03	Python Programming	0	0	2	1
8	EN3NG03	Soft Skills I	2	0	0	2
		Total	**20**	**2**	**8**	**26**
		Total Contact Hours		30		

SEMESTER V

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3CO39	Computer Networks	4	0	2	5
2	IT3CO33	Theory of Computation	3	0	0	3
3	IT3CO34	Design and Analysis of Algorithms	3	0	2	4
4	IT3EXXX	Elective 1	3	0	0	3
5	IT3EXXX	Elective 2	3	0	0	3
7	OE000XX	Open Elective 1	3	0	0	3
8	EN3NG04	Soft Skills II	2	0	0	2
9	EN3NG06	Open Learning Courses	1	0	0	1
		Total	**22**	**0**	**4**	**24**
		Total Contact Hours		26		

SEMESTER VI

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3CO35	Distributed and Cloud Computing	3	0	2	4
2	IT3CO36	Software Engineering	3	0	2	4
3	IT3CO37	Compiler Design	3	0	0	3
4	IT3EXXX	Elective 3	2	0	2	3
5	IT3EXXX	Elective 4	3	0	0	3
6	IT3PC04	Mini Project	0	0	4	2
7	OE000XX	Open Elective 2	3	0	0	3
8	EN3NG05	Soft Skills-III	2	0	0	2
		Total	**19**	**0**	**10**	**24**
		Total Contact Hours		29		

SEMESTER VII

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
2	IT3EXXX	Elective 5	3	0	0	3
3	IT3EXXX	Elective 6	3	0	0	3
4	IT3PC03	Industrial Training	0	0	4	2
5	IT3PC06	Project-I	0	0	8	4
6	OE000XX	Open Elective 3	3	0	0	3
		Total	**11**	**0**	**12**	**17**
		Total Contact Hours		**23**		

SEMESTER VIII

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3PC07	Project-II	0	0	24	12
		Total	**0**	**0**	**24**	**12**
		Total Contact Hours		**20**		

		Total Credits	**171**			

Summary of Credits

S. No	Course Work	% Range	Value	Total Credits (CS)
1	Basic Sciences (BS)	10-15%	16-24	16
2	Engineering Sciences (ES)	15-20%	24-32	27
3	Humanities and Social Sciences (HS)	5-10%	8-16	8
4	Core (CO)	30-40%	48-64	62
5	Program Electives (EL)	10-15%	16-24	18
6	Open Electives (OE)	5-10%	8-16	9
7	Project Work, Seminar	10-15%	16-24	20
8	Non Grading			11
	Total			**171**

Choice Based Credit System Scheme- B. Tech IT
Batch 2021-2025

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**			

* Non-gradial Courses

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

Course Learning Objectives (CLOs):

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:

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

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

CO03 To relate the integral calculus to relevant fields of engineering and can translate the concept of multiple integrals in finding area of regions and volume of solids.

CO04 To solve Ordinary Differential Equations using different methods.

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

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

Course Learning Objectives (CLOs):

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

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

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

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

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

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

CLO07   An ability to adapt the classical concept of oscillations.

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

CLO09   Students learn the advanced concept of the superconductivity.

Unit-I Laser and Fibre Optics

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

Unit-II Wave Optics

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

Unit-III Quantum mechanics

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

Unit-IV Solid State Physics

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

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

List of Practical's

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

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

Wave Optics
6. To determine the radius of curvature of plano convex lens using Newton's ring experiment.
7. To determine wavelength of spectral lines of mercury vapor lamp with the help of grating 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
8. Determination of Planck's constant (h) using light emitting diode (LED) of various colors.
9. To study black body Radiation by PhET Simulation.

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

Oscillations and Acoustics

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

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

Course Learning Objectives (CLOs):

CLO01 To introduce fundamental concepts and analysis techniques in electrical engineering to students across all disciplines.

CLO02 To introduce the students about domestic wiring, the functioning of various electrical apparatus and the safety measures. Emphasize the effects of electric shock and precautionary measures.

CLO03 To impart basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.

CLO04 To provide knowledge about the basic DC and AC electric circuits and magnetic circuits.

CLO05 To introduce the concepts of power supply, UPS, SMPS, motors, transformers, and their applications.

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

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

Unit-III: Electrical Machines
Definition, working principle and construction of transformer, construction & working principle of DC motor and three phase induction motor, single phase induction motor, application of rotating machines.

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

Unit-V: Electrical Energy Systems and Utilization

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

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

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

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

Course Outcomes (COs):

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

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

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

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

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

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

List of Experiments

1. To study various electric hazards and corresponding precautions.
2. To verify KCL and KVL.

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

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

Course Learning Objectives (CLOs):

CLO01 To impart knowledge of Environment and its basic components.

CLO02 To build basic understanding of various effects of human activities to the environment.

CLO03 To understand concepts of water pollution

CLO04 To understand function of solid waste management

CLO05 To learn concepts of disaster management

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

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

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

Unit-IV Solid Waste Management
Introduction, Types of solid waste, Harmful effects of solid waste, Methods to manage and modern techniques for solid waste management.

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

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

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

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

CO$_{01}$ Gain knowledge of Ecosystem & Biodiversity.

CO$_{02}$ Develop basic understanding of air pollution and its control method

CO$_{03}$ Develop basic understanding of water pollution and its control method

CO$_{04}$ Gain knowledge of Solid waste management and its importance.

CO$_{05}$ Gain knowledge of Disaster Management.

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

Course Learning Objectives (CLOs):

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.

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

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

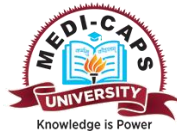|	
CO01	Familiarize with different drawing equipment's and technical standards and Know purpose, procedures, materials and conventional symbols used. Create and read an engineering drawing using standard views and have ability to Convert pictorial (3D) drawings to orthographic (2-D) drawings and vice versa
CO02	Understand the projection of points, straight lines and have the ability to convert the practical problems in to projections
CO03	To understand and apply concepts of the projection of simple planes & solids.
CO04	Understand and apply the concepts of Projection & Sections of solids & development of surfaces
CO05	Convert simple 2D orthographic projections into 3D isometric projections with the help of auto cad commands

List of Experiments

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

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

List of CAD Sheets

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

| Course Code | Course Name | Hours per Week | | | Total |
		L	T	P	Credits
EN3ES21	Programming-I	0	0	4	2

Course Learning Objectives (CLOs):

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

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

CLO03   Use different control structures for conditional programming.

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

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

Unit-I Introduction to Computer and Problem Solving Methodology

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

Unit-II Basics of Language

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

Unit-III Control Statements

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

Unit-IV Arrays and Strings

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

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

Unit-V Functions

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

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

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

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

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

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

List of Practical

1. Write a program to print hello user on output screen.

2. Write a program to perform arithmetic operation on two numbers.

3. Write a program to find sum of individual digits of any three digits number.

4. Write a program to print any three digit number in reverse order.

5. Write a program to swap any two numbers using third variable and without using third variable.

6. Write a program to check given number is even or odd.

7. Write a program to check given char is vowel or consonant.

8. Write a program to check given number is positive or negative.

9. Write a program to check given year is leap year or not.

10. Write a program to check given number in range of 100-200 or not.

11. Write a program to check given number is palindrome or not.

12. Write a program to print grade of student on the basis of percentage:
    a. If per greater than or equal to 75 □ A grade
    b. If per between 60-75 □ B grade
    c. If per between 50-60 □ C grade
    d. If per between 40-50 □ D grade
    e. If per less than 40   □ Fail

13. Write a program for addition subtraction multiplication division using switch case.

14. Write a program to print table of any number.

15. Write a program to calculate factorial of any number.

16. Write a program to print series of alphabet.

17. Write a program to print Fibonacci series.

18. Write a program to check given number is perfect or not

19. Write a program to check given number is prime or not.

20. Write a program to check given number is Armstrong or not

21. Write a program to print number in word in between 1-5. Like (1 =one)

22. Write a program to check given char is vowel or consonant.

23. Write a program to print name of month according to number.

24. Write a program for convertor
    a. For currency convertor
    b. For temperature convertor
    c. For weight convertor
    d. For length convertor
    e. For time convertor
    f. For energy convertor

25. Write a program to print series of number from 1-100 without using loop.

26. Write a program to find maximum & minimum number from array.

27. Write a program to check how many numbers is prime & not prime in a list

28. Write a program to check how many digits at each index of array.

29. Write a program to check (search) given number is present or not present in list.

30. Write a program to arrange (sort) array elements in ascending or descending order.

31. Write a program to print a 2*2 matrix.

32. Write a program to find sum of two matrix.

33. Write a program to find multiplication of two matrix.

34. Write a program of string functions.

35. Write a function to find sum of two numbers.

36. Write a function to calculate factorial of any number.

37. Write a function for call by value to find sum of two numbers.

38. Write a function to pass an integer array as an arguments and find sum of array elements

39. Write a function to pass a char array as an argument and find length of string.

40. Write a recursive function to calculate factorial of any number.

41. Write a program to find the no of char no of word and no of lines from given text input.

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

Course Learning Objectives (CLOs):

CLO01 To give the knowledge of various building and general construction materials such as bricks, stones, timber, cement, steel and concrete & their properties and application.

CLO02 To provide basic understanding of the forces and its components, stresses, strains and the modulus of elasticity of the different construction materials.

CLO03 To understand the components of the building such as beams, columns, foundations, slabs and different types of soils and their bearing capacities.

CLO04 To provide basic knowledge about principles of surveying for a location, and its application in execution of engineering projects, various instruments used for surveying such as chains, tapes, compass, theodolite and auto level.

CLO05 To understand various aspects of structural members and application of loads, shear force & bending moment in the field of civil engineering.

Unit I Building Construction Material

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

Unit II Surveying and levelling

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

Unit III Building Components

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

Unit IV Forces & Properties of Material

Forces and its components, Resolution and summation of forces, Lami's Theorem, Stress, Strain types, Hook's law, Three moduli of elasticity, 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:

CO01   Students will be able to recognize the civil engineering works and conversant about different construction materials and their uses.

CO02   Student will be able to differentiate force, pressure and stresses.

CO03   Students will be able to know the different building component and its importance.

CO04   Students will be conversant about vertical and horizontal variation of different terrains.

CO05   Students will be able to apply the theoretical knowledge about structural elements in practical manner.

List of Experiments

1. To determine particle size distribution & fineness modulus of coarse and fine aggregates.
2. To determine standard consistency of cement paste. -
3. To determine initial and final setting times for cement by using Vicat's apparatus.
4. To determine the workability of fresh concrete of given proportion by slump cone test.
5. To determine the area of land by chain surveying.
6. To perform traverse surveying with prismatic compass check for local attraction and determine corrected bearing and to balance the traversing by Bowditch'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

S 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**		

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

Course Learning Objectives (CLOs):

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

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

CLO03   To illustrate the concept of Partial Differential Equations.

CLO04   To impart the knowledge of Vector Calculus.

CLO05   To discuss numerical methods and to outline its application in solving algebraic, transcendental equations and system of linear equations.

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

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

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

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

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

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

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

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

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

Unit IV Vector Calculus

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

Unit V Numerical Analysis

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

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

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

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

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

Course Learning Objectives (CLOs):

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

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

CLO_{03} To make students understand about the present needs without compromising on 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.

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

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

CO01 To Understand the lubricants, their mechanism and practically analyze the properties of lubricants.

CO02 Will acquire betterment in lifestyle by understanding the need of bio polymers in the current scenario and replacing synthetic polymers with its bio-polymer substitute.

CO03 Will get familiarised with new engineering materials and their commercial applications.

CO04 Will get knowledge of using instrumental techniques and their applications for determination of chemical structure of any compound.

CO05 Identify various types of corrosion and methods to protect the metallic structures from corrosive environment.

List of Practicals:
Volumetric Analysis:

1. To determine Hardness of given water sample by 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 means of Redwood Viscometerno.1
9. To study rate of change of viscosity with temperature of the given lubricating oil by means of Redwood Viscometer no.2.

Electrochemistry:

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

Kinetics:

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

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

Course Learning Objectives (CLOs):

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

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

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

CLO04 To understand Construction and Working of Steam Generators

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

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

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

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

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

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

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

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

Course Outcomes (COs):

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

CO01   Students will be able to understand the engineering materials, their properties, Iron-Carbon Diagram and Stress-Strain Curve, Measuring Equipment's and Testing Machines.

CO02   Student will be thorough with the basic laws of thermodynamics and their applications in engineering also know about Refrigeration cycles and properties of refrigerants.

CO03   Students will be able to understand the construction and working of I.C. Engines .

CO04   Students will be able to understand the construction and working of Steam Generators

CO05   Students will be able to determine the Centroid & Moment of Inertia of areas/composite sections.

List of Experiments

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

| Course Code | Course Name | Hours per Week | | | Total |
		L	T	P	Credits
EN3ES22	Programming-II	0	0	4	2

Course Learning Objectives (CLOs):

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

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

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

CLO04 Use calloc, malloc, realloc dynamic memory.

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

CLO06 Apply graphics functions to create pictorial representation and animations

Unit-I Pointers

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

Unit-II User Defined Data Types

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

Unit-III Pre-processor and Memory Allocation

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

Unit-IV File Handling

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

Unit-V Graphics Programming

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

Text Books:

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

References:

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

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

CO_{01} Apply Pointers, Pointer Arithmetic and Accessing arrays, strings through pointers.

CO_{02} Use different user defined data types like structures, union and enum.

CO_{03} Understand and Use of dynamic memory allocation and preprocessor directives.

CO_{04} Use the concepts of file handing.

CO_{05} Use Graphics programming to draw and use different shapes.

List of Practical

1. Program to create, initialize, assign and access a pointer variable.
2. Program to swap two numbers using pointers.
3. Program to change the value of constant integer using pointers.
4. Program to print a string using pointer.
5. Program to count vowels and consonants in a string using pointer.
6. Program to find sum of elements of array using pointer.
7. Program to swap two numbers using pointers.

