DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHEME AND SYLLABUS

B.Tech. (Hons.) [Computer Science & Engineering]

[Artificial Intelligence & Machine Learning]

Academic Year: 2024-25

Department of Computer Science & Engineering

United University

Rawatpur-Jhalwa (Prayagraj)
Uttar Pradesh

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

University Vision

"To establish a Value based Global University having dynamic learning environment encouraging creativity and innovation, research inspired experimental learning and focusing on topics that are pertinent to the development of the region, the Country and the World. "

University Mission

- To provide a dynamic, inspiring, and varied learning environment with global exposure.
- To position the institution as a premier hub for research and experiential learning.
- To develop into an adaptable university meeting the demands of society and business.
- To incorporate Value thinking, integrity, wisdom and passion in professional for their career and life.

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Department Vision

The Vision of the Department of Computer Science & Engineering is to be a trailblazing institution that plays a transformative role in the nation's progress by producing exceptional human resources in information technology and related fields, meeting the dynamic demands of the country's IT industry for sustainable development. We envision driving cutting-edge research, advancing the frontiers of computer science and engineering, and making ground-breaking contributions through high-impact research publications and enduring patents. Embracing our social responsibility, we are dedicated to serving the local and national communities, fostering awareness of IT-related products, and emphasizing the critical significance of knowledge management. By nurturing a culture of innovation, inclusivity, and ethical leadership, we strive to shape a brighter future and create a positive and lasting impact on society and the ever-evolving technological landscape.

Department Mission

The Department of Computer Science & Engineering is committed to attain excellence in education, research, and service. We aim to produce highly skilled and motivated graduates through a comprehensive curriculum that fosters problem-solving abilities, teamwork, and a deep understanding of theory and practical applications. Our passion for research drives us to explore fundamental principles and innovative technologies, both within computer science and interdisciplinary fields.

Additionally, we actively serve our communities at local and national levels, while upholding ethical responsibilities to our profession and society. By nurturing a culture of innovation and entrepreneurship, we empower our students to become visionary leaders, driving positive change and making a lasting impact on the ever-evolving world of technology and beyond.

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Program Outcomes

On successful completion of the B.Tech.(CSE) programme the student will be able to:

PO1: Engineering knowledge: Apply a deep understanding of mathematics, science, engineering fundamentals, and the latest technological advancements to solve complex engineering problems using contemporary tools and technologies.

PO2: Problem analysis: Identify, formulate, and analyze engineering problems by leveraging advanced research techniques, cutting-edge technologies, and the latest literature, arriving at substantiated conclusions based on the integration of mathematical, natural, and engineering sciences.

PO3: Design/development of solutions: Design innovative solutions and system components for complex engineering problems, leveraging emerging technologies, state-of-the-art software frameworks, and considering factors such as public health, safety, cultural, societal, and environmental impact.

PO4: Conduct investigations of complex problems: Utilize research-driven knowledge, advanced experimental design methodologies, data analysis and interpretation techniques, and modern simulation tools to investigate complex engineering problems and derive valid and impactful conclusions.

PO5: Modern tool usage: Demonstrate proficiency in selecting and effectively utilizing cutting-edge techniques, resources, and modern engineering tools, including data analytics, artificial intelligence, machine learning, cloud computing, Internet of Things (IoT), and predictive modeling, to tackle complex engineering activities, while understanding the evolving limitations and ethical considerations.

PO6: The engineer and society: Apply contextual knowledge, including an understanding of social, cultural, economic, legal, and ethical aspects, to assess and address the societal impact, health, safety, and sustainability issues associated with engineering projects, aligning professional practices with contemporary societal needs.

PO7: Environment and sustainability: Demonstrate a comprehensive understanding of environmental and sustainability challenges, integrate sustainable development principles into engineering solutions, and leverage eco-friendly technologies, renewable energy sources, and resource optimization strategies to promote sustainable practices.

PO8: Ethics: Uphold the highest ethical standards, professionalism, and social responsibility in engineering practice, considering the ethical implications of technology applications, data privacy, cyber security, and fairness in decision-making processes.

PO9: Individual and team work: Collaborate effectively as an individual and as a leader or member of diverse teams, employing collaborative tools, virtual collaboration platforms, and interdisciplinary approaches to solve complex engineering problems in global and multicultural settings.

PO10: Communication: Communicate proficiently with diverse stakeholders, utilizing contemporary modes of communication such as digital platforms, visualizations, and multimedia presentations, to disseminate complex engineering concepts, project outcomes, and technical reports effectively.

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PO11: Project management and finance: Apply principles of project management, including agile methodologies, risk management, and financial analysis, to successfully lead and manage engineering projects, considering technological advancements, resource optimization, and market dynamics.

PO12: Life-long learning: Recognize the necessity of continuous professional development, adaptability to emerging technologies, and engage in lifelong learning, leveraging online learning platforms, professional networks, and keeping abreast of the latest trends and advancements in the rapidly evolving technological landscape.

Program Specific Outcomes

PSO1:

Analyse, design, develop, deploy, and evaluate information technology-based solutions for real-world problems using a comprehensive understanding of mathematics, software engineering principles, data communication technologies, algorithms, data structures, databases, and software frameworks on appropriate infrastructure.

PSO2:

Create and deploy integrated system-based prototypes and solutions by effectively applying knowledge and concepts of digital systems, computer organization, operating systems, computer networks, and database systems to address complex technological challenges.

PSO3:

Demonstrate proficiency in applying cutting-edge techniques from emerging areas such as data science, artificial intelligence, machine learning, computer security, and cyber-physical systems to solve real-world problems, showcasing adaptability to advancements in the field of computer science engineering.

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SCHEME OF INSTRUCTION

COURSE CATEGORY ABBREVIATIONS

1. Professional Core (PC)
2. Professional Elective (PE)
3. Open Elective (OE)
4. Basic Sciences (BS)
5. Engineering Science (ES)
6. Humanities and Social Sciences (HS)
7. Project Work, Seminar, Internship (PWSI)
8. Mandatory Audit Courses (AU)

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Semester I

				Contact Hours			28
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	ETUCAS101T	BS	Engineering Mathematics I	4	-	-	4
2	ETUCAS203T	BS	Engineering Chemistry	3	-	-	3
3	ETUCEC101T	ES	Basic Electronics Engineering	3	-	-	3
4	ETUCME101T	ES	Elements of Mechanical Engineering	3	-	-	3
5	ETUCAS204T	ES	Emerging Technology for Engineering	2	-	-	2
6	PTSPPET12T	HS	Professional Proficiency	1	-	2	1
7		HS	Skill Enhancement Subject*	1	-	1	1
8	ETUCAS203P	BS	Chemistry Lab	-	-	2	1
9	ETUCEC101P	ES	Electronics Engineering Lab	-	-	2	1
10	ETUCME101P	ES	Workshop Practices	-	-	2	1
11	ETUCME211P	ES	Engineering Graphics & Design Lab	-	-	2	1
* Skill Enhancement Subjects will follow the NEP compliance and offer Yoga/ Theater/ Drama/ Music/ Entrepreneur Development etc.							