8. Compare strings using pointer
9. Find smallest number in array using pointer.
10. Find largest element in array using pointer.
11. Find sum of all matrix elements using pointer.
12. Program to create a pointer array store elements in it and display.
13. Program to demonstrate function pointers.
14. Program to perform Addition Subtraction Multiplication Division using array of function pointers.
15. Program to display details of student two (Name, roll no, marks) using structure.
16. Program to display details of employee using array of structure.
17. Program to access member of structures using pointers.
18. Program for passing structure to a function.
19. Program for returning a structure from a function.
20. Program to display details of student two (Name, roll no, marks) with the help of union.
21. Program to demonstrate the memory allocation in structure and union.
22. Program to demonstrate malloc and calloc.
23. Program to allocate memory of array at run time.
24. Program to print the day of week.
25. Program to print month of a year.
26. Program to calculate area of circle using macro.
27. Program to calculate area of circle using macro function.
28. Program to create a header file and use it in a program.
29. Program to demonstrate file operation.
    a. Creating a new file
    b. Opening an existing file
    c. Closing a file
    d. Reading from and writing information to a file

30. Program to count number of words, number of character and number of lines from a given text file.
31. Program in C to delete a specific line from a file.
32. Write a program in C to append multiple lines at the end of a text file.
33. Write a program in C to copy a file in another name.
34. Write a program in C to merge two files and write it in a new file.
35. Write a program in C to encrypt a text file.
36. Write a program in C to decrypt a previously encrypted file.
37. Write a program in C to remove a file from the disk.
38. Write a program to draw a circle and fill blue color in it.
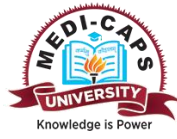
39. Write a program to draw a rectangle with diagonal and fill different colors in both halves.
40. Write a program to move a circle using suitable annimations.
41. Write a program to implement traffic signal.
42. Write a pogram to simulate a moving car. Draw car using simple shapes like line, circle and polygon.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS02	Communication Skills	2	0	2	3

Course Learning Objectives (CLOs):

CLO01   To develop, enhance and demonstrate LSRW Skills.

CLO02   To enable students to acquire oral presentation skills.

CLO03   To prepare students to become more confident and active participants in all aspects of their undergraduate programs

CLO04   To enable students with good vocabulary, grammar and writing skills.

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:

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

List of Experiments (if applicable): List of Practicals:
- JAM
- Debates
- Role plays
- GDs
- Extempore
- Story writing
- Picture description
- Symposium
- Oral presentation
- Phonetics practice
- Book Reviews

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

Course Learning Objectives (CLOs):

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

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

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

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

CLO05 To learn about basic Measurement & Instrument components.

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

Unit-II BIPOLAR JUNCTION TRANSISTOR
Construction and working of transistor, characteristics of transistor, transistor as an amplifier and switch, transistor configurations, transistor biasing and biasing methods, basic amplifier configurations, Basic principle and working of FET and MOSFET

Unit-III BASICS OF COMMUNICATION SYSTEMS
Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation: Amplitude, phase, frequency modulation, sampling theorem and pulse amplitude modulation.

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

Unit-V ELECTRONICS MEASUREMENT
Introduction, Basics of Measurements, Ammeter, Voltmeter, multimeter, Signal Generators, Cathode

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

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

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

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

CO01 Should have the knowledge of basic semiconductor materials and their usage in variety of PN junction diodes and applications of diodes

CO02 Should be able to understand the concept operation of transistors and its configuration.

CO03 Understand and identify the fundamental concepts and various components of analog communication systems

CO04 Should have the knowledge of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.

CO05 Should have understood the basics of Measurement & Instrument components.

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

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

Course Learning Objectives (CLOs):

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

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

CLO03   To understand different primary manufacturing process.

CLO04   To understand different metal joining process.

CLO05   To identify different tools used in basic manufacturing process.

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

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

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

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

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

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

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

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

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	2	0	0	2

Course Learning Objectives (CLOs):

CLO01 To know the historical perspective of science and technology in India, its roots and its role.

CLO02 To know how research and development field is progressing in India.

CLO03 To know what were the policies and plans are proposed after independence to be technologically sound.

CLO04 To Know what were the developments done in major areas of science & technology.

CLO05 To know the relationship between the technologies.

Unit-I Historical Perspective

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

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

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

Unit-III Policies and Plans after Independence

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

Unit-IV Science and Technological Developments in Major Areas

Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT

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

Unit-V Nexus between Technologies

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

Textbooks:

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

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

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

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

SEMESTER – III

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
2	IT3BS01	Discrete Mathematics	3	0	0	3
3	IT3CO02	Data Structures	3	1	2	5
4	IT3CO26	Digital Electronics	3	0	2	4
5	IT3CO27	Information Theory and Data Communication	3	0	0	3
6	IT3CO28	Object Oriented Programming	3	0	2	4
7	IT3ES01	Web Programming	0	0	2	1
8	IT3ES02	Java Programming	0	0	2	1
		Total	**18**	**1**	**10**	**24**
		Total Contact Hours	**29**			

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

Course Learning Objectives (CLOs):

CLO01 To enable the students to study the basics of management and managerial operations.
CLO02 To study the concept, nature, function and emerging concept of HR and Marketing.
CLO03 To learn the basics of economics with respect to business cycle.
CLO04 To create an understanding over accounting principles.
CLO05 To study the financial management and investment decision making.

Unit-I

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

Unit-II

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

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

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

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

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

Website Link

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

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
IT3BS01	Discrete Mathematics	3	0	0	3

Course Learning Objectives (CLOs):

CLO01   To study the concept of set, set operations, function and its type, propositions.

CLO02   Equip the students with knowledge of Boolean algebra and function, use in computer application.

CLO03   To study the concept of group and fundamental properties of group that lead to the different structure, symmetry of objects and use in computer application.

CLO04   Equip with the concept of graph and standard result, application in computer science and information technology.

CLO05   To study the recursive formulae and relationship to practical problems.

Unit-I

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

Unit-II

PO-Sets, Boolean Function and Boolean algebra
Partial order relation, Poset, least upper bound, greatest lower bound, maximal and minimal elements of a poset, Definition & Example of Boolean algebra, Boolean functions, minimum & maximum terms, simplification of circuits by Boolean function with Karnaugh map & Quine Mc Clusky method. Applications in computer Science.

Unit-III

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

Unit-IV

Graph theory

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

Unit-V

Recurrence Relations and Combinatorics

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

Text Books:
1. C.L Liu, D. P. Mohapatra, Elements of Discrete Mathematics, Mc Graw –Hill Education, Fourth edition (2008).
2. Kenneth H Rosen, Discrete Mathematics and its Applications, Mc Graw –Hill Education, Seventh edition (2016).

Reference Books:
1. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, Mc Graw –Hill Education , First edition (2001).
2. Narsingh Deo, Graph theory with Applications to Engineering and Computer Science, PHI India, Eastern Economy Edition (2006).
3. I. N. Herstein, Topics in Algebra, John Wiley & Sons, Second edition (2006).

Web Source:
1. nptel.ac.in/courses/111107058/
2. nptel.ac.in/downloads/111104026/

Open Learning Source:
1. https://swayam.gov.in/courses/public
2. http://nptel.ac.in/course.php

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

CO01 Remember and understand basics of sets and set operation, function, properties of algebraic structure, definition and properties of graph, basic formulae of recursive relation.

CO02 Apply function and algebraic structure concepts in circuit Analysis, mathematical logic, set theory and statistics.

CO03 Analyse different algebraic structures, function and their properties for symmetry in objects and graph, the process of data transmission.

CO04 Evaluate practical problems related to set and function, permutation and combination

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO02	Data Structures	3	1	2	5

Course Learning Objectives (CLOs):

CLO01 To make students to learn data structures categorization & implementation of array and recursive methods.

CLO02 To make students to learn the concept of Linked List & its implementation.

CLO03 To teach Linear data structures like Stack, Queue and their types with implementation.

CLO04 To make students to learn different searching and sorting algorithms.

CLO05 To teach nonlinear data structures like Tree and Graph with Implementation.

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, Pearson
2. Tenebaum, Langsam & Augenstein, Data Structures Using C, Pearson
3. Horowitz and Sahani, "Fundamentals of data Structures", University Press

Reference Books:
1. Trembley and Sorenson , "Data Structures", TMH Publications
2. Venkatesan , Rose, "Data Structures" Wiley India Pvt.Ltd
3. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, TMH

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

CO01 Student will be able to choose appropriate data structure as applied to specific problem definition.

CO02 Student will be able to handle operations like searching, sorting, insertion, deletion, traversing mechanism etc. on various data structures.

CO03 Students will be able to apply concepts like Stack ,Queue ,Linked List and Array in various domains like DBMS, compiler construction and OS etc

CO04 Students will be able to use different searching and sorting algorithms according to problems.

CO05 Students will be able to understand and implement non linear data structure like tree and graph.

List of Experiments:

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 a circular queue through an 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 a 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
IT3CO26	Digital Electronics	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 To understand the concept of number systems and Boolean Algebra. To learn minimization of Boolean function by different methods.

CLO02 To understand the concept of Logic gates and other Combinational circuits and their designing.

CLO03 To learn about Sequential circuits and their implementation using concept of State machine and to gain awareness of digital circuits and its applications in day to day life.

CLO04 To learn about Programmable Logic Devices & Memory: Architecture and characteristics and Analyze, design, and evaluate digital circuits of medium complexity that are based on SSIs, MSIs, and programmable logic devices.

CLO05 To understand the concept of Logic families. Relation between them with respect to advancement in technology.

Unit-I

Number System: Introduction to Binary Numbers, Data Representation, Binary, Octal, Hexadecimal Number System and their Conversion, Various Coding Schemes such as BCD Codes, Excess-3 Code. Binary Arithmetic, Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Minimization Techniques, Sum of Products and Product of Sums Simplification, Karnaugh's Map Method, Quine Mecluskey Method.

Unit-II

Logic Gates and Combinational Logic: Digital Logic Gates such as AND, OR, NAND, NOR, EX-OR, EX-NOR. Realization of Boolean Functions using Logic Gates. Adders, Substractors, BCD Adder, Magnitude Comparator, Decoders and Encoders, Multiplexers and Demultiplexers, Code Converters. Analysis and Design of Combinational Circuits. Implementation of Combinational Logic using Multiplexers, Decoders etc.

Unit-III

Sequential Circuits: Introduction, Comparison of Sequential and Combinational Circuits. Various types of Flip-Flops and their Conversions, Triggering of Flip Flops, Timing Issues, Setup and Hold Times, Registers, Counters, Ring, Johnson, Asynchronous and Synchronous. Finite State Machines, Moore and Mealy, Design of Synchronous Sequential Circuits.

Unit-IV

Memories: ROM, PLA and PAL. Memories: Organisation and Construction of RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM.

Unit-V

Logic Families: DTL, RTL, TTL, IIL, PMOS, NMOS and CMOS Logic Families, Interfacing between TTL and MOS vice-versa.

Text Books:
1. D. Roy Choudhury, Digital Circuits, Vol-I and II, Eureka Publication.
2. M. Mano, Digital and Computer Design, Pearson Education.

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

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

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

List of Experiments:

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO27	Information Theory and Data Communication	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Design the channel performance using Information theory.

CLO02 To develop an understanding Binary Symmetric Channel.

CLO03 Apply linear block codes for encoding.

CLO04 To develop an understanding of Encoding and decoding of signals.

CLO05 To develop an understanding of Error Correction and detection.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

Encoding Digital Data into Analog Signals, PCM, PM, DM Encoding Analog Data into Analog Signals, AM, FM, PM. Encoding Digital Data into Analog Signals, ASK, FSK, PSK. Multiplexing, TDM, FDM, WDM, Encoding Techniques, Spread Spectrum. The Concept of Spread Spectrum – Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access (CDMA).

Unit-V

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

Text Books

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

References

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

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

CO01   Students will able to understand the channel performance using Information theory.

CO02   Students will able to understand Channel matrix and Binary Symmetric Channel.

CO03   Student will apply linear block codes for encoding.

CO04   Student will apply Encoding and decoding techniques.

CO05   Student will able to detect and correct errors.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO28	Object Oriented Programming	3	0	2	4

Course Learning Objectives (CLOs):

CLO01   To understand the class and objects

CLO02   To understand the Problem Solving approach.

CLO03   To understand the object oriented concepts.

CLO04   To implement the concept of inheritance and polymorphism

CLO05   To understand the concept of file handling

Unit-I

Introduction to Object Oriented Programming, Characteristics, Applications, Difference Between Object Oriented and Procedure Based Programming, Object Oriented Programming Languages, Object Oriented Concepts: Abstraction, Encapsulation, Polymorphism, Inheritance and Information Hiding..

Unit-II

Abstract Data Type, Class Declaration, Creating Objects, Accessing Objects Members, Nested Member Functions, Memory Allocation for Class, Objects, Static Data Members and Functions. Array of Objects, Dynamic Memory Allocation, this Pointer, Nested Classes, Friend Functions, Constructors and Destructors, Constructor Overloading, Copy Constructors.

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, Stream in C++, Files Modes, File Pointer and Manipulators, Type of Files, Accepting Command Line Arguments, Handling Exceptions

Text Books:

1. E. Balaguruswami, "Object Oriented Programming in C++", TMH
2. Object Oriented Programming in C++ by Robert Lafore: Galgotia
3. Richard Johnsonbaugh, Martin Kalin, Object Oriented Programming in C++, Pearson; 2nd edition

Reference Books:

1. David Parsons; Object Oriented Programming with C++; BPB Publication
2. Scott W Amber, The Object Primer , 3/e, Cambridge 2004.
3. Timothy Budd, Object Oriented Programming, 3/e, Pearson Education 2002.
4. Reema Thareja, Object Oriented Programming With C++- 2018, Oxford University Press
5. A. K. Sharma, Object-Oriented Programming with C++, Pearson India, 2014

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

CO01   Students will be able to understand Real World objects.

CO02   Student will familiar with problem solving technique and approach.

CO03   Student will be able to understand all the concept of OOPM

CO04   Students will be able to decompose the real world problem into step by step solution by applying domain knowledge.

CO05   Should be able to understand the tools to write the code.

List of Experiments:

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

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3ES01	Web Programming	0	0	2	1

Course Learning Objectives (CLOs):

CLO01 How computer client-server work, basic principles, fundamental of web server architecture, world wide web and protocols.

CLO02 Understand the web design web browser and cache, linking and publishing website.

CLO03 Understand HyperText Markup Language, history, structure, tables and Application programming interface.

CLO04 How CSS add to html pages, need, syntax, structure, Bootstrap and Javascript introduction.

CLO05 Understand JavaScript,objects, function, loops , arrays, event handling and JSON.

Unit-I

Basics of WWW, HTTP Protocol, Client Server Architecture, Introduction to Web Server Installation and Configuration.

Unit-II

Concepts of Effective Web Design, Web Design Issues Including Browser, Bandwidth and Cache, Display Resolution, Look and Feel of the Website, Page Layout and Linking, User Centric Design, Sitemap, Planning and Publishing Website, Designing Effective Navigation

Unit-III

Structure of HTML Page, HTML tags for Data Formatting, Tables, Links, Images, meta tags, Frames, html form tags, media, APIs, HTML 5tags and Validation.

Unit-IV

Need for CSS, Syntax and Structure, CSS Rules for Backgrounds, Colours and Properties, Manipulating Texts, Fonts, Borders and Boxes, Margins, Padding Lists, CSS Positioning. Animations, Tool-Tips, Style Images, Variables, Media Queries, Wildcard Selectors (*, ^ and $) in CSS, Working with Gradients, Pseudo Class, Pseudo elements, Basic of Frameworks like Bootstrap.
Syntax of JavaScript, Execution of JavaScript, Internal, Embedded and External Javascript

Unit-V

JavaScript : Variables, Arrays, Functions, Conditions, Loops, Pop up Boxes, JavaScript

Objects and DOM, JavaScript Inbuilt Functions, JavaScript Validations and Regular Expressions, Event Handling with JavaScript, Callbacks in Javascript, Function as Arguments in JavaScript, Introduction to JSON

Text Books:
1. Web Design The Complete Reference, Thomas Powell, Tata McGraw Hill
2. HTML5 Step by Step, Faithe Wempen, Microsoft Press
3. Head First HTML programming, Eric Freeman, O'Reilly.

Reference Books:
1. JavaScript 2.0: The Complete Reference, Thomas Powell and Fritz Schneider, Tata McGraw Hill
2. Web Design, Joel Sklar, Cengage Learning
3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

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

CO01 Student will understand Basic structure of client server architecture and principal of WWW.

CO02 Students will know how to design web pages, web layouts, navigations and publishing a website on internet.

CO03 Students will be able to understand basic tags of HTML, HTML5 and use of validations on HTML page.

CO04 Student will know the concept of CSS, Bootstrap and basics of Javascript.

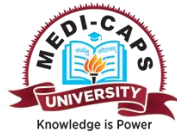**CO05** Student will distinguish the concept of Javascript and JSON.

List of Experiments:

Practical No	Details
1	**Use of Basic Tags**
a	Design a web page using Different Text Formatting Tags.
b	Design a web page with links to Different Pages and Allow Navigation between web pages.
c	Design a web page Demonstrating all Style Sheet Types

2	Image Maps, Tables, Forms and Media
a	Design a web page with Imagemaps.
b	Design a web page with a form that uses all types of controls.
c	Design a web page demonstrating different semantics
d	Design a web page with different tables. Design a webpages using table so that the content appears well placed.
e	Design a web page embedding with multimedia features.
3	Java Script
a	. Using JavaScript design, a web page that prints factorial/Fibonacci series/any given series.
b	Design a form and validate all the controls placed on the form using Java Script
c	Write a JavaScript program to display all the prime numbers between 1 and 100.
d	Write a JavaScript program to accept a number from the user and display the sum of its digits.
e	Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
f	Write a java script program to design simple calculator.
4	Control and looping statements and Java Script references
a	Design a web page demonstrating different conditional statements.
b	Design a web page demonstrating different looping statements
c	Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp).

List of e-Learning Resources:

1. HTML:

a. https://developer.mozilla.org/en-US/docs/Web/HTML

b. https://www.w3schools.com/html/

c. https://www.tutorialspoint.com/html/index.htm

2. CSS:

a. https://developer.mozilla.org/en-US/docs/Web/CSS

b. https://www.manning.com/books/css-in-depth

c. https://www.w3schools.com/css/

d. https://www.tutorialspoint.com/css/index.htm

3. Java Script:

a. https://javascript.info/

b. https://github.com/getify/You-Dont-Know-JS

c. https://www.w3schools.com/js/

d. https://www.tutorialspoint.com/javascript/index.html

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
IT3ES02	Java Programming	0	0	2	1

Course Learning Objectives (CLOs):

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

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

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

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

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

Unit-I

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

Unit-II

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

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

Unit-III

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

Unit-IV

Exception Handling: Defining Exception, types of Exception, Exception Class, Try and Catch block, Multiple Catch Blocks, Nested Try, Finally Block, Throw Keyword, Exception Propagation, Throws Keyword.

Multithreading: Overview of Thread, Thread Types, Life Cycle of a Thread, Creating Thread, Sleeping a Thread, Joining a Thread, Thread Priority, Daemon Thread.

Unit-V

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

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

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

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

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

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

CO01 The student will be able to write and run basic programs in java.

CO02 The student will be able to relate real world problems to Object Oriented programming environment.

CO03 The students will be able to apply the concepts of reusability using the build-in string functions.

CO04 The students will be able to use exception handling in their programs and to apply the concepts of multithreading in java

CO05 The students will be able use input and output functionality, Applets and AWT in java programs.

List of Experiments:

1. Write a program that accepts two numbers from the user and print their sum.
2. Write a program to calculate addition of two numbers using prototyping of methods.

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

SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	IT3CO05	Database Management Systems	3	1	2	5
2	IT3CO21	Operating System	3	1	2	5
3	IT3CO29	Computational Statistics	3	0	0	3
4	IT3CO30	Artificial Intelligence	3	0	0	3
5	IT3CO31	Computer System Architecture	3	0	0	3
6	IT3CO32	Microprocessor & Microcontroller	3	0	2	4
7	IT3ES03	Python Programming	0	0	2	1
8	EN3NG03	Soft Skills I	2	0	0	2
		Total	**20**	**2**	**8**	**26**
		Total Contact Hours	**30**			

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO05	Database Management Systems	3	1	2	5

Course Learning Objectives (CLOs):

CLO01 To Understand the Types of Data and Structured database, different methods of modelling, conceptual model like ER Model, Object Oriented Model.

CLO02 To understand the Relational Model, Relational Algebra and Relational Calculus.

CLO03 To Understand the Functional dependency, Keys, Normalization process.

CLO04 To Understand Database Transaction and its Properties

CLO05 To Understand the File organization, Query optimization, indexes, Fragmentation, Replication and Allocation Techniques.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

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

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

CO01   Students will be able to identify the major entities of miniworld and relationships between them, familiar with conceptual design of databases.

CO02   Students will be able to model the database and will be able to convert the Conceptualmodel into Relational model.

CO03   Students will be able to normalize the relations, remove the redundancy and inconsistency in the database.

CO04   Students will be able to design the transaction in such a way that it never takes the database in an inconsistent state

CO05   Students will be familiar with various types of indexing, searching and file organization techniques.

List of Experiments:

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

Course Code	Course Name	Hours per Week	

		L	T	P	Credits
IT3CO21	Operating System	3	1	2	5

Course Learning Objectives (CLOs):

CLO$_{01}$ To learn the fundamentals of Language processing activities, Macros, Operating Systems.

CLO$_{02}$ To learn the mechanisms of OS to handle processes and threads and their communication.

CLO$_{03}$ To understand CPU Scheduling in OS.

CLO$_{04}$ Understanding Deadlocks: Prevention, Avoidance, Detection and recovery from deadlock.

CLO$_{05}$ To learn the mechanisms involved in memory management in OS.

Unit-I

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

Unit-II

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

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

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

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

CO01 Students will understand the history of the operating system. Students will be able to understand design issues associated with operating systems.

CO02 Students will understand process management concepts including scheduling, synchronization, and deadlocks

CO03 Students will be able to understand concepts of memory management including virtual memory.

CO04 Students will understand issues related to file system interface and implementation, disk management.

CO05 Students will be familiar with various types of operating systems including LINUX/ UNIX and its services.

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

List of Experiments:

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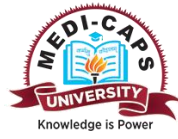
9. Case Study on Unix, Linux (any latest variant), Windows (latest version) which must essentially contain its features like scheduler, file management strategy, process and memory management techniques.
10. Study on Android and IOS with its features.

Course Code	Course Name	Hours per Week			Credits
		L	**T**	**P**	
IT3CO29	Computational Statistics	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-I

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

Unit-II

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

Unit III

Probability Distribution:

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

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

Unit-IV

Curve fitting, Correlation, Regression:

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

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

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

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

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

CO01   Understanding the basic concept of central tendency, dispersion, and probability distribution for discrete and continuous random variable and remembering the formula for correlation, regression and testing of hypothesis.

CO02   Apply the theoretical methods for testing and comparison of the sample and population for mean, variance, standard deviation.

CO03   Analyze and organize the statistical data to examine the facts under view.

CO04   Evaluate the mean, median, mode on the basis of observation and compare it with the theoretical distribution and evaluate the relation between the different variates on the basis of correlation, regression.

| Course Code | Course Name | Hours per Week | | | |
		L	T	P	Credits
IT3CO30	Artificial Intelligence	3	0	0	3

Course Learning Objectives (CLOs):

CLO01   Introduction to Intelligence and various AI search algorithms (uninformed)

CLO02   To understand Heuristics, informed search techniques, constraint satisfaction

CLO03   To understand different knowledge representations.

CLO04   Understanding classifier and reasoning

CLO05   To understand game playing techniques.

Unit-I

Introduction to Artificial Intelligence, Various Types of Production Systems, Characteristics of Production Systems, Study and Comparison of Breadth First Search and Depth First Search Techniques

Unit-II

Optimization Problems: Hill-Climbing Search Simulated Annealing Like Hill Climbing, Best First Search. A* Algorithm, AO* Algorithms etc, and Various Types of Control Strategies, Heuristic Functions, Constraint Satisfaction Problem

Unit-III

Knowledge Representation, Structures, Predicate Logic, Resolution, Refutation, Deduction, Theorem Proving, Inferencing, Semantic Networks, Scripts, Schemas, Frames, Conceptual Dependency

Unit-IV

Uncertain Knowledge and Reasoning, Forward and Backward Reasoning, Monotonic and Nonmonotonic Reasoning, Probabilistic Reasoning, Baye's Theorem, Decision Tree, Understanding, Common Sense, Planning

Unit-V

Game Playing Techniques like Minimax Procedure, Alpha-Beta Cut-Offs etc, Study of the Block World Problem in Robotics

Text Books:
   1. Elaine Rich, Kevin Knight and Nair, Artificial Intelligence, TMH.

2. Peter and Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.
3. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education.

Reference Books:
1. Saroj Kausik, Artificial Intelligence, Cengage Learning.
2. Nils Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann.
3. David Poole, Alan Mackworth, Artificial Intelligence: Foundations for Computational Agents, Cambridge Univ. Press.

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

CO01 Students will be able to apply the strategies for solving AI problems.

CO02 Students will be able to demonstrate informed search algorithms.

CO03 Student will be able to Attain the capability to represent knowledge

CO04 Students will be able to Formulate and solve problems with uncertain information using classifier and perform reasoning

CO05 Ability to apply knowledge in Game Playing and robotics problems.

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
IT3CO31	Computer System Architecture	3	0	0	3

Course Learning Objectives (CLOs):

CLO₀₁ How computer work, basic principles, fundamental of computer architecture, instructions and technologies.

CLO₀₂ Understand the ALU unit and their operation, Comprehend, stack organization and control unit.

CLO₀₃ Understand Memory mapping concepts and technique and can differentiate between types of memory in computer system.

CLO₀₄ How processor communicates with peripheral devices and performs read write operation and understand input output subsystems.

CLO₀₅ How computer perform parallel processing and understand the concepts of supercomputer, array processor, vector processor.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

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

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

CO01 Student will understand Basic structure of computer system, arithmetic operations, and Demonstrate design of basic computer.

CO02 Students will know how to design various electronic circuits and able to perform computer arithmetic operations.

CO03 Students will be able to understand control unit, memory unit, I/O unit and apply the memory hierarchy design, memory access time formula, performance improvement techniques.

CO04 Student will know the concept of memory management, interleaving and mapping, DMA controller.

CO05 Student will distinguish the concept of pipeline, super computer, array processor and their structure.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO32	Microprocessor & Microcontrollers	3	0	2	4

Course Learning Objectives (CLOs):

CLO01   To learn basic concept of microprocessor and microcontroller.

CLO02   To learn architecture and assembly language programming of microprocessor 8085, 8086 and 8051 microcontrollers.

CLO03   To learn the use of different peripheral ICs in a microcomputer system.

CLO04   To learn hardware interfacing and programming of various IOs with 8086 microprocessor and 8051 microcontrollers.

CLO05   To learn features of advanced microprocessors and microcontrollers.