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Semester II

						Contact Hours	26
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	ETUCAS201T	BS	Engineering Mathematics II	4	-	-	4
2	ETUCAS102T	BS	Engineering Physics	3	-	-	3
3	ETUCEE101T	ES	Basic Electrical Engineering	3	-	-	3
4	ETUCCS111T	ES	Programming & Problem Solving	3	-	-	3
5	ETUCAS104T	HS	Professional Communication	2	-	-	2
6	ETUCAS106T	BS	Environmental Science	2	-	-	2
7	PTSPPET23T	HS	Professional Proficiency	1	-	2	1
8	ETUCAS102P	BS	Physics Lab	-	-	2	1
9	ETUCEE101P	ES	Electrical Engineering Lab	-	-	2	1
10	ETUCCS101P	ES	Computer Programming Lab	-	-	2	1

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Semester III

						Contact Hours	32
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	ETUCAS301T	BS	Engineering Mathematics III	3	-	-	3
2	ETUCCS301T	PC	Data Structures	3	-	-	3
3	ETUCCS302T	PC	Computer Organization & Architecture	3	-	-	3
4	ETUCCS311T	PC	Software Engineering	3	-	-	3
5	ETUCCS314T	PC	Python Programming	2	-	-	2
6	ETUCCS310T	PC	Data Base Management System	3	-	-	3
7	PTSPPET31T	HS	Professional Proficiency	1	-	2	1
8	ETUCCS301P	PC	Data Structures Lab	-	-	2	1
9	ETUCCS302P	PC	Computer Organization Lab	-	-	2	1
10	ETUCCS304P	PC	Python Programming Lab	-	-	4	2
11	ETUCCS310P	PC	Data Base Management System Lab	-	-	2	1
12		AU	Technical Training	2	-	-	0

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Semester IV

				Contact Hours			30
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	ETUCCS401T	PC	Operating Systems	3	-	-	3
2	ETUCCS402T	PC	Design & Analysis of Algorithm	3	-	-	3
3	ETUCCS403T	PC	Object Oriented Techniques using Java	3	-	-	3
4	ETUCCS405T	PC	Theory of Automata & Formal Language	3	-	-	3
5	ETUCCS412T	PC	Discrete Mathematical Structure	3	-	-	3
6	PTSPPET41T	HS	Professional Proficiency	1	-	2	1
7	ETUCCS401P	PC	Operating Systems Lab	-	-	2	1
8	ETUCCS402P	PC	Design & Analysis of Algorithm Lab	-	-	2	1
9	ETUCCS403P	PC	Object Oriented Techniques Lab	-	-	2	1
10	ETUCCS413P	PWSI	Mini Project- I	-	-	4	4
11		AU	Technical Training	2	-	-	0
	Summer Internship 6 weeks (Mandatory) during summer vacation (EPICS)						
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				4	0	0	4

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Semester V

				Contact Hours			34
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	ETUCCS502T	PC	Computer Networks	3	-	-	3
2	CSPEAI001T	PC	Artificial Intelligence	3	-	-	3
3	CSPEAI002T	PC	Machine Learning	3	-	-	3
4	CSPEAI004T	PC	Soft Computing	3	-	-	3
5		OE	Open Elective I	3	-	-	3
6	PTSPPET51T	HS	Professional Proficiency	1	-	2	1
7	ETUCCS502P	PC	Computer Networks Lab	-	-	2	1
8	CSPEAI001P	PC	Artificial Intelligence Lab	-	-	2	1
9	CSPEAI002P	PC	Machine Learning Lab	-	-	2	1
10	CSPEAI004P	PC	Soft Computing Lab	-	-	2	1
11	ETUCCS512P	PWSI	Internship Assessment - I	-	-	4	4
12		AU	Technical Training	2	-	2	0
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				4	0	0	4

Semester VI

				Contact Hours			34
S. No	Course Code	Course Category	Course Name	L	T	P	C
1	CSPEAI005T	PC	Artificial Neural Networks	3	-	-	3
2	CSPEAI007T	PC	Reinforcement Learning	3	-	-	3
3	CSPEAI008T	PC	Computer Vision	3	-	-	3
4		PE	Professional Elective – I	3	-	-	3
5		OE	Open Elective II	3	-	-	3
6	PTSPPET61T	HS	Professional Proficiency	1	-	2	1
7	CSPEAI005T	PC	Artificial Neural Networks Lab	-	-	2	1
8	CSPEAI007T	PC	Reinforcement Learning Lab	-	-	2	1
9	CSPEAI008T	PC	Computer Vision Lab	-	-	2	1

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10		PE	Professional Elective – I Lab	-	-	2	1
11	ETUCCS604P	PWSI	Mini Project- II	-	-	4	4
12		AU	Technical Training	2		2	0
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				4	0	0	4

Semester VII

				Contact Hours			33
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	CSPEAI006T	PC	Deep Learning	3	-	-	3
2	CSPEAI009T	PC	Natural Language Processing	3	-	-	3
3		PE	Professional Elective – II	3	-	-	3
4		OE	Open Elective-III	3	-	-	3
5	CSPEAI006P	PC	Deep Learning Lab	-	-	2	1
6	CSPEAI009P	PC	Natural Language Processing Lab	-	-	2	1
7		PE	Professional Elective – II Lab	-	-	2	1
8	ETUCCS703P	PWSI	Internship Assessment – II	-	-	4	4
9	ETUCCS702P	PWSI	Major Project (CS)-I	-	-	5	5
10		PC	Explainable AI*	-	-	2	2
11		AU	Technical Training	-	-	4	0
Industrial/ Research Internship six weeks (Mandatory) during summer vacation							
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				0	0	0	4

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Semester VIII

						Contact Hours	32
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1		PC	Expert System	3	-	-	3
2		PE	Professional Elective – III	3	-	-	3
3		OE	Open Elective-IV	3	-	-	3
4		PC	Expert System Lab	-	-	2	1
5		PE	Professional Elective – III Lab	-	-	2	1
6		PWSI	Major Project (CS)-II	-	-	13	13
7		PC	Generative AI*	-	-	2	2
8		AU	Technical Training	-	-	4	0

[*L - Lecture, T - Tutorial, P - Practical, C - Credits*]

Note:

1. The student should undergo internship and simultaneously he/she should work on a project with well-defined objectives.
2. At the end of the semester the student should submit an internship completion certificate and a project report.
3. If any of our associated company comes forward to offer an emerging course that will be offered as an industry offered course in V, VI or VII semesters under program elective with the approval of BoS.
4. This is incorporated to enhance student skills and employability in cutting edge technologies.

COURSE CODE & NAME: ETUCAS101T/ ENGINEERING MATHEMATICS I

COURSE OUTCOMES

1. Understand the concept of limit, continuity and differentiability and apply in the study of , Rolle's , Lagrange's and Cauchy mean value theorem and Leibnitz theorems .
2. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
3. Remember the concept of matrices and apply for solving linear simultaneous equations.
4. Illustrate the working methods of multiple integral and apply for finding area and volume.
5. Remember the concept of definite integral and apply for evaluating surface areas and volumes.

UNIT I:

Differential Calculus- I: Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (nth order derivatives), Leibnitz theorem and its application, Curve tracing: Cartesian and Polar co-ordinates

UNIT II:

Differential Calculus-II: Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

UNIT III:

Matrices : Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix.

UNIT IV:

Integral Calculus-I : Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes

UNIT V:

Integral Calculus-II : Improper integrals, Beta & Gama function and their properties,Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

TEXTBOOKS

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.

2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.
4. N. P. Bali and Manish Goyal A Text Engineering Mathematics, Laxmi Publication.

REFERENCE BOOKS

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Son.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008..
3. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition,Pearson India Education Services Pvt. Ltd
4. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

COURSE CODE & NAME: ETUCAS201T/ Engineering Chemistry

COURSE OUTCOMES

1. Demonstrate knowledge on fundamental principles including concepts and their applications related to chemistry.
2. Have ability for in depth structural and analytical thinking towards chemical science conceptualize and analyze to improve the knowledge of chemical systems and its connections with natural and engineering sciences.
3. Have ability to design system components and chemical processes meeting all applicable consideration for public health, safety, cultural, societal and environmental considerations.
4. Have ability to investigate and analyze critical physicochemical and structural problem towards the development of appropriate solution.
5. Have ability to use modern lab equipment's and relevant theoretical understand to perform measurements, experiments, design and analysis.

UNIT I:

Chemical Bonding: Ionic bond: Radius ratio rule, Born-Haber cycle, Molecular orbital Theory, Metallic Band Theory, defects in solids, Werner's Theory, Bonding in Transition metal complexes, Ligands, coordination complexes, , Crystal Field Theory, Octahedral, Tetrahedral and square planar complexes, Concept of Nonmaterial and its application

UNIT II:

Spectroscopic Techniques and its Application: Spectroscopic Techniques of Absorption and emission Spectroscopy, Lambert-Beers Law, Principles and applications of UV-Visible, Factors influencing for UV-VIS spectrum; Rotational and Vibrational spectroscopy; Modern techniques in structural elucidation of compounds by UV-VIS, IR, & NMR Spectroscopy, Raman Spectroscopy.