Unit-I BASICS OF MICROPROCESSOR SYSTEM

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

Unit-II 8086 MICPROCESSOR

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

Unit-III INTERFACING OF DEVICES WITH 8086

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

Unit-IV 8051 MICROCONTROLLER

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

Unit-V HIGH END PROCESSSORS & MICROCONTROLLER

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

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

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

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

CO01   To understand the architecture of 8085, 8086 microprocessor and 8051 microcontroller with their real-time application..

CO02   To write 8086 microprocessor and 8051 microcontroller assembly language program.

CO03   To illustrate the operation of microcomputer-based system consisting of processor, memory and peripherals.

CO04   To compare features of ARM processors and design and implement microcontroller based project.

CO05   To Interface Microprocessor with other devices

Web Sources:

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

List of Practical

1. Assembly Language Programs based on 8086 microprocessor.
2. I/O devices interfacing with 8086/8051 (microprocessor/microcontroller) using Peripheral ICs.IT3ES03

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3ES03	Python Programming	0	0	2	1

Course Learning Objectives (CLOs):

CLO₀₁   To understand why Python is a useful scripting language for developers.

CLO₀₂   To learn how to use lists, tuples, dictionaries, indexing and slicing to access data in Python programs.

CLO₀₃   To learn how to read and write files in Python.

CLO₀₄   To learn how to design object-oriented programs with Python classes.

Unit-I

Basic Introduction: Introduction to Python, History, Features, Command Interpreter and Development Environment-IDLE, Application of Python, Python 2/3 differences, Basic Program Structure-Quotation and Indentation, Operator, Basic Data Types and In-Built Objects, Looping and Control Flow.

Unit-II

Function and Arrays: Functions: Definition and Use, Arguments, Block Structure, Scope, Recursion, Argument Passing, Conditionals and Boolean expressions, Arrays: Types of Arrays, Working with Arrays using NumPy, Creating Arrays using: linspace() , logspace(), arange(), zeros() and ones() function, reshape method , flatten method, Working with Multidimensional Arrays, Lambda Function.

Unit-III

Sequences and File Operation: Sequences: Strings, Tuples, Lists Iteration, String Methods and Formatting, Dictionaries, Sets and Mutability, List and Dictionary Comprehensions

Fie Operation: 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-IV

OOPS Concepts: Object Oriented Concepts- Encapsulation, Classes, Class Instances, Constructors & Destructors__init__, __del__, Multiple Inheritance, Method Resolution Order (MRO), Polymorphism,

Duck Typing Philosophy, Operator overloading Properties, Special Methods, Method Overloading, Method Overriding, Abstract classes and Interfaces, Emulating Built-in Types.

Unit-V

Exception and Standard Modules: Exceptions, Exception Handling, Types of Exceptions, Except Block, Assert Statement, User Defined Exception, Standard Modules-Math, Random Packages, Data Frame using pandas, Operations on Data Frames.

Text Books:
1. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech press.
2. Paul Barry, Head First Python, O'REILLY.
3. Martin C Brown , The Complete Reference Python, McGraw Hill

Reference Books:
1. Mark Luiz, Learning Python, O'REILLY.
2. Jamie Chan, Learn Python in One Day, LCF Publishing.
3. Mark Summerfield, Programming in Python 3, Developers Library Second Edition

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

CO01   Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python

CO02   Express different Decision making statements and Function

CO03   Interpret Object oriented programming in Python

CO04   Understand and summarize different File handling operations

CO05   Student will be able to distinguish between mutable and immutable data types.

List of Programs:

1.	Answer these three questions without typing code. Then type code to check your answer. • What is the value of the expression 4 * (6 + 5)? • What is the value of the expression 4 * 6 + 5? • What is the value of the expression 4 + 6 * 5?
2.	What is the type of the result of the expression 3 + 1.5 + 4?
3.	Write a Python Program addition of two numbers?
4.	Write a Python Program to display the sum of two complex numbers?
5.	WAP to convert numbers from octal, binary and hexadecimal system into decimal number system?

6.	What would you use to find a number's square root, as well as its Square?
7.	WAP to find product of two numbers using command line arguments?
8.	WAP to Given the string 'hello', give an index command that returns 'e'.
9.	WAP to Reverse the string 'hello' using slicing.
10.	WAP to Given the string 'hello', give two methods of producing the letter 'o' using indexing.
11.	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.)
12.	Go through the string below and if the length of a word is even, print"even!" st = 'Print every word in this sentence that has an even number of letters'
13.	Write a program that picks a random integer from 1 to 100, and has players guess the number. The rules are: i. If a player's guess is less than 1 or greater than 100, say"OUT OF BOUNDS". ii. On a player's first turn, if their guess is a. Within 10 of the number, return "WARM!". b. Further than 10 away from the number, return."COLD!". iii. On all subsequent turns, if a guess is a. Closer to the number than the previous guess, return"WARMER!". b. Farther from the number than the previous guess, return"COLDER". iv. When the player's guess equals the number, tell them that they have guessed correctly and how many guesses it took.
14.	Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) Remember the rules: • Rock beats scissors • Scissors beats paper • Paper beats rock

15.	Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
16.	WAP to create a byte type array, read and display the elements of the array.
17.	WAP to accept a numeric digit from keyboard and display in words.
18.	WAP to display a group of messages when the condition is true?
19.	WAP to accept a number from keyboard and test whether a number is even or odd.
20.	WAP to test whether a given number is in between 1 and 10.
21.	WAP to display even numbers between m and n
22.	WAP to display characters of a string using for loops
23.	WAP to display odd numbers from 1 to 10 using range ().
24.	WAP to display and sum of a list of numbers using loop.
25.	WAP to display the stars in an equilateral triangular form using a loop.
26.	WAP to display numbers from 1 to 100 in a proper format
27.	WAP to search for an element in the list of elements.
28.	WAP to display prime number series.
29.	WAP to generate Fibonacci number series.
30.	Write a program that takes a list of numbers (for example, a = [5, 10, 15, 20, 25]) and makes a new list of only the first and last elements of the given list. For practice, write this code inside a function
31.	WAP to Use List comprehension to create a list of all numbers between 1 and 50 that are divisible by 3
32.	Take a list, say for example this one: a. a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b. and write a program that prints out all the elements of the list that are less than 5.
33.	Take two lists, say for example these two: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.
34.	Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates.
35.	Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.
36.	Write a Python class named Rectangle constructed by a length and width and a method which will compute the area of a rectangle.
37.	Write a Python class to reverse a string word by word. • Input string: 'hello .py' • Expected Output: '.py hello'

38.	Given a .txt file that has a list of a bunch of names, count how many of each name there are in the file, and print out the results to the screen.
39.	Write a Python program to remove newline characters from a file
40.	Write a Python program to combine each line from first file with the corresponding line in second file
41.	Write a Python program to copy the contents of a file to another file
42.	WAP to define Student class and create an object to it. Also, we will call the method and display the student's details.
43.	WAP to create a static method that counts the number of instances created for a class.
44.	WAP to create a Bank class where deposits and withdraw can be handled by using instance methods.
45.	WAP showing single inheritance in which two sub classes are derived from a single base class.
46.	WAP to implement multiple inheritance using two base classes.
47.	WAP to show method overloading to find sum of two or three numbers.
48.	WAP to Create a 3×3 numpy array of all True's
49.	WAP to Replace all odd numbers in arr with -1 a. Input ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
50.	WAP to Convert a 1D array to a 2D array with 2 rows a. Input: np. arrange (10)
51.	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])
52.	Write a programme, which generates a random password for the user. Ask the user how long they want their password to be, and how many letters and numbers they want in their password. Have a mix of upper and lowercase letters, as well as numbers and symbols. The password should be a minimum of 6 characters long

53.	**Python Project: - Grading System**
	DESCRIPTION
	Create a student grading system using Python that has the following functionalities: 1. Entering the Grades of a student 2. Removing a student from the system 3. Calculating the average grades of students The user should be able to select whether he/she wants to remove a student, enter grades for a student or find the average grades. Also, perform the following as part of this project: There should be a log-in system to allow only admin access to the grading system. Make sure you use dictionaries and lists for storing student's data. Use Python functions as much as you can Hint: Statistics module might be helpful

54.	**Python Project: - Hangman Game with Python**
	
	Create a "guess the word" game. As simple as it sounds, it has certain key things you need to note.
	    ● The user needs to be able to input letter guesses.
	    ● A limit should also be set on how many guesses they can use.
	    ● Keep notifying the user of the remaining turns.
	
	This means you'll need a way to grab a word to use for guessing. Let us keep it simple and use a text file for the input. The text file consists of the words from which we have to guess.
	You will also need functions to check if the user has actually inputted a single letter, to check if the inputted letter is in the hidden word (and if it is, how many times it appears), to print letters, and a counter variable to limit guesses.

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

Course Objectives:

    a) Improving professional communication

    b) Knowing traits of personality and working on it

    c) Developing writing skills

    d) Cultivating art of formal presentation and public speaking

    e) Improving interview and group discussion skills and hence employability

Prerequisites : Nil

Co-requisites : Nil

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

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

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

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

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

Case Studies: Nil

List of Practicals: Not Appicable.

Project: Nil

Course Outcomes: Mention 5 Course Outcomes

    A. Students will be able to interacat confidently at formal occasions
    B. Students will be able to understand their personality and improve it
    C. Studets will be able to work on their writing skills
    D. Students will get to write formally with perfaction
    E. Students will be able to face interview confidently and will be able to know the qualities of participants taking part in GD

Text Books:

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

Reference Books:

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

Web Source:

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

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

Open Learning Source:

https:/onlinecourses.nptel.ac.in

SEMESTER V

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3CO39	Computer Networks	4	0	2	5
2	IT3CO33	Theory of Computation	3	0	0	3
3	IT3CO34	Design and Analysis of Algorithms	3	0	2	4
4	IT3EXXX	Elective 1	3	0	0	3
5	IT3EXXX	Elective 2	3	0	0	3
7	OE000XX	Open Elective 1	3	0	0	3
8	EN3NG04	Soft Skills II	2	0	0	2
9	EN3NG06	Open Learning Courses	1	0	0	1
		Total	**22**	**0**	**4**	**24**
		Total Contact Hours		**26**		

Course Code	Course Name	Hours per Week	

		L	T	P	Credits
IT3CO39	Computer Networks	4	0	2	5

Course Learning Objectives (CLOs):

CLO01 Describe how computer networks are organized with the concept of layered approach.

CLO02 Implement a simple LAN with hubs, bridges, and switches.

CLO03 Describe how packets in the Internet are delivered and Analyze the contents in a given Data Link layer packet, based on the layer concept

CLO04 Design logical sub-address blocks with a given address block

CLO05 Decide routing entries given a simple example of network topology and Describe how routing protocols work.

Unit-I

Introduction: History and development of computer networks, networks topologies. Layering and protocols. Design issues, Interface and services, connection oriented and connectionless service, ISO-OSI reference model, Description of layers, comparison with TCP/IP, Introduction to internetworking devices.

Unit-II

Data Link Layer: Design issues, framing, error detection and correction, elementary and sliding window protocols, 1-Bit, Go Back N, Selective repeat, Bit oriented Protocol: HDLC, SDLC.

Unit-III

Medium Access Control Sub Layer: Channel allocation problem, static and dynamic channel allocation, pure ALOHA, Slotted ALOHA, multiple access protocols, CSMA, CSMA/CD, CSMA/CA, IEEE Standards: 802.3 Ethernet, 802.4 token bus, 802.5 token ring, 802.11 Wireless LANs, 802.15 Personal Area Networks (Bluetooth).

Unit-IV

Network Layer: Design issues, Routing algorithms: flooding, Bellman ford, Link state routing, hierarchical routing, Dijkstra's algorithm, broadcast and multicast routing, RIP, OSPF, Path vector, Network Address Translation (NAT), Internet Protocol, IPv4 header format, Addressing, Subnetting, ARP, RARP, BOOTP, DHCP, ICMP, Comparison between IPv4 and IPv6.

Unit-V

Transport Layer: Design issues, Process to process delivery, TCP Connection establishment and termination. TCP header format, TCP flow control, TCP congestion control, Timers in TCP. UDP header format, Checksum. Session layer: Authentication, authorization. Presentation formatting and data compression, Domain Name Server (DNS), World Wide Web (WWW), Hypertext Transfer Protocol (HTTP), Remote login: Telnet, File Transfer Protocol (FTP).

Text Books:
1. Computer Networks, Andrew S. Tanenbaum, Pearson Education
2. Computer Networking: A Top-Down Approach, James F. Kurose, Pearson Education
3. Data and Computer Communications, William Stallings, Pearson Education.

Reference Books:
1. Computer Networks: A Systems Approach, Peterson, Davie, ELSEVIER.
2. Data Communications & Networking, Behrouz A. Forouzan, Tata McGraw Hill.
3. Computer Networks: Principles, Technologies and Protocols for Network Design, Natalia Olifer, Victor Olifer, Wiley.

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

CO01   Analyse the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

CO02   Have a basic knowledge of the use of cryptography and network security.

CO03   Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.

CO04   Analyse, specify and design the topological and routing strategies for an IP based networking infrastructure

CO05   Have a working knowledge of datagram and internet socket programming.

List of Experiments:

1. Introduction to basic Networking Commands.
2. Study of different types of Network Equipment's.
3. Implement the cross-wired cable and straight through cable using crimping tool.
4. Study of Cisco Packet Tracer
    1. Packet Tracer: Study & Verification of Network Topologies.
    2. Packet Tracer: Navigating IOS
    3. Packet Tracer: Configuring Initial Switch Settings
    4. Packet Tracer: Identify MAC and IP Addresses.
    5. Packet Tracer: Implementing Basic Connectivity
    6. Packet Tracer: Investigating the TCP/IP and OSI Models in Action
    7. Packet Tracer: Connecting a Wired and Wireless LAN
    8. Packet Tracer: Configuring a DNS and DHCP Server
    9. Packet Tracer: Configuring Web Server and FTP Server.
5. Installation and Configuration of Local Area Network (LAN).
6. Write a program to implement various types of framing methods.
7. Write a program to implement various types of error correcting techniques.