UNIT III:

Nernst Equation and application, relation of e.m.f. with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery.

Corrosion: causes, effects and its prevention

Phase Rule and its application to water system of (one component and two component Pb/Ag) Chemical equilibrium.

UNIT IV:

Water Chemistry and its Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulong's methods).

UNIT V:

Polymer : Polymer and its characteristics; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers, Addition , condensation, polymerization, free radical polymerization, thermoplastic and thermosetting polymerization. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

TEXTBOOKS

1. Huheey, J. E., Inorganic Chemistry: Principles of Structure and Reactivity, 4th edition, Pearson.
2. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Seventh Edition, Pearson
3. Atkins, P. W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014
4. University Chemistry By C.N.R. Rao

REFERENCE BOOKS

1. University Chemistry By B.H. Mahan
2. Organic Chemistry By I.L. Finar
3. Physical Chemistry By S. Glasstone
4. Engineering Chemistry By S.S. Dara

COURSE CODE & NAME: ETUCEC101T/ Basic Electronics Engineering

COURSE OUTCOMES

1. Understand the concept of Semiconductors, PN junction diode and its applications.
2. Understand the concept of BJT and amplification.
3. Study the concept of FET and introduction to Boolean Logic.
4. Study the concept of MOSFET and its related circuits.
5. Understand the Concept of Digital storage Oscilloscope and comparison of DSO with analog Oscilloscope. Also study few photovoltaic applications.

UNIT I:

Semiconductor Diode and Its Applications: Semiconductor Diode: Semiconductor materials, Crystal Structure, Intrinsic and Extrinsic semiconductors, Electron and Holes as Charge Carriers and Conductivity, P-N Junction Diode, Depletion Region and built-in potential, V-I curves of Forward & Reverse biased Diode, Diode current Equation, Diode capacitance: Transition and Diffusion Capacitance, Zener and Avalanche Breakdown Mechanisms.

Applications: Diode Equivalent Circuits, Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers, Zener diode as voltage regulator.

UNIT II:

Bipolar Junction Transistor Characteristics: Bipolar Junction Transistor (BJT): Structure, Operation, n-p-n and p-n-p transistor, Emitter, Base and Collector currents, Active, Saturation and Cut-off modes of operation, Amplifying Action, Common Base(CB), Common Emitter(CE) and Common Collector(CC) Configurations, Operating Point, Need of Biasing, Fixed bias, Emitter bias, Potential divider bias, Voltage feedback bias; Bias stabilization; Stability factor, CE,CB,CC amplifiers, small signal ac equivalent circuit and analysis of single stage CE amplifier, BJT as a switch.

UNIT III:

Field Effect Transistor (FET): Structure and physical operation of JFET, V-I Characteristics of Junction FET, Common Source, Common Drain and Common Gate amplifier, JFET current Equation, small signal ac analysis of CS amplifier.

Introduction to Boolean Logic: Laws of Boolean algebra, Basic Gates like NOT, AND, OR, XOR, NAND and NOR.

UNIT IV:

Metal Oxide Semiconductor Field Effect Transistor (MOSFET)

MOSFET: MOSFET Construction, Characteristics, Current equation, Enhancement MOSFET and Depletion MOSFET, n-Channel MOSFET and p-Channel MOSFET, Complementary MOSFET (CMOS), Advantages of CMOS in switching, Implementation of NOT, AND, OR, XOR, NAND and NOR gates using CMOS.

UNIT V:

Electronics Instrumentation and few device applications:

Oscilloscope And Multimeter: Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current , phase and frequency using CRO, Digital Multimeter.

Device applications: Light-Emitting Diodes, Photo Detector, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays, Solar Cells.

TEXTBOOKS

1. Robert L. Boylestad & Louis Nashelsky, "Electronic Devices and Circuit Theory", Tenth Edition, Pearson Education, 2013
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.

REFERENCE BOOKS

1. Albert Malvino & David Bates, "Electronic Principles" McGraw Hill Education

COURSE CODE & NAME: ETUCME101T/ Elements of Mechanical Engineering

COURSE OUTCOMES

1. Understand the representation and analysis of forces, moments, and equilibrium of particles and rigid bodies,
2. Understand the Concept and principles of velocity acceleration, momentum, work and energy.
3. Understand the basic laws of thermodynamics and their applications in engineering.
4. Understand the processes and operations of metal joining, fabrication casting and machining with applications.
5. Develop basic know how and awareness of various manufacturing processes.

UNIT I:

Force Systems and Equilibrium: Concept of Rigid Body, External Forces, moments, reactions couples, Laws of Mechanics. Concurrent, non-concurrent and Parallel forces in a plane, Free Body Diagram, Equation of equilibrium and their applications to various systems of forces. Beams; Types Support and load conditions, Shear Force and Bending Moment Diagrams for point load, uniformly distributed load, uniformly varying load. Centroid and Moment of Inertia; Centroid Moment of inertia for composite and cut sections, Parallel and perpendicular axis theorem and their applications

UNIT II:

Kinematics and kinetics of Rigid Body: A Plain motion of rigid body, Velocity and acceleration under translation and rotational motion, Absolute motion, Relative motion. Force, Mass and Acceleration, Work, Power and Energy, Impulse and Momentum, D' Alembert's Principle and dynamic equilibrium.

UNIT III:

Fundamentals of Thermal Engineering: Thermodynamic systems, State & properties, Thermodynamic equilibrium & processes, Heat &work, Work done for different polytrophic processes, Zeroth law of thermodynamics and its applications, First law of thermodynamics, Steady flow energy equation, Application of first law to various thermodynamic systems and its limitations.

UNIT IV:

Second Law of Thermodynamics and Manufacturing Process:

Concept of heat engine, heat pump &refrigerator, Second Law of Thermodynamics, Carnot Cycle, Carnot theorem. Clausius Inequality, Concept of entropy, Entropy changes during various processes. Introduction to Manufacturing Processes; Mechanical properties of materials, Engineering Materials: High Carbon, Medium Carbon and Low Carbon Steel with applications.

UNIT V:

Casting Process, Machining Processes, Fabrication Processes: Patterns and types of patterns and their allowances, Moulding sand and its properties, Elements of gating system, casting defects. Machining Processes; Working principle and operations of Lathe and Drill Machine. Fabrication processes; Introduction and classification of welding, principle and applications of Shielded Metal Arc Welding and Gas welding

TEXTBOOKS

1. "Elements of Mechanical Engg" by D.S. Kumar Katson Publications
2. "Engg Mechanics by S.S Bhavikatti" New Age Publications
3. " Mechanical Engg." by R.kRajput Birla Publications Pvt. Ltd
4. "A Learning Resources of Engg. Mechanics" by R. K. Bansal Laxmi Publications
5. "Engineering Mechanics" – I.H. Shames, Prentice Hall of India Pvt. Ltd., New Delhi (EEE)

REFERENCE BOOKS

1. "Mechanics for Engineers" – (Statics and Dynamics) F.P. Beer & E.R. Johnston, TMH New Delhi
2. "Engineering Mechanics" – Statics & Dynamics by J.L. Marriam& L.G. Kraig, John Wiley & Sons Ltd
3. Nag P. K.: "Engineering Thermodynamics", TMH, and India.
4. Yadav R.: "Thermodynamics and Heat Engines", Vol I & II (Sl Edition) Central Publishing House Allahabad.

COURSE CODE & NAME: ETUCAS204T/ Emerging Technology for Engineering

COURSE OUTCOMES

1. Understand the Fundamentals of AI
2. Understand Fundamentals of Cloud Computing
3. Understand the Fundamentals of IoT and its Societal Benefits
4. Understand the Basics of Robotics add its Industrial Applications
5. Understand the Future Trends in Engineering and Technology

UNIT I:

Artificial Intelligence: Foundations, Scope, Problems, and Approaches of AI. Introduction to AI, History of AI, Course Logistics, Roadmap, and Industry Applications of AI

UNIT II:

Cloud Computing: Introduction and Evolution of Computing Paradigms, Brief History and Evolution, History of Cloud Computing, Evolution of Cloud Computing, Traditional vs Cloud Computing. Cloud Deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing, Industry Applications

UNIT III:

Internet of Things: The Internet of Things Today, Internet of Things Vision, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technology Devices, IOT Devices vs. Computers, Societal Benefits of IOT, Risks, Privacy, and Security, Applications

UNIT IV:

Robotics and Automation¬: Automation and Robotics, Robot Anatomy, Basic Structure of Robots, Resolution, Accuracy and Repeatability, Classification and Structure of Robots, Point to Point and Continuous path Systems. Components of Robotic System, Industry Applications

UNIT V:

Future Trends: 5G Technology and Further, History, Objective ,and Global Scenario of 5G Telecom and its Applications, Fundamentals of Quantum Computing ,Julia Programming Language. Benefits of Julia Language over other Programming Languages

TEXTBOOKS

1. Artificial Intelligence dummies by John Paul Mueller and Luca Massaron

REFERENCE BOOKS

1. Fundamentals of Robotics Engineering by Harry. H. Poole

COURSE CODE & NAME: PTSPPET23T/ Professional Proficiency

COURSE OUTCOMES

1. Better representation of himself/herself in terms of communication skills, overall personality development and aptitude building required for jobs.
2. This program will help students employable and ready for Industries /corporate and other Public and Private Sector jobs.

UNIT I:

HARD SKILLS: Hard skill includes Basic Grammar, Vocabulary ,Articles, Tenses, Construction of Sentences and Reading Comprehension etc.

UNIT II:

COMMUNICATION SKILL

Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include:

- Follow only English language in the class.
- Class should be interactive and students should always be engaged in some kind of conversation.
- Each student should speak 5 minutes, 3-4 times in 1st semester on topics of his choice selected from Social, Environmental, Sports, Business and Economics, Medicines and Health Care, Science and Technology ,Politics, World Affairs and Religion etc.
- In the above process students should be regulated towards better Vocabulary and Pronunciation.

UNIT III:

APTITUDE BUILDING

QUANTITATIVE APTITUDE

1. Basic Calculations: BODMASS rule, Square and square root, Cube and cube root, Different types of numbers, Divisibility rule, Fraction and comparison of fraction
2. Number System: Multiples, Factors Remainder, Remainder Theorem, Unit Place, Number formation, Factorial, LCM and HCF Finding and its application.
3. Percentage: Basics of percentage and it’s calculation, Comparison of percentage, How to use in data interpretation, Venn diagram

COURSE CODE & NAME: ETUCAS203P/ Chemistry Lab

Lab Course Outcomes :

1. Get an understanding of the use of different analytical instruments.
2. Measure the molecular / system properties such as surface tension,
3. viscosity, conductance of solution, chloride and iron content in the water.
4. Measure the hardness and alkalinity of the water.
5. Know the fundamental concepts of the preparation of phenol
6. formaldehyde & urea formaldehyde resin, adipic acid and Paracetamol.
7. Estimate the rate constant of reaction.

List of Experiments

1. Preparation Of Standard Solution
2. Determination of alkalinity in the given water sample.
3. Determination of temporary and permanent hardness in water sample using EDTA.
4. Determination of iron content in the given solution by Mohr's method.
5. Determination of viscosity of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Determination of dissolved oxygen by iodometric/ Wrinkler's methods in water
13. To Determine (wave length of maximum absorption)of solution KMno4 using spectrophotometer.

COURSE CODE & NAME: ETUCEC101P/ Electronics Engineering Lab

Lab Course Outcomes :

1. To apply the concepts and analytical principles to analyze electronic (diodes, transistors) circuits.
2. To Understanding of the operation diodes and transistors in order to build circuits.
3. To learn to the characteristics of Transistor.
4. To learn the basics of Amplifiers.
5. The students are able to design Op-amp circuits.

List of Experiments:

1. Familiarization with CRO, Ammeter, Voltmeter, Multimeter, and DC Power supply. Continuity check in multimeter, Low amplitude DC voltage and current measurement, Diode check. Introduction of safety guidelines in Laboratory practice.
2. Plot the Forward bias V-I characteristics curve for PN junction and calculate the DC forward resistance.
3. Plot the Reverse bias V-I characteristic curve for PN junction.
4. Obtain the Full-wave rectification Plots with PN junction diode based Bridge rectifier. Calculate the rectifier efficiency and ripple factor.
5. Obtain the Input characteristics curves for a BJT in Common Emitter mode. Find the Early Effect.
6. Plot the Output characteristics curve for a BJT in Common Emitter mode. Determine the DC current gain.
7. Design a BJT based voltage amplifier in CE mode. Find the voltage gain.

COURSE CODE & NAME: ETUCME101P/ Workshop Practices

LAB COURSE OUTCOMES:

1. Use various engineering materials, tools, machines and measuring equipments. Perform machine operations in lathe and CNC machine.
2. Perform manufacturing operations on components in fitting and carpentry shop.
3. Perform operations in welding, moulding, casting and gas cutting.
4. Fabricate a job by 3D printing manufacturing technique
5. dentify tools and equipment used and their respective functions.
6. Identify different types of materials and their basic properties.
7. Use and take measurements with the help of basic measuring tools/equipment.
8. Select proper tools for a particular operation.
9. Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
10. Use safety equipment and Personal Protection Equipment.

1. CARPENTRY SHOP

General Shop Talk Name and use of raw materials used in carpentry shop: wood & alternative materials Names, uses, care and maintenance of hand tools such as different types of Saws, C Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc. Specification of tools used in carpentry shop. Different types of Timbers, their properties, uses & defects. Seasoning of wood.

Practice-

Practices for Basic Carpentry Work Sawing practice using different types of saws

Assembling jack plane — Planning practice including sharpening of jack plane cutter.

Chiselling practice using different types of chisels including sharpening of chisel.

Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

Job Practice:-

Job 1 Marking, sawing, planning and chiselling and their practice

Job II Half Lap Joint (cross, L or T – any one)

Job III Mortise and Tenon joint (T-Joint)

Job IV Dove tail Joint (Lap or Bridle Joint)

Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

2. PAINTING AND POLISHING SHOP

Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.

Job Practice:-

Job I: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Job II: To prepare metal surface for painting, apply primer and paint the same.

Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.
The sequence of polishing will be as follows:
Abrasive cutting by leather wheel
Polishing with hard cotton wheel and with polishing material
Buffing with cotton wheel or buff wheel.

3. ELECTRICAL SHOP
   Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories. Study of electrical safety measures and protective devices.
   Job I: Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs.
   Job II: Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping. Study of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc. Introduction to the construction of lead acid battery and its working.
   Job III: Installation of battery and connecting two or three batteries in series and parallel. Introduction to battery charger and its functioning.
   Job IV: Charging a battery and testing with hydrometer and cell Tester.

4. SMITHY SHOP
   General Shop Talk Purpose of Smithy shop Different types of Hearths used in Smithy shop Purpose, specifications, uses, care and maintenance of various tools and equipments used in hand forging by segregating as cutting tools, supporting tools, holding tools, measuring tools etc. Types of fuel used and maximum temperature obtained Types of raw materials used in Smithy shop Uses of Fire Bricks & Clays in Forging workshop.
   Practice-
   Practice of firing of hearth/Furnace, Cleaning of Clinkers and Temperature Control of Fire.
   Practice on different basic Smithy/Forging operations such as Cutting, Upsetting, Drawing down, Setting down, Necking, Bending, Fullering, Swaging, Punching and Drifting.
   Demonstration — Making cube, hexagonal cube, hexagonal bar from round bar Practice of Simple Heat treatment processes like Tempering, Normalizing Hardening etc
   Job Practice:-
   Job I Making a cold / hot, hexagonal / octagonal flat chisel including tempering of edges.
   Job II Production of utility goods e.g. hexagonal bolt / square shank boring tool, fan hook (long S-type) [Two jobs are to be done by the students].
   Job III To prepare a cube from a M.S. round by forging method

5. PLUMBING SHOP
   Use of personal protective equipments, safety precautions while working and cleaning of shop. Introduction and demonstration of tools, equipment and machines used in plumbing shop. Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.
6. FITTING SHOP
   Use of personal protective equipment and safety precautions while working. Basic deburring processes. Introduction to fitting shop tools, marking and measuring devices/equipment. Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

Identification of various steel sections (flat, angle, channel, bar etc.).Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

Job Practice:-

Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of .25 mm.

Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping

Job IV Drilling and tapping practice on MS Flat.4

7. SHEET METAL SHOP

Introduction to sheet metal shop, use of hand tools and accessories e.g. Different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material. Introduction and demonstration of hand tools used in sheet metal shop. Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine. Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

Study of various types of nuts, bolts, rivets, screws etc.

Job Practice:-

Job I: Shearing practice on a sheet using hand shears.

Job II: Practice on making Single riveted lap joint/Double riveted lap Joint.

Job III: Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

8. WELDING SHOP

Introduction and importance of welding as compared to other material joining processes Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions

Job Practice:-

Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).

Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).

Job III Preparation of lap joint using arc welding process.

Job IV Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

9. FOUNDRY SHOP

Study of metal and non metals.

Study and Sketch of the Foundry tools

Study and sketch of Cupola and pit furnace

To prepare green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould) Casting of non ferrous (lead or aluminium)

10. MACHINE SHOP

Study and sketch of lathe machine

Study and Sketch of grinders, milling machine, drilling machine and CNC machine.

Plain and step turning and knurling practice.

Study and sketch of planning/shaping machine and to plane a rectangle of cast iron

Job Practice:-

Job 1 : Preparation of job using elbow, bend and nipple

Job II: Preparation of job using Union, Tap, Plug and Socket. Job III: Threading practice on pipe with die

Reference Book:

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi

COURSE CODE & NAME: ETUCME211P/ Engineering Graphics & Design Lab

Lab Course Outcome:

1. Identify and use of different grades of pencils and other drafting instruments which are used in engineering field.
2. Draw free hand sketches of various kinds of objects.
3. Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
4. Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
5. Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
6. To make projections of Solid
7. Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
8. Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
9. Use basic commands of AutoCAD.
10. Draw and learn different types of wooden joints used in furniture.
11. Draw the assembly from part details of objects
12. Identify and draw different types of screw threads used in various machines and assemblies as per domestic and international standards
13. Draw different types of nuts, bolts and washers
14. Draw various locking devices and foundation bolts
15. Draw different section of various types of keys and cotter joints
16. Draw various riveted joints
17. Draw various types of couplings used in power transmission.

1 **Introduction to engineering drawing**: Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards. Different types of lines in engineering drawing as per BIS specifications. Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.

Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4

Dimensioning Technique: Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions) Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

2 **Scales:** Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale Drawing of plain and diagonal scales

Orthographic Projection: Theory of orthographic projections (Elaborate theoretical instructions)

1. Projection of Points in different quadrant
2. Projection of Straight Line (1st and 3rd angle)

- Line parallel to both the planes
- Line perpendicular to any one of the reference plane
- Line inclined to any one of the reference plane.

o Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only

- Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)

- Identification of surfaces

3 **Projection of Solid:** Definition and salient features of Solid, Types of Solid (Polyhedron and Solid of revolution). To make projections, sources, Top view, Front view and Side view of various types of Solid.

Sections: Importance and salient features, Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections, Orthographic sectional views of different objects.

4 **Isometric Views**

a. Fundamentals of isometric projections and isometric scale.
b. Isometric views of combination of regular solids like cylinder, cone, cube and prism.

5 **Common Symbols and Conventions used in Engineering**

a. Civil Engineering sanitary fitting symbols
b. Electrical fitting symbols for domestic interior installations

Introduction to AutoCAD: Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

* Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.

6 **Detail and Assembly Drawing**: Principle and utility of detail and assembly drawings Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and. Tenon joint, furniture drawing - freehand and with the help of drawing instruments

Screw Threads: Thread Terms and Nomenclature Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads. Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)

7 **Nuts and Bolt: Different views of hexagonal and square nuts**. Square and hexagonal headed bolt Assembly of Hexagonal headed bolt and Hexagonal nut with washer. Assembly of square headed bolt with hexagonal and with washer.

Locking Devices: Different types of locking devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer. Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt. Drawing of various types of studs

8 **Keys and Cotters:** Various types of keys and cotters - their practical application, drawings of various keys and cotters showing keys and cotters in position.

- Various types of joints Spigot and socket joint
- Gib and cotter joint
- Knuckle joint

9 **Rivets and Riveted Joints:** Types of general purpose-rivets heads Caulking and fullering of riveted joint Types of riveted joints

- Lap joint-Single riveted, double riveted (chain and zig-zag type)
- Single riveted, Single cover plate butt joint
- Single riveted, double cover plate butt joint
- Double riveted, double cover plate butt joint(chain and zig-zag type)

10 **Couplings:** Introduction to coupling, their use and types

- Flange coupling (protected)
- Flexible Coupling

Use of CAD software: Draw any two joints/coupling using CAD software from the following:

- Sleeve and cotter joint
- Knuckle joint
- Spigot and socket joint
- Gib and cotter joint
- Flange coupling
- Muff coupling

Reference Book:

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar

COURSE CODE & NAME: ETUCAS201T/ Engineering Mathematics II

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

UNIT I:

Ordinary Differential Equation of Higher Order: Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.

UNIT II:

Vector Calculus: Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.
Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke'stheorem (without proof) and their applications

UNIT III:

Sequences and Series: Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

UNIT IV:

Complex Variable – **Differentiation** Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping.

UNIT V:

Complex Variable –Integration: Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem and it's application in evaluation of real integrals

TEXTBOOKS

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002
4. N. P. Bali and Manish Goyal A Text Engineering Mathematics, Laxmi Publication.

REFERENCE BOOKS

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons,
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008..
3. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd
4. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

COURSE CODE & NAME: ETUCAS102T/ ENGINEERING PHYSICS

COURSE OUTCOMES

1. Comprehend the dual nature of radiation and matter.
2. Compute Schrodinger equations to solve finite potential problems.
3. Recall Maxwell's equation in differential and integral form.
4. Understand basic idea and applications of various types of optical fibres.
5. Attain concept of X-rays and laser. systems

UNIT I:

Wave Optics Interference: Superposition of waves and interference of light, Wavefront splitting, Amplitude splitting, Interference in uniform and wedge shaped thin films, Newton's rings and its applications. Diffraction: Introduction, Fresnel and Fraunhoffer class difference, Fraunhoffer class diffraction at single slit, Diffraction grating (Concept only), Rayleigh criterion for limit of resolution, Resolving power and Dispersive Power of grating (Concept only).

UNIT II:

Electromagnetic Theory: Electrostatic field and potential for a point charge, Gauss law in electrostatics and its differential form, Faraday's law and its differential form, Ampere's law in electrostatic field and its differential form, Equation of continuity, Maxwell's equations (Integral and differential forms) and their significance, Electromagnetic wave propagation in free space, concept of skin depth.

UNIT III: Quantum Mechanics: Wave –particle duality, De-Broglie waves, Davission –Germer experiment, Heisenberg's Uncertainty Principle, Wave function and its physical interpretation, Schrodinger wave equation in one dimension (Time dependent and time independent forms), Particle in one dimensional box.

UNIT IV: Atomic Physics and Superconductivity: Production of X-ray (Brief idea), Characteristic and continuous X-ray spectra, Mosley's law, X-ray absorption and diffraction, Bragg's law, Bragg's spectrometer. Introduction to superconductivity, Properties of superconductors (Zero resistance, Meissner effect, Critical field), Type I and Type II superconductors, Applications of superconductors.

UNIT V: Lasers and Fibre optics

Lasers: Spontaneous and stimulated emissions, Einstein's coefficients, Brief working principle of three and four level lasers, Ruby and He-Ne lasers, Applications of laser.

Fibre Optics: Elementary idea of fibre optics, Acceptance angle, Numerical aperture, Classification of optical fibres, Attenuation and dispersion in optical fibres.