Course Code	Course Name	Hours Per Week

IT3CO33	Theory of Computation	L	T	P	Credits
		3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To understand foundations of computation including automata theory.

CLO02 To construct models of regular expressions and languages.

CLO03 To design and simplify Context Free Grammar.

CLO04 To design and understand Push Down Automata.

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

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

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

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

   CO_{01} Construct automata theory using Finite Automata.

   CO_{02} Write regular expressions for any pattern.

   CO_{03} Design context free grammar and simplify CFG

   CO_{04} Construct PushDown Automata equivalent to CFGs.

   CO_{05} Design Turing machine for computational functions.

Course Code	Course Name	Hours Per Week				
		L	T	P	Hrs.	Credits
IT3CO34	Design and Analysis of Algorithms	3	0	2	5	4

Course Learning Objective :

The main objectives of this course are:

CLO01	To understand Algorithms & their complexities.
CLO02	To understand the Divide and Conquer method and numerical.
CLO03	To understand & solve Dynamic Programming problems.
CLO04	To understand Backtracking concepts and problems.
CLO05	To understand NP Hard and NP Complete Problems.

Unit I

Introduction to Algorithms: Algorithms, Analysis, Performance issues: Time and Space complexity; Asymptotic Notations. Recurrence relations, Methods for solving recurrences. Disjoint set operations,Elementary Sorting techniques and its analysis: Selection, Bubble, Insertion sort etc.

Unit II

Sorting and Divide & Conquer: Advance sorting techniques and its analysis: Heap sort, Radix sort and Bucket sort, General method, applications-analysis of binary search, quick sort, merge sort,Strassen's Matrix multiplication.

Unit III

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 IV

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

Unit V

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

Text Books:

1. Introduction to Algorithms, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Second Edition, MIT Press/McGraw-Hill
2. Computer Algorithms, E. Horowitz, S. Sahni, S Rajasekaran,,Galgotia Publications
3. Fundamentals of Algorithms"Gilles Brassard, Paul Bratle , Pearsons

Reference Books:

1. Computer Algorithms: Introduction to Design and Analysis,Saara Base, Addision Wesley.
2. The Design and Analysis of Computer Algorithms, A V Aho, J E Hopcroft & J D Ullman, Addison Wesley.
3. Introduction to Design and Analysis of Algorithms, A Strategic approach, R.C.T.Lee, S S Tseng, R C Chang, Y T Tsai Tata McGraw Hill.
4. Introduction to the Design & Analysis of Algorithm ,AnanyLevitin,Pearson

Course Outcomes :

After completion of this course the students shall able to:

CO01   Students will be able to understand Algorithms.

CO02   Student will familiar with problem solving technique and approach

CO03   Students will be able to understand all the concepts of Algorithm Complexities.

CO04   Students will be able to decompose the real-world problem into a step-by-step solution by applying domain knowledge.

CO05   Should be able to understand the tools to write the code and calculate complexity.

List of Experiments

1. Implement program which display frequency of loop is executed using (do ,while ,for etc).
2. Implement program which identifies the memory usage for implementation.
3. Implement program for various sorting algorithms .
4. Implementation of minimum and maximum heap .
5. Implementation of Binary Search Algorithm
6. Implementation of Minimum Spanning Tree Algorithm
7. Implementation of Knapsack Algorithm
8. Implementation of Multistage Graphs
9. Implementation of All pair shortest Path Algorithm
10. Implementation of Eight Queens Problem
11. Implementation of Graph Coloring
12. Implementation of Huffman coding.
13. Implementation of Dijkstra's algorithm
14. Implementation of the Traveling Salesman Problem.

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
IT3EA03	Soft Computing	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Introduction to soft computing techniques, characteristics and their applications

CLO02 Understand the fundamentals of neural networks, learning rules.

CLO03 Different ANN training algorithms, their application areas.

CLO04 Fuzzy logic, working principles and its applications.

CLO05 To understand genetic algorithm and optimization problem solving

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

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

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

CO$_{01}$ Students will be able to understand soft computing techniques and applications

CO$_{02}$ Students will be familiar with neural network learning.

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

CO$_{04}$ Students will be able to understand to apply genetic algorithms to optimization problems

CO$_{05}$ Ability to understand the working of hybrid systems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3ED02	Data Mining and Warehousing	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To Understand the importance of Data Warehouse in real world.

CLO02 To Learn importance of Data Mining and techniques.

CLO03 Understand association and classification and mining algorithms.

CLO04 To learn why make clusters and use of data mining in real world.

CLO05 Understand modelling and different query and OLAP tools.

Unit-I

Introduction: Data warehousing Components –Building a Data warehouse, Need for data warehousing, Basic elements of data warehousing, Data Mart, Data Extraction, Cleanup, and Transformation Tools – Metadata. Star, Snow flake and Galaxy Schemas for Multidimensional databases, Fact and dimension data, Partitioning Strategy-Horizontal and Vertical Partitioning.

Unit-II

Data Mining: Basics of Data Mining – Data mining techniques, KDP (Knowledge Discovery Process), Application and Challenges of Data Mining, Data Preprocessing: Overview, Data cleaning, Data integration, Data reduction, Data transformation and discretization.

Unit-III

Association and Classification: Basic concepts, Pattern Mining: Apriori algorithm, FP-growth Algorithm; Generating association rules, Pattern evaluation methods, Multi-level and multi-dimensional pattern mining. Introduction, Decision tree induction, Bayes classification, Rule based classification, Advance classification methods: Bayesian belief networks, backpropogation etc.

Unit-IV

Clustering: Clustering: Introduction, Types of clustering; Partition-based clustering: K-Means, K Medoids; Density based clustering: DBSCAN, Clustering evaluation.

Mining Data Stream, Mining Time-Series Data, Mining Sequence Patterns in Transactional Database, Social Network analysis and Multirelational Data Mining.

Unit-V

Business Analysis: Reporting and Query Tools and Application-Tool Categories-Need for Applications-SAS, KNIME, ORANGE, ETL, Data Quality, OLAP, Dimensional Modelling, Multidimesional Model, Multidimensional vs Multirelational OLAP, OLAP Tools

Text Books:
1. Han, Kamber and Pi, Data Mining Concepts & Techniques, Morgan Kaufmann, India, 2012.
2. Mohammed Zaki and Wagner Meira Jr., Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press.
3. Z. Markov, Daniel T. Larose Data Mining the Web, Jhon wiley & son, USA.

Reference Books:
1. Sam Anahory and Dennis Murray, Data Warehousing in the Real World, Pearson Education Asia.
2. W. H. Inmon, Building the Data Warehouse, 4th Ed Wiley India.
3. Michael Steinbach, Vipin Kumar, Introduction to Data Mining, First Edition, 2016

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

CO01   Student will able to understand need for data warehouse, tools, schemas and distinguish between database and data warehouse.

CO02   Students will know the concept of knowledge discovery process and process of data mining, data cleaning, data reduction etc.

CO03   Students will be able to learn data mining algorithms and pattern evaluation methods.

CO04   Student will know the concept of clustering and its types and social network analysis.

CO05   Student will able to learn Dimensional Modelling application tools and know how to use data mining and olap tools.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3EL10	Information Security	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization

CLO02 Analyze the cyber security needs of an organization

CLO03 Understand key terms and concepts in Cryptography and Learn to apply Cyber Security with Public key encryption and Hash function.

CLO04 Develop cyber security strategies and policies

CLO05 Understand principles of web security and to guarantee a secure network by monitoring

Unit-I

Introduction to Information Security: Security Attacks, Security Services, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

Unit-II

Block Cipher Principles, Data Encryption Standard (DES), Differential and Linear Cryptanalysis, Modular Arithmetic, Euclidean Algorithm, Advanced Encryption Standard (AES)

Unit-III

Public key cryptography: Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Unit-IV

Message Authentication and Hash Functions: Message Authentication codes, Secure Hash Algorithm, HMAC, Digital Signature, Authentication Protocol, Digital Signature Standards.

Unit-V

Authentication Applications: Kerberos, X.509 Authentication service, Pretty Good Privacy, S/MIME, IP Security, Firewalls.

Text Books:
1. Stallings William, "Cryptography and Network Security", Pearson Education

2. William Stallings and Lawrie Brown, Larry Brown , "Computer Security": Principles and Practice, Pearson
3. Atul Kahate, "Cryptography and Network Security", TMH

Reference Books:
1. Matt Bishop, "Introduction to Computer Security", Addison-Wesley
2. Buchmann J. A., "Introduction to Cryptography", Springer Verlag
3. Schneier Bruce, "Applied Cryptography", John Wiley and Sons

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

CO$_{01}$ Analyse and evaluate the information security needs of an organization

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

CO$_{03}$ Design and develop a security architecture for an organization.

CO$_{04}$ Measure the performance and troubleshoot information security systems.

CO$_{05}$ Design operational information security strategies and policies

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

Course Learning Objectives (CLOs):

CLO01   Students with understand the fundamental concepts of Blockchain

CLO02   They will be 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 CryptoCurrency, CryptoCurrency Exchanges.

Unit-II

Introduction to Blockchain: History of Blockchain, Hash Functions, SHA-256, Symmetric Cryptography, Asymmetric Cryptography, Keys & Digital signatures, Benefits and Limitation of Blockchain, Features of Blockchain.

Unit-III

Consensus: Nakamoto Consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy Utilization, Collision of Energy Utilization, Introduction to Ethereum.

Unit-IV

Blockchain Architectures: Blockchain Network, Merkle Patricia Tree, Soft & Hard Fork, Private and Public Blockchain, Tokenized Blockchain.

Unit-V

Blockchain Applications: Financial Sector, Medical Record Management System, Domain Name Service and Future of Blockchain, Case Study: Government on Blockchain. Introduction to Hashgraph and Tangle.

Text Books:
1. Andreas Antonopoulo, Mastering Bitcoin Unlocking Digital Cryptocurrencies, O'Reilly Publication.
2. Imran Bashir, Mastering Blockchain: Distributed Ledger Technology, Decentralization, Packt Publishing.
3. Phil Champagne, The Book of Satoshi: The Collected Writings of Bitcoin, LLC Newyork

Reference Books:
1. Wattenhofer, The Science of the Blockchain
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University.
3. Don Tapscott, Alex Tapscott , "Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World" , Penguin Publishing Group

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

CO01   Students will understand the basic terminology used in Blockchain and Bitcoin.

CO02   Students will be able to explore Blockchain and classification of various cryptocurrency.

CO03   Students will learn about various Consensus algorithms.

CO04   Students will be able to understand basic Blockchain Architecture.

CO05   Students will be able to use and understand applications of Blockchain.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00069	IoT with Applications	3	0	0	3

Course Learning Objectives (CLOs):

CLO01   To understand the architecture of IoT

CLO02   To understand the protocols related with IoT

CLO03   To understand the relationship of IoT with other domains

CLO04   To understand the Security challenges in IoT networks

CLO05   To understand the different fields where IoT can be used.

Unit-I

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-II

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-III

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-IV

Security issues in IoT: Introduction, Vulnerabilities, Security requirements and threat analysis, IoT Security Tomography, Layered Attacker Model, Identity Management and Establishment, Access Control.

Unit-V

Application areas of IoT: Home Automation, Smart Lighting, Home Intrusion Detection, Smart Cities, Smart Parking, Environment, Weather Monitoring System, Agriculture.

Text Books:
1. ArshdeepBahga, Vijay Madisetti, Internet of Things –A Hands-on Approach, Universities Press.

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

Reference Books:
1. Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things – Key Applications and Protocols, Wiley
2. Dimitris N. Chorafas, Cloud Computing Strategies
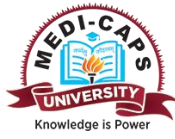3. Charless Bell, MySQL for the Internet of Things, Apress Publications

Open Learning Source:
1. https://onlinecourses.nptel.ac.in/noc17_cs22
2. https://github.com/connectIOT/iottoolkit

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

CO01   Understand building blocks of Internet of Things and characteristics.

CO02   Describe the IoT Reference Architecture and real-world design constraints

CO03   Discuss the various protocols used in IoT networks.

CO04   Explain the Security constraints behind IoT networks.

CO05   Create/Simulate and analyze IoT applications in real time scenario

SEMESTER VI

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3CO35	Distributed and Cloud Computing	3	0	2	4
2	IT3CO36	Software Engineering	3	0	2	4
3	IT3CO37	Compiler Design	3	0	0	3
4	IT3EXXX	Elective 3	2	0	2	3
5	IT3EXXX	Elective 4	3	0	0	3
6	IT3PC04	Mini Project	0	0	4	2
7	OE000XX	Open Elective 2	3	0	0	3
8	EN3NG05	Soft Skills-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
IT3CO35	Distributed and Cloud Computing	3	0	2	4

Course Learning Objectives (CLOs):

CLO_{01} Illustrate the concepts of Distributed and cloud computing with latest applications.

CLO_{02} Understand various distributed objects and concepts of virtualization.

CLO_{03} Understanding the concept of Synchronization and cloud services.

CLO_{04} Illustrating concepts of distributed file systems and cloud security.