TEXTBOOKS

1. Ghatak A.K, Optics
2. Arthur Biser, Concept of Modern Physics
3. Neeraj Mehta, Applied Physics for Engineer
4. Singh A.K & Malik H.K Engineering Physics

REFERENCE BOOKS

1. Eisberg and Resnick, Introduction to Quantum Physics
2. Wehr and Richards, Physics of Atom
3. David Griffiths, Introduction to Electrodynamics
4. Richard Robinett, Quantum Mechanics

COURSE CODE & NAME: ETUCEE101T/ Basic Electrical Engineering

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. CO2 Analyse the steady state behaviour of single phase and three phase AC electrical circuits.
3. CO3 To understand and analyse basic electric and magnetic circuits.
4. CO4 To study the working principles of electrical machines.
5. CO5 To introduce the components of low voltage electrical installations

UNIT I:

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, Mesh and Nodal analysis, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT II:

AC Circuits: Representation of sinusoidal waveforms, peak and r.m.s values, phase or representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III: Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT IV: Electrical Machines

Principle of operation, construction and Types of DC machines, EMF equation of generator, torque and speed equations of motor, operating characteristics and applications of DC motors. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic and Applications of three-phase induction motor. Single-phase induction motor – Principle of operation, methods of starting and applications. Construction and working of synchronous machines and their applications. **UNIT V:**

Electrical Installations Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthling. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, battery backup.

TEXTBOOKS

1. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

REFERENCE BOOKS

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. Ritu Sahdev, “Basic Electrical Engineering”, Khanna Publishing House.

COURSE CODE & NAME: ETUCCS111T/ Programming & Problem Solving

COURSE OUTCOMES

1. Develop efficient algorithms for solving a problem.
2. Use the various constructs of a programming language viz. conditional, iteration and recursion.
3. Implement the algorithms in "C" language.
4. Use simple data structures like arrays, stacks and linked list in solving problems.

UNIT I:

Problem Solving Using Programming Concepts: The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Basic elements of C language (Keywords, C Tokens, Identifiers, Separators, Constant, Data Types and Variables, Pre-define Function and Syntax), Expressions and Operators in C (Unary Operator, Binary Operator, Ternary Operator), Implicit and explicit-type conversions, Precedence and associativity of C operators, Input and Output in C Programming (Formatted and Unformatted I/O Functions).

UNIT II:

Conditional Statements and Loops: Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, if-else-if statement, nested if-else statement. Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.

UNIT III:

Arrays and Functions in C: Array Declaration and Initialization, Memory Organization in C, Types of Arrays, Operation on Array (Traversal, Insert, Delete, Searching, Sorting, Merge), Searching & Sorting Techniques (Linear Search, Binary Search, Bubble Sorting, Insertion Sorting, Selection Sorting), Defining and calling macros. Function: Advantages of using Functions, Types of functions, Function definition and Function calling, passing arguments to functions, Call by Value, Storage classes, Recursion. Storage Classes-Automatic, External, Static and Register Variables.

UNIT IV:

Structures and Union: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, typedef, enum

Pointers: Declarations, Pointer arithmetic, Pointers and functions, Pointers and Arrays, Arrays of Pointers, Pointers and Structures. Meaning of static and dynamic memory allocation, Memory allocation functions, Call by reference.

UNIT V:

Strings: Declaring and Initializing strings, Operations on strings, Arrays of strings, passing, Strings to functions.

File Processing: Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file.

TEXTBOOKS

1. Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007 (Paperback).
2. R.G. Dromey, "How to solve it by Computer", Pearson Education,2008.
3. Kanetkar Y, "Let us C", BPB Publications,2007.
4. Hanly J R &Koffman E.B, "Problem Solving and Program design in C", Pearson Education,2009.

REFERENCE BOOKS

1. E. Balagurusamy, "Programming with ANSI-C", Fourth Edition,2008, Tata McGrawHill.
2. Venugopa lK. R and Prasad S. R, "Mastering 'C'", Third Edition, 2008, Tata McGraw Hill.
3. B.W. Kernighan & D.M.Ritchie, "The C Programming Language", SecondEdition,2001, Pearson Education
4. ISRD Group, "Programming and Problem-Solving Using C", Tata McGrawHill,2008.

COURSE CODE & NAME: ETUCAS104T/ Professional Communication

COURSE OUTCOMES

1. Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
2. Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
3. Students will cultivate relevant technical style of communication & presentation at their work place & also for academic uses
4. Students will apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing
5. Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.

UNIT I:

Components of Technical Writing and Functional Grammar:

Words and Phrases: Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Correct Usage: sub-verb agreement; Parts of Speech ; Modals; Concord; Articles; Infinitives; vocabulary development: technical vocabulary, vocabulary used in formal letters/emails and reports.

UNIT II:

Fundamentals of Technical Communication

Introduction to Communication; Process of Communication; Technical Communication: features: Distinction between General And Technical Communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) ; Barriers to Communication ; Dimensions of Communication: Reading, Listening & Comprehension: skills, types & methods.

UNIT III:

Local & Adversarial Search: Optimization Problems, Hill Climbing Search, Simulated Annealing, Local Beam Search, Genetic Algorithms -Crossover, Mutation, Fitness Functions, Online Search Agents and Unknown Environments. Optimal Decisions in Games, Alpha-Beta Pruning, Cutting Of Search, Forward Pruning.

UNIT IV: Technical Style & Written Communication

Technical Style: Features; types; Requisites of Sentence Construction; Types of Sentences; Paragraph Development: Techniques and Methods: Inductive, Deductive, Spatial , Linear, Chronological etc. Devices; Coherence; Unity; Emphasis in Writing; Use of Writing methods in Documents; Techniques of writing.

UNIT V:

Presentation Strategies & Oral Communication :

Analysis of Audience and Locale; Nuances and Modes of Delivery; Kinesics ; Proxemics; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes &

Interjections; Flow in Speaking; Public Speaking: method; Techniques: Clarity of substance; emotion; Humour

TEXTBOOKS

1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
4. Ashraf Rizvi, "Effective Technical Communication", 2ndEdition, McGraw Hill Education, 2017

REFERENCE BOOKS

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.,Sharma& Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

COURSE CODE & NAME: ETUCAS104T/ Environmental Science

COURSE OUTCOMES

1. Comprehend the importance of ecosystem and sustainable
2. Demonstrate interdisciplinary nature of environmental issues
3. Identify different types of environmental pollution and control measures.
4. Adopt cleaner productive technologies
5. Identify the role of non-conventional energy resources in environmental protection.
6. Analyse the impact of human activities on the environment

UNIT I:

Introduction to Environmental Studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. Ecosystems: Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological pyramids. Nutrient cycle (carbon cycle, nitrogen cycle, Sulphur cycle, water cycle, oxygen cycle).

UNIT II:

Renewable and non-renewable energy resources, Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impact due to mining dam building on environment. Flood and drought.

UNIT III:

Environmental Pollution: air pollution, water pollution, thermal pollution, noise pollution, soil pollution; Solid Waste Management; Environmental Impact Assessment..

UNIT IV:

Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Hot spots; threats to biodiversity; Conservation of biodiversity: in-situ and ex -situ conservation of biodiversity.

UNIT V:

Impact of energy usage on environment: Global warming, Climate change, Depletion of ozone layer, Acid rain. Environmental ethics, Role of NGOs, Environmental Laws: Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection. Act. Forest Conservation Act.

TEXTBOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.

REFERENCE BOOKS

1. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi

2. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

COURSE CODE & NAME: PTSPPET12T/Professional Proficiency

COURSE OUTCOMES

1. Better representation of himself/herself in terms of communication skills, overall personality development and aptitude building required for jobs.
2. This program will help students employable and ready for Industries /corporate and other Public and Private Sector jobs.

UNIT I:

HARD SKILLS: Hard skill includes Basic Grammar, Vocabulary ,Articles, Tenses, Construction of Sentences and Reading Comprehension etc.