CLO_{05} Understanding ideas Fault-tolerant Services, and Cloud Platforms

Unit-I

Introduction to Distributed Systems and Cloud Computing: Definition, Design Issues, and Goals of Distributed Systems Types of Distributed Systems Centralized Computing, Advantages of Distributed Systems Over Centralized Systems Architectural Models of Distributed Systems Client-Server Communication Introduction to DCE (Distributed Computing Environment) Cloud Computing: Terminology, Definitions, Characteristics (NIST), Architecture, Deployment Models, Reference Model

Unit II

Distributed Objects, Remote Invocation, and Virtualization: Communication between Distributed Objects Remote Procedure Call (RPC) Events and Notifications Operating System Layer Protection, Processes, and Threads Introduction to Distributed Shared Memory (DSM) Benefits of Virtualization Full Virtualization, Para-Virtualization Hypervisors Cloud Interoperability Cloud Service Management, Analytics, Broker, Capex, Opex

Unit III

Clock Synchronization, Mutual Exclusion, and Cloud Service Models: Clocks, Events, and Process States Synchronizing Physical Clocks, Logical Time, and Logical Clocks Lamport's Logical Clock Global States Distributed Mutual Exclusion Algorithms Multicast Communication Platform as a Service (PaaS) Infrastructure as a Service (IaaS) Software as a Service (SaaS) Desktop as a Service (DaaS) Backup as a Service (BaaS), DRaaS

Unit IV

Distributed File Systems, Transactions, and Cloud Security: File Service Architecture Distributed File Systems Implementation Naming System Network File System (NFS) Distributed Transactions, Atomic Commit Protocols Concurrency Control in Distributed Transactions Distributed Deadlocks Cloud Security Essentials Vulnerability Assessment Security Architecture Identity Management and Access Control Data at Rest, Data in Flight, Data in Motion Security in Virtualization

Unit V

Scheduling, Fault-tolerant Services, and Cloud Platforms: Issues in Load Distributing Components for Load Distributing Algorithms Different Types of Loads Distributing Algorithms Fault-tolerant Services Highly Available Services Introduction to Distributed Database and Multimedia System Cloud Application Development Platforms (Xen Hypervisor, AWS, Google App Engine, Open Stack)

Text Books:

1. K. Chandrasekaran, "Essentials of Cloud Computing," CRC Press
2. Thomas Erl, Zaigham Mahmood, RichardoPuttini, Cloud Computing: Concepts, Technology & Architecture, ServiceTech press

Reference Books:
1. Tanenbaum and Steen, Distributed systems: Principles and Paradigms, Pearson.
2. Sunita Mahajan & Shah, Distributed Computing, Oxford Press.
3. Distributed Algorithms by Nancy Lynch, Morgan Kaufmann.

Course Outcomes (COs):

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

CO_{01} Understand Distributed computing environment and cloud computing terminology.

CO_{02} Distributed Shared Memory Virtualization, Cloud computing broker model.

CO_{03} Synchronization and Cloud Service models and SLA agreement.

CO_{04} Distributed file system and concepts of Cloud security.

CO_{05} Load distribution algorithms and Cloud Application Development platforms-Hyperviso

List of Experiments:

1. To study about submarine cables and submarine cable map and summarize it in own words.

2. Implementation of virtualization through hypervisor / software such as Virtual box,

     VMware workstation player etc.

3. Study of Web Services and its components.

4. Create a amazon free tier account.

5. Create your first ec2 windows instance.

6. Launching RDS instance in AWS.

7. Case study of xen hypervisor.

8. Case study of open stack.

9. Write a program in c for implementation of non token base algorithm for distributed

    mutual exclusion.

10. Write a program in C to implement Lamports logical clock

11. Write a program to implement edge chasing distributed deadlock detection algorithm.

12. Write a program in C to implement locking algorithm.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO36	Software Engineering	3	0	2	4

Course Learning Objectives (CLOs):

CLO₀₁ To make students understand the fundamental concepts of software engineering and comprehend the principles of object orientation.

CLO₀₂ To make students possess the skills to perform requirement analysis using UML and create effective requirement models.

CLO₀₃ To make students design and model software systems using different views, including state machine, activity, interaction, physical, and deployment views.

CLO₀₄ To make students understand software quality assurance and testing principles, as well as be familiar with different software metrics.

CLO₀₅ To have the skills to assess and manage risks in software projects, apply software metrics for project estimation, and develop project schedules.

Unit I

Software Engineering – Definition, Process, Evolution and Myths, Generic Process Model, Framework, Process Models – Waterfall, Incremental, Evolutionary, Spiral, Component Based Model, Fundamental Concepts of Object Orientation, Rational Unified Process and its Phases.

Unit II

Requirement Analysis, Models, Concepts in UML, Structural and Behavioral Models, Requirement Modelling - Use Cases, Activity Diagrams, Data Modelling, Data Flow Diagram, Overview of Class Based Modelling, Relationships, Association, Generalization, Realization, Dependencies

Unit III

Principles of Software Design, Design Concepts, Design Model, Component Design, User Interface Design, Configuration Management, State Machine View, Activity View, Interaction View, Physical View, Sequence Diagram, Collaboration Diagram, Interaction Diagrams. , Component Diagram, Deployment Diagram

Unit IV

Package, Dependencies on Packages, Modelling System and Subsystems, Patterns and Types of Patterns, Applying Patterns, Software Quality, Approaches for Quality Assurance, Software Testing, Object Oriented Testing Verification and Validation, Types of Testing.

Unit V

Risk Assessment, Risk Mitigation, Monitoring and Management, Software Metrics, Process Metrics, Product Metrics, Function Oriented Metrics, Software Project Estimations, Function Point Based Metrics, COCOMO Models, Project Scheduling, Effort Distribution

Text Books:
1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw-Hill.
2. Ian Sommerville, Software Engineering, Pearson Education Inc., New Delhi
3. Grady Booch, Object Oriented Analysis and Design with Applications, Addison Wesley
4. James Rambaugh, Ivar Jacobson, Grady Booch, The Unified Modelling Language Reference Manual, Addison Wesley

Reference Book:
1. Fundamentals of Software Engineering by Rajib Mall, – PHI
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vissides, Design Patterns - Elements of Reusable Object-Oriented Software, Addison-Wesley
3. Craig Larman ,Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Pearson Education
4. Garry Pollice, David West, Brett McLaughlin, Head First Object Oriented Analysis and Design, O'Reilly Media Inc.

Course Outcome (COs):

After completion of this course, students should be able to:

CO01 Analyze and compare various software process models and understand fundamental concepts of object orientation.

CO02 Apply UML concepts in requirement analysis and Demonstrate proficiency in class-based modeling

CO03 Create design models employing state machine views and activity views.

CO04 Apply software quality assurance approaches and techniques.

CO05 Evaluate and mitigate risks in software projects effectively.
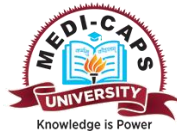
List of Experiments:

1   Study of UML tools

2   Problem Definition

3   Class Diagram for ATM system

4   Use Case Diagram for Student Project

5   Sequence Diagram for Student Project

6   Collaboration Diagram for Student Project

7   Activity Diagram for Application development system

8   Project Assessment (Design)

9   Project Assessment (Development)

10   Project Assessment (Testing & Complete Demonstration)

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3CO37	Compiler Design	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Understand the basic concepts of Compiler Design.

CLO02 Getting the knowledge of various phases of Compiler.

CLO03 Know various parsing techniques used in compiler.

CLO04 Know the code optimization & code generation techniques.

CLO05 To design phases of compiler in programming concepts.

Unit-I

Introduction to Compiler and its structure: Pass Structure of compiler, Translators, Phases of Compilers, 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-II

Basic Parsing Techniques: Top Down parsers, Recursive Descent Parsers, Predictive Parsers. Bottom Up Parsing: Operator precedence parsing, LR parsers, Construction of SLR, Canonical LR and LALR parsing tables.

Unit-III

Syntax Directed Translation: Syntax Directed Definition, Translation Scheme, Synthesized and inherited attributes, dependency graph, Construction of syntax trees, S-attributed and L-attributed definitions, Top down translation, postfix notation and bottom up evaluation.

Unit-IV

Intermediate Code Generation: Three address codes, quadruples, triples and indirect triples, Translation of assignment statements, Boolean expression and control structure, Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation.

Unit-V

Code Optimization and Generation: Basic blocks and flow graphs, Directed Acyclic Graph, Representation of basic block, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations.

Text Books:
1. Alfred V. Aho, and J.D. Ullman, Principle of Compiler Design, Narosa Publication.
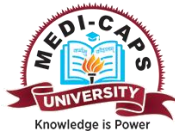2. John E. Hopcroft, Jeffery Ullman, Introduction to Automata theory, Langauges & computation, Narosa Publishers.

Reference Books:
1. Compiler design in C, A.C. Holub, PHI.
2. Compiler construction (Theory and Practice), A. Barret William and R.M. Bates, Galgotia Publication.
3. Compiler Design, Dr. O.G. Kakde.

Course Outcomes (COs):

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

CO01   Understand fundamentals of compiler and identify the relationships among different phases of the compiler.

CO02   Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.

CO03   Analyze & implement required module, which may include front-end, back-end, and a small set of middle-end optimizations.

CO04   Understand how code optimization works.

CO05   Use modern tools and technologies for designing new compiler.

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
IT3EA10	Pattern Recognition	2	0	2	3

Course Learning Objectives (CLOs):

CLO01 To know about pattern recognition techniques, classifier and its types

CLO02 To understand basic principles of implementing pattern recognition parametric methods

CLO03 To gain Knowledge of dimensionality reduction methods and Non parametric algorithms

CLO04 To understand broad perspective of clustering and association algorithms

CLO05 To understand and apply knowledge of Pattern Recognition to solve Applications

Unit-I

Overview of Pattern Recognition, Supervised Learning, Bayes Decision Theory, Minimum Error Rate Classification, Classifiers, Decision Trees.

Unit-II

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

Unit-III

Dimensionality Reduction: Problems of Dimensionality, Principal Component Analysis, Fisher Discriminant Analysis.

Non-Parametric Technique:K-Nearest Neighbour Estimation.

Unit-IV

Unsupervised Learning: Algorithms for Clustering, Hierarchical, Agglomerative, Partitional K-Means.

Unit-V

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

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

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

Course Outcomes (COs):

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

CO01 Students will be able to apply the models to solve statical classification problem.

CO02 Student will be able to demonstrate parametric algorithms.

CO03 Student will be able to Attain the capability to reduce dimensions and apply non parametric methods of classification

CO04 Students will be able to Formulate and solve problems of unsupervised learning

CO05 Ability to apply knowledge in solving real life problems.

List of Experiments :

1. **Text preprocessing level-1**

   i.   To implement operations such as change of case, sentence tokenization, word tokenization, stop word removal, punctuation mark removal, stemming, lemmatization, Parts of Speech (PoS) tagging using NLTK (Natural Language Tool Kit) platform
   ii   To implement tokenization without using built in function of nltk

iii   To comprehend the difference between stemming and lemmatization

iv   To count frequency of each word in the given document

2. Text pre-processing level-2

   i.   To implement label encoding and one hot encoding on textual data

   ii.   To implement Bag of Words (BoW) feature engineering technique on textual data

   iii.   To implement TF-IDF feature engineering technique

   iv.   To analyze and comprehend the effect of various approaches to convert text into vectors

3. Analysing Gutenberg and Brown corpus with python

   i.   Working with corpus file lists

   ii.   Working with file contents

   iii. Visualization

4. Exploratory data analysis for textual data

   i.   Most frequent words distribution, average chapter length, most frequent phrases (bi, tri and quad-grams), names of characters, places, and events.

   ii.   Findings through word-clouds, bar plots and histograms.

5. Information extraction -Part of Speech(POS)tagging and Named Entity Recognition (NER)

   i.   Identify the Part of speech like noun, verb, adjective, adverb and tag it

   ii.   Identify Named Entity in text data

6. Sentiment Analysis

   i.   Implement sentiment analysis on the given dataset in Natural Language Processing

   ii.   Analyze and comprehend the results obtained

7. Text Classification

   i.   Implement text classification to extracting information from Text

   ii.   Analyse and comprehend the results

8. **Study and use of libraries in Python for data import, preprocessing and Machine Learning.**

9. **Implement Linear Regression and Logistic Regression**

10. **Implement K-Nearest Neighbours.**

11. **Implement Decision Trees and Random Forest Classifier.**

12. **Implement Support Vector Machine.**

13. **Implement Naive Bayes Classifier.**

14. **Implement k-means clustering.**

15. **Implement Neural Network for classification.**

16. **Implement Deep Learning for image classification**
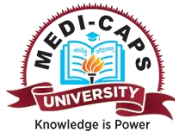
Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
IT3ED08	Information Storage and Management	2	0	2	3

Course Learning Objectives (CLOs):

CLO01   To evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, CAS

CLO02   To learn the backup, recovery, disaster recovery, business continuity, and replication

CLO03   To understand emerging technologies including IP-SAN

CLO04   Understand logical and physical components of a storage infrastructure, Identify components of managing and monitoring the data center

CLO05   To learn the information security and identify different storage virtualization technologies

Unit-I

Introduction to Storage Technology: Data Proliferation, Evolution of Various Storage Technologies, Key Challenges in Managing Information, Information Lifecycle Management, Data Categorization.

Unit-II

Storage Systems Architecture: Intelligent Disk Subsystems Overview, Contrast of Integrated vs Modular Arrays, Disk Physical Structure Components, Properties, Performance and Specifications, RAID levels & Parity Algorithms, Hot Sparing.

Unit-III

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS Evolution and Comparison. Applications, Elements, Management, Security and Limitations of DAS, NAS, CAS & SAN.

Unit-IV

Hybrid Storage Solutions; Memory, Network, Server, Storage, Storage Virtualization Challenges, Types of Storage Virtualization, Data Center Concept, Core Elements & Requirements.

Unit-V

Information storage on cloud: Backup Methods, Backup and Restore Operations, Managing & Monitoring Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges.

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.
3. Saurabh, Cloud Computing: Insight into New Era Infrastructure, Wiley India.

Reference Books:
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 and Application, Springer.
3. Rich Schiesser, IT Systems Management: Designing, Implementing and Managing World -class Infrastructures, PHI Learning.

Course Outcomes (COs):

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

CO01	Understand about Information Storage Environment
CO02	Understand Storage Area Networks Content –Addressed Storage
CO03	Understand managing information and will be able to analyze different storage networking technologies and virtualization
CO04	Monitor the storage infrastructure and management activities

List of Experiments

1. Introduction to Tableau and Installation
2. To perform Manipulating Data, using Data Names and Ranges, Filters and Sort and Validation Lists
3. To perform Data Analysis Using Charts and Graphs
4. To perform Advanced Data Analysis using PivotTables and Pivot Charts
5. Implementing Measure of central tendency: Mean, median, mode
6. Implementing Measure of dispersion: variance, standard deviation, Coefficient of variation
7. To perform Chi- Square Test (Parametric and Non-Parametric Test)
8. To perform Cluster Analysis using matplot
9. To perform Logistic Regression using machine learning.
10. To perform Connecting to Data and preparing data for visualization in Tableau
11. Demonstration of association rule mining using apriory algorithm on supermarket data.
12. To perform the classification by decision tree induction using weka tools.
13. To perform the cluster analysis by k-means method.
14. To Study and introduction to leading open-source RapidMiner tool for data mining solution
15. Install and configure different file systems (NTFS, ext4, FAT32).
16. Implement data compression algorithms (e.g., Huffman coding, Lempel-Ziv).
17. Implement data encryption techniques for storage.
18. Set up and configure a storage virtualization environment.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3EA06	Natural Language Processing	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 Understand natural language processing and to learn how to apply basic algorithms in this field.

CLO02 Describe the formal language and their representation using grammars.

CLO03 POS tagging and context free grammar for English language.

CLO04 Understanding semantics and pragmatics of English language for processing.

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

Unit-I

Introduction: Human Languages, Main Approach of NLP, Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Formal Language and Natural Language, Regular Expression and Automata.

Unit-II

Morphology: Text Pre-processing, Tokenization, Feature Extraction from text, Inflectional and Derivational, Finite State Morphological Parsing, Finite State Transducer

Part of Speech Tagging: Rule Based, Stochastic POS, Transformation Based Tagging.

Unit-III

Speech Processing: Speech and Phonetics, Vocal Organ, Phonological Rules and Transducer, Probabilistic Models, Spelling Error, Bayesian Method to Spelling, Minimum Edit Distance, Bayesian Method of Pronunciation Variation.

Unit-IV

N-Grams: Simple N-Gram, Perplexity, Smoothing, Backoff, Entropy, Parsing, Statistical Parsing, Probabilistic Parsing, Treebank.

Unit-V

Application: Sentiment Analysis, Spelling Correction, Word Sense Disambiguation, Machine Translation, Text Classification, Question Answering System.

Text Books:
1. Daniel Jurafsky & James H.Martin, Speech and Language Processing, Pearson Education.
2. James Allen, Natural Language Understanding, Pearson Education.
3. Jacob Eisenstein, Introduction to Natural Language Processing, MIT Press.

Reference Books:
1. Christopher D. Manning and Hinrich Schutze, Foundation of statistical Natural Language Processing, MIT Press.
2. Mary Dee Harris, Introduction to Natural Language Processing, Reston.
3. Akshar Bharati, Vineet Chaitanya and Rajeev Sangal, Natural Language Processing: A Paninian Perspective, Prentice-Hall of India

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

CO01 Student will Understand the interactive computer graphics architecture and Fundaments of NLP Objects with algorithm

CO02 Students will get Knowledge of the formal language and their representation using grammars.

CO03 Students will be able Broad perspective of modern POS tagging and context free grammar for English language

CO04 To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.

CO05 To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3ED03	Data Analytics	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To introduce students to the concept and challenges of Big Data.
CLO02 To teach basic statistical concepts required for analyzing big data.
CLO03 To teach the impact of big data for business decisions and strategy.
CLO04 To teach the algorithms required to solve real business problems.
CLO05 To give an understanding of real business scenario using a case study.

Unit-I

Introduction to Predictive Analytics: Data Mining and Tasks, Analytics- Definition, Need and Types, Data Analytics Methodology.

Predictive Analytics: Supervised and Unsupervised Learning, Parametric and Non-Parametric Models, Business Intelligence, Statistics and Data Mining, Challenges in Data Mining.

Unit-II

Data Preprocessing: Measures of Center and Spread, Skewness, Kurtosis, Rank-Ordered Statistics, Data Visualization in One, Two and Higher Dimensions, Anscombe's Quartet, Data Cleaning, Missing Values and Outliers Processing, Feature Creation, Data Transformation, Normalization and Standardization, Variable Scaling, Variable Binning.

Unit-III

Dimension Reduction Methods: Data Preparation Issues, Need of Dimension Reduction, Principal Component Analysis- Algorithm and Numerical, Criteria for PCA, Communalities, Minimum Communality Criteria, Factor Analysis, Factor Rotation.

Unit-IV

Univariate Statistical Analysis: Statistical Approach to Estimation and Prediction, Statistical Inference, Confidence Interval for Estimation of Mean, Margin of Error, Confidence Interval for Estimation of Proportion, Hypothesis Testing for Mean, Hypothesis Testing for Proportion.

Unit-V

Multivariate Statistics: Two-Sample t-Test for difference in Means, Two-Sample Z-Test for Difference in Proportions, Test for Homogeneity of Proportions, Chi-Square Test for Goodness of Fit for Multinomial data, Analysis of Variance.

Text Books:
1. Dean Abott, Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst, Wiley Publication
2. Daniel T. Larose, Chantal D. Larose, Data Mining and Predictive Analytics.
3. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Probability & Statistics for Engineers & Scientists, Prentice Hall Inc.

Reference Books:

1. John M. Chambers, Software for Data Analysis: Programming with R (Statistics and Computing), Springer
2. John D Kelleher, Brian Mac Namee, Aoife D Arcy, Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies, Kindle Edition
3. Dr. Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive Analytics for dummies, Wiley Publication

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

CO_{01} Student will be able to look at various pieces of data and draw a conclusion
CO_{02} Students will be able to apply the concepts of statistics to solve business problems.
CO_{03} Students will understand the fundamentals of various big data analytics techniques.
CO_{04} Students will be able to apply data modeling techniques to large data sets.
CO_{05} Students will be able to build a business data analytics solution.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3PC04	Mini Project	0	0	4	2

Course Learning Objectives (CLOs):

CLO01 Apply Information Technology 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 Information Technology 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 Information Technology 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
OE00051	R Programming	3	0	0	3

Course Learning Objectives (CLOs):

CLO$_{01}$ To understand importance of R Programming. Choosing right language for right application.

CLO$_{02}$ To be aware of future of Data Science in IT industry and getting started with R Programming.

CLO$_{03}$ To understand Data Structures in R

CLO$_{04}$ To understand basic fundamentals like Objects, Classes, Functions in R

CLO$_{05}$ To work with Data Sets, Plotting and Graphics.

CLO$_{06}$ To become proficient in writing a fundamental program and perform Data Analytics with R.

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Text Books:

1. Andrie de Vries, Joris Meys, R Programming for Dummies, Wiley Publications.
2. Roger D. Peng, R Programming for Data Science, Leanpub.
3. Kun Ren, Learning R Programming, Packt Publishing

Reference Books:
1. Emmanuel Paradis, R For Beginners, CRAN Publications.
2. Michael J. Crawley, The R Book, Wiley Publications.
3. Rob kabacoff , R in Action , Manning Publications

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

CO01   Decide the programming languages for different applications like Machine Learning, Data Science etc.

CO02   Student will familiar with Basics of R Programming.

CO03   Student will be able to understand the fundamentals and Data Structures used in R Programming.

CO04   Students will be able to understand working with the Data Sets, Training algorithms and plotting.

CO05   Will be able enough to write programs of Data Analytics and Machine Learning.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00069	IoT with Applications	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand the architecture of IoT
CLO_{02} To understand the protocols related with IoT
CLO_{03} To understand the relationship of IoT with other domains
CLO_{04} To understand the Security challenges in IoT networks
CLO_{05} To understand the different fields where IoT can be used.

Unit-I

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-II

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-III

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-IV

Security issues in IoT: Introduction, Vulnerabilities, Security requirements and threat analysis, IoT Security Tomography, Layered Attacker Model, Identity Management and Establishment, Access Control.

Unit-V

Application areas of IoT: Home Automation, Smart Lighting, Home Intrusion Detection, Smart Cities, Smart Parking, Environment, Weather Monitoring System, Agriculture.

Text Books:
1. ArshdeepBahga, Vijay Madisetti, Internet of Things –A Hands-on Approach, Universities Press.
2. Rajkamal, Internet of Things, Tata McGraw Hill publication

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

Reference Books:
1. Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things – Key Applications and Protocols, Wiley
2. Dimitris N. Chorafas, Cloud Computing Strategies
3. Charless Bell, MySQL for the Internet of Things, Apress Publications

Open Learning Source:
1. https://onlinecourses.nptel.ac.in/noc17_cs22
2. https://github.com/connectIOT/iottoolkit

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

CO01   Understand building blocks of Internet of Things and characteristics.
CO02   Describe the IoT Reference Architecture and real-world design constraints
CO03   Discuss the various protocols used in IoT networks.
CO04   Explain the Security constraints behind IoT networks.
CO05   Create/Simulate and analyze IoT applications in real time scenario

Course Code	Course Name	Hours per Week			Total Credits
		L	**T**	**P**	
EN3NG05	Soft Skills III	2	0	0	2

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

Interview Techniques and Mock Interviews: - Common Interview Questions. - STAR Technique. - Mock Interviews: Simulated interviews to practice and receive feedback. - Follow-up Etiquette: Sending thank you notes and inquiries post-interview.

Networking and Mentorship: - Importance of Networking: Building professional relationships for growth. - Networking Platforms and Events: Finding opportunities to connect with professionals. - Seeking Mentorship: Identifying potential mentors and building a mentor-mentee relationship. - Giving Back: Becoming a mentor to others and sharing knowledge.

Reference Book: The Ace of Soft Skills: Attitude, Communication and Etiquette For Success By Gopalaswamy Ramesh And Mahadevan Ramesh, Pearson

SEMESTER VII

S. No	Course Code	Course Name	L	T	P	Credit
1	EN3NG02	Universal Human Values & Professional Ethics	2	0	0	2
2	IT3EXXX	Elective 5	3	0	0	3
3	IT3EXXX	Elective 6	3	0	0	3
4	IT3PC03	Industrial Training	0	0	4	2
5	IT3PC06	Project-I	0	0	8	4
6	OE000XX	Open Elective 3	3	0	0	3
Total			**11**	**0**	**12**	**17**
Total Contact Hours			**23**			

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
IT3EL10	Information Security	3	0	0	3

Course Learning Objectives (CLOs):

CLO01   Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization

CLO02   Analyze the cyber security needs of an organization

CLO03   Understand key terms and concepts in Cryptography and Learn to apply Cyber Security with Public key encryption and Hash function.

CLO04   Develop cyber security strategies and policies

CLO05   Understand principles of web security and to guarantee a secure network by monitoring

Unit-I

Introduction to Information Security: Security Attacks, Security Services, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

Unit-II

Block Cipher Principles, Data Encryption Standard (DES), Differential and Linear Cryptanalysis, Modular Arithmetic, Euclidean Algorithm, Advanced Encryption Standard (AES)

Unit-III

Public key cryptography: Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Unit-IV

Message Authentication and Hash Functions: Message Authentication codes, Secure Hash Algorithm, HMAC, Digital Signature, Authentication Protocol, Digital Signature Standards.

Unit-V

Authentication Applications: Kerberos, X.509 Authentication service, Pretty Good Privacy, S/MIME, IP Security, Firewalls.

Text Books:
1. Stallings William, "Cryptography and Network Security", Pearson Education
2. William Stallings and Lawrie Brown, Larry Brown , "Computer Security": Principles and Practice, Pearson
3. Atul Kahate, "Cryptography and Network Security", TMH

Reference Books:
1. Matt Bishop, "Introduction to Computer Security", Addison-Wesley
2. Buchmann J. A., "Introduction to Cryptography", Springer Verlag
3. Schneier Bruce, "Applied Cryptography", John Wiley and Sons

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

CO01   Analyse and evaluate the information security needs of an organization

CO02   Determine and analyse software vulnerabilities and security solutions to reduce the risk of exploitation.

CO03   Design and develop a security architecture for an organization.

CO04   Measure the performance and troubleshoot information security systems.

CO05   Design operational information security strategies and policies

Course Code	Course Name	Hours Per Week				
IT3EA07	Machine Learning	L	T	P	Hrs.	Credits
		3	0	0	3	3

Course Learning Objectives (CLOs):

CLO01 To introduce machine learning with some of its problems and its types like classification

CLO02 To provide detailed knowledge about classification technique under supervised learning

CLO03 To explore different unsupervised learning algorithms to solve any problem and its application

CLO04 To study various neural network models and tools for implementing it

CLO05 To study advance type of machine learning, and evaluation of models.

Unit I
Introduction to Machine Learning, Applications, Classification; Supervised Learning: Linear Regression: Cost Function, Gradient Descent; Logistic Regression, Nearest-Neighbors, Gaussian Function.

Unit II
Overfitting and Underfitting, Regularization, Bias and Variance, Decision Trees, Naïve Bayes; Support Vector Machines, Kernel Methods.

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

Unit IV
Introduction to Neural Network, Perceptron, Feed Forward, Back Propogation, Recurrent Neural Network. Introduction to Python Machine Learning Libraries: Keras, Tensor Flow and Theano.