UNIT II:

COMMUNICATION SKILL

Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include:

- Follow only English language in the class.
- Class should be interactive and students should always be engaged in some kind of conversation.
- Each student should speak 5 minutes, 3-4 times in 1st semester on topics of his choice selected from Social, Environmental, Sports, Business and Economics, Medicines and Health Care, Science and Technology ,Politics, World Affairs and Religion etc.
- In the above process students should be regulated towards better Vocabulary and Pronunciation.

UNIT III:

APTITUDE BUILDING

QUANTITATIVE APTITUDE

1. Basic Calculations: BODMASS rule, Square and square root, Cube and cube root, Different types of numbers, Divisibility rule, Fraction and comparison of fraction
2. Number System: Multiples, Factors Remainder, Remainder Theorem, Unit Place, Number formation, Factorial, LCM and HCF Finding and its application.
3. Percentage: Basics of percentage and it's calculation, Comparison of percentage, How to use in data interpretation, Venn diagram

LOGICAL REASONING

1. Coding and decoding.
2. Number Series
3. Blood Relation.UNIT IV

COURSE CODE & NAME: ETUCAS102P/ Physics Lab

Lab Course Outcomes :

1. Apply the principle of interference and diffraction to find the wavelength of
2. monochromatic and polychromatic light.
3. Compute and analyze various electrical and electronic properties of a given material by using various experiments.
4. Verify different established laws with the help of optical and electrical experiments.
5. Determine and calculate various physical properties of a given material by using
6. various experiments.
7. Study and estimate the performance and parameter of given equipment by using
8. graphical and computational analysis.

List of Experiments

1. To determine the focal length of combination of two thin lens by Nodal slide assembly and its verification.
2. To determine the wavelength of light by Newton's ring method.
3. To determine the wavelength of light by Diffraction Grating.
4. To determine the specific resistance of wire by Cary-Foster Bridge.
5. To determine reduction factor of Helmholtz Galvanometer.
6. To determine E.C.E of copper using voltmeter
7. To verify Stefan's law by electrical method.
8. To determine the variation of magnetic field along the axis of current carrying coil.
9. To calibrate an ammeter using potentiometer.
10. To calibrate a voltmeter using potentiometer.
11. To find the resistance of galvanometer using P.O. box.
12. To find the internal resistance of a cell using P.O. box.
13. To determine e/m by magnetic focussing.

COURSE CODE & NAME: ETUCEE101P/ Electrical Engineering Lab

Lab Course Outcomes :

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

List of Experiments

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff's laws.
3. Verification of Superposition and Thevenin Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. To observe the B-H loop of a ferromagnetic material in CRO.
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
8. Demonstration of cut-out sections of machines: dc machine (commutated-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
9. Torque Speed Characteristic of self excited dc shunt motor.
10. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
11. Demonstration of Components of LT switchgear.
12. Demonstration of Lead-acid Battery, Nickel-iron Battery and Nickel-cadmium Battery.

COURSE CODE & NAME: ETUCCS101P/ Computer Programming Lab

Lab Course Outcomes :

1. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
2. Demonstrate an understanding of computer programming language concepts.
3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.
4. Able to define data types and use them in simple data processing applications he/she must be able to use the concept of array of structures.
5. Develop confidence for self-education and ability for life-long learning needed for Computer language.

List of Experiments:

1. Write programs to perform mathematical operations by taking input from users.
2. Write programs to use the concept of conditional operators.
3. Write programs to use the concept of looping.
4. Write programs to use various types of operators like logical operators.
5. Write programs using array to perform various operations on them.
6. Write programs to implement user defined functions.
7. Write programs to perform various operations on strings.
8. Write programs to using structures and unions to store heterogeneous data together.
9. Write programs for file handling in C Language.
10. Create a small project for “Library Management System’ using file handling, structures and menu based programs.

COURSE CODE & NAME: ETUCAS301T / Engineering Mathematics III

COURSE OUTCOMES

1. Remember the concept of partial differential equation and to solve partial differential equations
2. Analyse the concept of partial differential equations to evaluate the problems concerned with partial differential equations
3. Understand the concept of correlation, moments, skewness and kurtosis and curve fitting
4. Remember the concept of probability to evaluate probability distributions
5. Apply the concept of hypothesis testing and statistical quality control to create control charts

UNIT I:

Partial Differential Equations: Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Cauchy's method of Characteristics, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.

UNIT II:

Applications of Partial Differential Equations: Classification of linear partial differential equation of second order, Method of separation of variables, Solution of wave and heat conduction equation up to two dimension, Laplace equation in two dimensions, Equations of Transmission lines.

UNIT III:

Statistical Techniques I:Introduction: Measures of central tendency, Moments, Moment generating function (MGF) , Skewness, Kurtosis, Curve Fitting , Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves ,Correlation and Rank correlation, Regression Analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions coefficients and non linear regression.

UNIT IV:

Probability and Distribution: Introduction, Addition and multiplication law of probability, Conditional probability, Baye's theorem, Random variables (Discrete and Continuous Random variable) Probability mass function and Probability density function, Expectation and variance, Discrete and Continuous Probability distribution: Binomial, Poission and Normal distributions.

UNIT V:

Sampling, Testing of Hypothesis and Statistical Quality Control: Introduction, Sampling Theory (Small and Large) , Hypothesis, Null hypothesis, Alternative hypothesis, Testing a Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, T-test, F-test and Chi-square test, One way Analysis of Variance (ANOVA).Statistical Quality Control (SQC) , Control Charts , Control Charts for variables (X and R Charts), Control Charts for Variables (p, np and C charts).

TEXTBOOKS

5. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006.
6. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
7. N.P.Bali, A Textbook of Engineering Mathematics-IV, Laxmi Publication, 10th Edition 2021
8. H.K.Dass, Introduction to Engineering Mathematics - Volume IV, S Chand Publication, 2019 Edition

REFERENCE BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2. T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.
3. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.

COURSE CODE & NAME: ETUCCS301T / Data Structures

COURSE OUTCOMES

1. Students demonstrate an ability to apply knowledge of computing and mathematics appropriate to the discipline including computer science theory, recursion, and order N analysis.
2. Implement an N-way tree with correct insertion and deletion such that it stores words that are displayed in alphabetical order given an in-order traversal, will display the words in alphabetical order.
3. Given a cyclic-directed graph with weighted lengths, determine the shortest path between two nodes. Then generate the transitive closure given a starting node.

UNIT I:

Introduction to Data Structure: Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition.

UNIT II:

Stacks: Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion **Queues,Operations on Queue**: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT III:

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder.

UNIT IV:

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

UNIT V:

Searching: Sequential search, Binary Search, Comparison and Analysis

Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, AVL trees, Introduction to m-way Search Trees, basics of B Trees.

Hashing: Hash Function, Collision Resolution Strategies Storage Management: Garbage Collection and Compaction.

TEXTBOOKS

1. E Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India

2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.

REFERENCE BOOKS

1. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.

2. Thareja, “Data Structure Using C” Oxford Higher Education

COURSE CODE & NAME: ETUCCS302T / Computer Organization & Architecture

COURSE OUTCOMES

1. Understanding basic design of computer with modern computer architecture
2. Understanding CPU organization, Memory Organization, I/O Organization
3. Understanding various data transfer schemes with interrupt Handling
4. Understanding architecture, and concept of Parallel Computing

UNIT I:

Introduction to Digital System: Number System, Direct conversion between bases, Negative numbers. Boolean Algebra, Minimization of Boolean Functions: K-Map.

Combinational Logic Circuits: Design Procedure, Adders, Subtractors, Decoder, Encoder, Multiplexers, Demultiplexers.

UNIT II:

Basic Computer Concepts: Organization and Architecture, Harvard Architecture vs Von Neumann Architecture, Structure of Digital Computer System Components, Computer Registers, Types of Registers and its Functions, Bus Architecture, Types of Buses, Stored Program Organization.

UNIT III:

Data Representation and Micro Operations: Register Transfer Language, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Signed Operand Multiplication, Booth Multiplication, Fixed Point Representation: Integer Representation, Arithmetic Addition, Arithmetic Subtraction, Floating Point Representation, IEEE754 Standard Floating-Point Representation.