Unit V

Evaluating Machine Learning Algorithms and Model Selection, Ensemble Methods: Boosting, Bagging, Random Forests, Deep Learning, Semi-Supervised Learning, Reinforcement Learning.

Text Books:

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

Reference Books:

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

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

CO01   Understand the problems where machine learning can be used effectively

CO02   Understand various classification techniques and where it can be used

CO03   Understand the unsupervised learning including clustering algorithms

CO04   Understanding various neural network and tools for implementation

CO05   Understanding advance machine learning methods including deep learning

Course Code	Course Name	Hours Per Week				
IT3EA09	**Graph Theory**	L	T	P	Hrs.	Credits
		3	0	0	3	3

CLO01   To explain basic concepts in graph, tree, Euler graph in graph theory

CLO02   To discuss the concept of cut set and Combinatory and geometric graph

CLO03   To define how graphs serve as models for many standard problems

CLO04   To explain the benefits of representing networks as probabilistic graphs vs. the traditional binary representation

CLO05   To explore the applications of graphs in science and explore the concept of generating function.

Unit I
Introduction: Graphs- Introduction, Isomorphism, Sub Graphs, Walks, Paths, Circuits, Connectedness, Components, Euler Graphs, Hamiltonian Paths and Circuits, Trees- Properties of Trees, Distance and Centers in Tree, Rooted and Binary Trees. Special Classes of Graphs: Bipartite Graphs, Line Graphs, Chordal Graphs.

Unit II
Spanning Trees: Fundamental Circuits, Spanning Trees in a Weighted Graph, Cut Sets: Properties of Cut Set, All Cut Sets, Fundamental Circuits and Cut Sets, Connectivity and Separability, Network Flows, 1-Isomorphism, 2-Isomorphism, Combinational and Geometric
Graphs, Planer Graphs, Different Representation of a Planer Graph.

Unit III
Chromatic Number, Chromatic Partitioning, Chromatic Polynomial, Matching, Covering, Greedy Coloring Algorithm, Four Color Problem, Directed Graphs -Types of Directed Graphs, Digraphs and Binary Relations, Directed Paths and Connectedness, Euler Graphs.

Unit IV

Fundamental Principles of Counting, Permutations and Combinations, Binomial Theorem, Combinations with Repetition, Combinatorial Numbers, Principle of Inclusion and Exclusion, Derangement.

Unit V

Generating Functions, Partitions of Integers, Exponential Generating Function, Summation Operator, Recurrence Relations, First Order and Second Order, Non-homogeneous Recurrence Relations, Method of Generating Functions.

Text Books:

1. Narsingh Deo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.
2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.
3. Clark J. And Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.

Reference Books:

1. Mott J.L., Kandel A. And Baker T.P. "Discrete Mathematics for Computer Scientists and Mathematicians", Prentice Hall of India, 1996.
2. Liu C.L., "Elements of Discrete Mathematics", Mc Graw Hill, 1985.
3. Rosen K.H., "Discrete Mathematics and Its Applications", Mc Graw Hill, 2007.

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

CO$_{01}$	The student shall be able to know some important classes of graph theoretic problems
CO$_{02}$	They should be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs
CO$_{03}$	They should be able to describe and apply some basic algorithms for graphs
CO$_{04}$	They should be able to know to fundamental principles of counting.
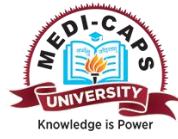
| CO₀₅ | They should be able to know the concept of generating functions and use graph theory as a modelling tool. |

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
IT3ED07	Data Science	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To Understand the importance of Data Science in real world

CLO02 To learn the importance of Probability and statistic in Data Science

CLO03 To Learn Why we analysis of Data before applied Data Science Process

CLO04 To Learn the importance of Data Visualization in Real world and Data Science

CLO05 To Learn the Importance of Python as a Data Science Tool

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 Modeling

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.

Text Books:
1. Joel Grus, Data Science from Scratch: First Principles with Python,O'RIELLY
2. Sinan Ozdemir, Principles of Data Science, PACKT.
3. Joke Vanderplas, Python Data Science Hand Book, O'Reilly Publication.

Reference Books:
1. Lillian Pierson, Data Science for Dummies,WILEY
2. Foster Provost, Tom Fawcett, Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking
3. Field Cady The Data Science Hand Book, Wiley Publication

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

CO01   Students will able to learn importance of Data Scientist and Data Science Technique

CO02   Students will able to learn Probability and Statistical Modelling

CO03   Students will able to learn Exploratory Data Analysis in Data Science

CO04   Student will able to learn Data Visualization of Data with example of Inspiring Industry Projects

CO05   Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively with the help of Python as a Data Science tool

Course Code	Course Name	Hours Per Week			
IT3ED06	Predictive Modelling and Data Visualization	**L**	**T**	**P**	**Credits**
		3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To know about pattern recognition techniques, classifier and its types

CLO02 To understand basic principles of implementing pattern recognition parametric methods

CLO03 To gain Knowledge of dimensionality reduction methods and Non parametric algorithms

CLO04 To understand broad perspective of clustering and association algorithms

CLO05 To understand and apply knowledge of Pattern Recognition to solve Application

Unit- I
Introduction to Predictive Modeling: Introduction to Predictive Modelling, Machine Learning Approach, Importance of Machine Learning, Aspects of Developing a Learning System: Training Data and Test Data, Issues in Machine Learning, Applications of Machine Learning, ML Techniques: Supervised Learning, Unsupervised Learning, Semi Supervised Learning, Reinforcement Learning.

Unit -II
Regression: Simple Linear Regression, Multiple Regression, Model Representation and Cost Function, Gradient Descent, Overfitting and Underfitting, Bias -Variance trade off.

Unit -III
Classification and Clustering: Classification: K-Nearest Neighbour Algorithm, Decision Trees, Logistic Regression, Model Evaluation technique for Classification task.Clustering: Hierarchical and K-means clustering, Measuring cluster goodness

Unit -IV
Data Visualization: Introduction to Data Visualization, Importance of Data Visualization in Business Intelligence, Coordinate system and axes, Colour scales, Visualizing amounts using Bar plots, Dot plots

and Heat maps, Visualizing distributions using histograms and density plots, Visualizing distribution using Q-Q plot, Visualizing many distributions at once.

Unit -V
Visualization using Python: Data Visualization Libraries in Python: Matplotlib, Seaborn, Bokeh, Folium, Networkx
Plotting using Python: Multiple Plot, Subplot, Histogram, Scatter plot, Heat Map, Pie Chart, Pair Plot, Bar plot, Pairwise Plot, Box and Whisker Plot.

Text Books

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", Wiley Publication
2. Joel Grus, "Data Science from Scratch", O'Reilly
3. Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly

References
1. Dr. Ossama Embarak, "Data Analysis and Visualization using Python", Apress
2. Aurelien Geron, "Hands on Machine Learning with Sci-kit Learn", O'Reilly
3. Kieran Healy, "Data Visualization: A practical introduction", Princeton University press

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

CO_{01} Students will learn to identify the real-world problems from different application domains that can be solved by applying the concepts of predictive modeling

CO_{02} Students will be able to design and analyze new models for prediction

CO_{03} Students will learn to integrate and apply the concepts of statistics, mathematics and IT with domain specific knowledge

CO_{04} Decompose the real-world problem into a step by step solution by applying domain knowledge.

CO_{05} Understand the programming language and libraries to optimize the code.

Course Code	Course Name	Hours Per Week			
IT3PC03	Industrial Training	L	T	P	Credits
		0	0	4	2

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

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

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

ii.   To encourage students to work in synergetic collaboration within teams

iii.   To develop professional attitude and critical thinking

iv.   To learn organizational functioning and decision making

v.   To set a stage for future recruitments and placements for students by potential employers

Prerequisites: Nil

Minimum days of Training: 4 weeks

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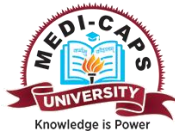
training. In case of training is opted by the students from the options provided by University, Students will not be allowed to change.

Procedure:

i. Internal and external guide from the department and the industry/ institutions respectively will be finalised within a week of commencement of training. In case of training given in University campus only the internal guide is required.

ii. Daily log book must be maintained by the student, duly signed by the industry/ internal guide. This log book will be considered as attendance record. Student will report weekly to the departmental guide about the progress of training.

iii. Confidential report of the student's attitude and learning in the organization should be provided by the external guide to the internal guide through mail or sealed and signed hard copy.

iv. Student will submit Training completion certificate in the department before applying for 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			Credits
		L	T	P	
IT3PC06	Project-I	0	0	8	4

A project encourages students to learn new techniques and technology that 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.
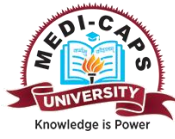
This course is also essential to keep in pace with the advancements and expectations of industry. The development life cycle of any project is an essential component of learning in this course. Broadly, the objectives of the course may be defined as follows:

- To implement his knowledge of realistic and practical problems
- To encourage students to work in synergetic collaboration within teams
- To develop a professional attitude and critical thinking
- To learn organizational ethics and work culture
- To apply his skills in the actual development scenario

Prerequisites: Nil

Project Implementation 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	1ˢᵗ week

	● Finalize supervisor	
Pre-Project Planning	● Synopsis ● Estimations – Time and Features	2nd week
Analysis	● Software Requirement Specification ● Presentation I	4th week
Design	● Software Design Specification ● Presentation II	6th week
Implementation + Testing and deployment	Presentation – III	10th week
	Dissertation – I Report + Viva – Voce	14th week End Sem exam (Evaluation by External examiner must)

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
OE00053	E-Commerce	3	0	0	3

Course Learning Objectives (CLOs):

CLO01 To develop an understanding concept of E-Commerce and different business models.

CLO02 To develop an understanding of e-commerce Laws, Policies and Strategies.

CLO03 To develop an understanding of Emerging Issues & Implementation Issues.

CLO04 To develop an understanding of M- Commerce, E-Governance, E- Readiness.

CLO05 To develop an understanding of the Challenges and Approach to E-Government Security in their services and payment system.

Unit-I

Introduction: Electronic Commerce, Technology and Prospects, E–Commerce Organization, Architectural Framework, Model Based on Transaction Type and Transaction Party: B2B, B2C, C2B, C2C, E-Commerce, Advantages and Disadvantages, Limitations & Scope and Strategy.

Unit-II

Emerging Issues and Implementation Issues: E- Commerce Law, Govt. Policies and Agenda. Electronic Payment Systems: Credit Cards, Debit Cards, Smart Cards, e-credit accounts, e-money, Marketing on the Web, Marketing Strategies, Advertising on the Web, Customer Service and Support.

Unit-III

Introduction to M-Commerce and E-Governance: E-Government, Issues in e-governance Applications, Evolution, its Scope and Content, Benefits and Reasons e- governance, e-governance Models- Broadcasting, Critical Flow, Comparative Analysis, Mobilization and Lobbying, Interactive Services/G2C2G.

Unit-IV

E-Readiness, E-Government Readiness, E- Framework, Step & Issues, Application of Data Warehousing and Data Mining in E-Government, Case Studies: NICNET-Role of Nationwide Networking in E-Governance, E-Seva.

Unit-V

E-Government Systems Security: Challenges and Approach to E-Government Security, Security Concern in E-Commerce, E-Payment Security, Security for Server Computers and Client Computers, Communication Channel Security.

Text Books:
1. Gary P. Schneider, "E-Commerce", Cengage Learning India
2. V. Rajaraman, "Essentials of E-Commerce Technology", PHI Learning Private Limited.
3. C. S. R. Prabhu, "E-Governance: Concept and Case Study", PHI Learning Private Limited.

Reference Books:
1. K.K. Bajaj, D. Nag "E-Commerce, McGraw-Hill Education.
2. J. Satyanarayan,"E-Government, the science of the possible",PHI Learning Private Limited.
3. Efraim Turban, Jae Lee "Electronic Commerce- A Managerial and Social Network Perspective", Springer

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

CO01   Students will be able to understand the concept of E-Commerce and different business models.

CO02   Students will be able to understand the e-commerce Laws, Policies and Strategies.

CO03   Students will be able to understand the concept of Emerging Issues & Implementation Issues of e commerce.

CO04   Students will be able to understand the concept of M- Commerce, E-Governance, E-Readiness.

CO05   Students will be able to understand the Challenges and Approach to E-Government Security in their services and payment system.

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

Course Learning Objectives (CLOs):

CLO01 Promote a disciplined project management process that encourages frequent inspection and adaptation, a leadership philosophy that encourages teamwork, self-organization and accountability.

CLO02 Understand various Agile approaches and different Agile roles.

CLO03 Understand the Product Vision, Product Roadmap and Project Planning in Agile.

CLO04 Identify risks and manage quality, cost and time in Agile Project.

CLO05 Iteratively identify and test the right agile practices from leading frameworks like scrum, XP, and kanban to your team's work.

Unit I
Understanding Agile: Introduction to Agile Project Management, Agile Manifesto, Agile Principles.
Agile Benefits: Product Development and Customers, Development Teams etc.

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

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

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

Unit V
Ensuring Agile Success: Building a Foundation Commitment, Choosing the Right Project Team

Members Development Team, Scrum Master etc. Being a Change Agent, Key Benefits and Key Resources for Agile Project Management.

Text Books:

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

Reference Books:

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

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

CO$_{01}$ An ability to apply Agile Principles and values in real time projects.

CO$_{02}$ An ability to apply Agile Practices and implement Agile roles.

CO$_{03}$ An ability to understand the Product Vision and create product roadmap in Project Planning.

CO$_{04}$ An ability to identify risks and manage quality, cost and time in Agile Project.

CO$_{05}$ Know the ethical practices that software professionals are expected to adopt.

1.

Course Code	Course Name	Hours Per Week			
IT3PC07	Project-II	**L**	**T**	**P**	**Credits**
		0	0	24	12

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)