UNIT IV:

Central Processing Unit: General Register Organization, Stack Organization, Instruction Codes, Instruction Set: Characteristics, Cycle, Formats, Types, Addressing Modes.

Input-Output Organization: Peripheral Devices, Input Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.

UNIT V:

Memory Organization: Basic concept of memory system, Memory Hierarchy, Main Memory, Auxiliary Memory, 2D & 2.5D Memory Organization, Associative Memory, Cache Memory, Virtual Memory.

TEXTBOOKS

1. D.A. Patterson and J. L. Hennessy, Computer Organisation and Design: The Hardware/Software Interface, 5/e, Morgan Kaufmann, 2014.

2. J. L Hennessy and D. A. Patterson, A. Computer Architecture: A Quantitative approach, 6/e, Morgan Kaufmann, 2017.

REFERENCE BOOKS

1. V.P. Heuring and H. F. Jordan, Computer System Design and Architecture, Prentice Hall, 2003.
2. D. A. Patterson and J. L. Hennessy, Computer Organisation and Design: The Hardware/ Software Interface, 5/e, Harcourt Asia Pte Ltd (Morgan Kaufman), 2014.

COURSE CODE & NAME: ETUCCS311T / Software Engineering

COURSE OUTCOMES

1. Apply the principles of the engineering processes in software development.
2. Demonstrate software project management activities such as planning, scheduling and estimation.
3. Model the requirements for the software projects.
4. Design and Test the requirements of the software projects.
5. Implement the software development processes activities from requirements to validation and verification.
6. Apply and evaluate the standards in process and in product.

UNIT I:

Introduction: Introduction and overview of Software Engineering, Software Crisis, Scope and necessity of software engineering, Software Engineering Processes, Software Development Life Cycle (SDLC) model: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II:

Software Requirement Analysis & Specification: Requirement Engineering, Problem Analysis: Data Flow Diagram, Data Dictionaries, ER Diagram, Approaches to Problem Analysis, SRS Document. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model

UNIT III:

System Design: Conceptual and Technical Design, Objectives of Design, Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function versus Object Oriented Design, Top-Down and Bottom-Up Design.

Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT IV:

Software Testing: Software verification & validation, Strategic Approach to Software Testing, Testing Fundamentals Test Plan, Test Design, Test Execution, Reviews, Inspection Auditing, Alpha and Beta Testing of Products, Recent Trends in Software Design/Specialized Software Testing, Related Tools and Standards.

UNIT V:

Software Maintenance and Software Project Management: Software Maintenance, Types of Maintenance, Overview of RE-engineering Reverse Engineering, Software Configuration Management, Cost Estimation-Constructive Cost Models (COCOMO), Project Scheduling, Resource Allocation Models, Software Risk Analysis and Management.

TEXTBOOKS

1. Roger Pressman, Software Engineering: A Practitioner?s Approach, 7th Edition, McGraw Hill
2. Ian Sommerville, Software Engineering, 9th Edition, Addision-Wesley, 2016

REFERENCE BOOKS

1. Pankaj Jalote, A Concise Introduction to Software Engineering, Springer, 2008
2. William E. Lewis , Software Testing and Continuous Quality Improvement, Third Edition, Auerbach Publications, 2008

COURSE CODE & NAME: ETUCCS314T / Python Programming

COURSE OUTCOMES

1. Understanding basic programming skills using Python programming language.
2. Understanding the notion of data types and complex data types such as lists, tuples etc.
3. Understanding the concept of decision making and iterative control structure in python.
4. Understanding the concepts of functions and file handling in Python.

UNIT I:

Introduction to Python Language: Introduction to Python: Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types: int, float etc.

UNIT II:

Control Structures: Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.

UNIT III:

Strings, Lists, Tuples and Dictionaries,: Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.

UNIT IV:

Functions & Modules: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables. Importing module, Math module, Packages and their composition

UNIT V:

File Handling: Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations.

TEXTBOOKS

1. R Nageswar Rao, Core Python Programming, 2018.
2. Eric Mathews, Python Crash Course, 2019.

REFERENCE BOOKS

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. Exploring Python, Timothy A. Budd, Mc Graw Hill Education

COURSE CODE & NAME: ETUCCS310T / Database Management System

COURSE OUTCOMES

1. Understand the basic principles of database management systems.
2. Draw Entity-Relationship diagrams to represent simple database application scenarios
3. write SQL queries for a given context in relational database.
4. Discuss normalization techniques with simple examples.
5. Describe transaction processing and concurrency control concepts.

UNIT I:

Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure. **Data Modelling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

UNIT II:

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.PL/SQL, Triggers and clusters.

UNIT III:

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

UNIT IV:

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling

UNIT V:

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

TEXTBOOKS

1. Date C J, "An Introduction To Database System", Addision Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", Tata Mcgraw-hill Education (India) Pvt. Ltd.
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Pearson Education New Delhi India.
4. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication Pvt. Ltd. New Delhi.
5. Majumdar& Bhattacharya, "Database Management System", Tata Mcgraw-hill Education (India) Pvt. Ltd.

REFERENCE BOOKS

1. G.K. Gupta, "Database Management System", Tata Mcgraw-hill Education (India) Pvt. Ltd.
2. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill (India) Pvt Ltd. New Delhi.
3. Chakravarti, "Advanced Database Mnagement System" Wiley Dreamtech Publications.

CORSE CODE & NAME: PTSPPET31T / Professional Proficiency

COURSE OUTCOMES

1. Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
2. Students will cultivate relevant technical style of communication & presentation at their work place & also for academic uses
3. Students will apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing
4. Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.

UNIT I:

Components of Technical Writing and Functional Grammar, Fundamentals of Technical Communication, Technical Style & Written Communication-Level 3

UNIT II:

Quantitative and Qualitative Aptitude-Level 3.

UNIT III:

Reasoning and Logic Building- Level 3

UNIT IV:

Advanced Programming Practices-1:

Graphs- Concepts, Applications and Examples, Operations- DFS, BFS, Finding Spanning Trees, Shortest Path Algorithms, Flow Control, Cut, Max Flow Min Cut Algorthm etc.

UNIT V:

Advanced Programming Practices-2:

Greedy Algorithms- Concept, Applications and Examples

Back Tracking Algorithms - Concepts, Applications and Examples

TEXTBOOKS

1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.

3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
4. Ashraf Rizvi, "Effective Technical Communication", 2ndEdition, McGraw Hill Education, 2017.
5. Salaria, R. S. Data Structures & Algorithms Using C++. KHANNA PUBLISHING HOUSE, 2012.
6. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
7. Elmasri, Navathe, "Fundamentals Of Database Systems", Pearson Education New Delhi India.
8. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication Pvt. Ltd. New Delhi.
9. Majumdar& Bhattacharya, "Database Management System", Tata Mcgraw-hill Education (India) Pvt. Ltd.

REFERENCE BOOKS

1. Business Correspondence and Report Writing by Prof. R. C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
2. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
3. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi
4. Kanetkar, Yashavant. Data Structures Through C: Learn the fundamentals of Data Structures through C. Bpb Publications, 2019.
5. Kanetkar, Yashavant P. Understanding Pointers In C. Bpb Publications, 2003.

COURSE CODE & NAME: ETUCCS301P / Data Structures Lab

Lab Course Outcomes :

1. Ability to understand a systematic approach to organizing, writing and debugging C programs
2. Ability to implement linear and non-linear data structure operations using C programs
3. Ability to solve problems implementing appropriate data structures
4. Ability to implement sorting and searching algorithms using relevant data structures

List of Experiments:

Write C Programs to illustrate the concept of the following:

1. Implementation of multi-dimensional array and operations on arrays
2. Implementation of singly, doubly, circular linked list.
3. Implementation of Bubble, Insertion, Selection, Merge, Heap and Quick sorting Algorithms in non-recursive fashion.
4. Implementation of Bubble, Insertion, Selection, Merge, Heap and Quick sorting Algorithms using recursive.
5. Implementation of Linear and Binary Searching Algorithm.
6. Implementation of Stack using array and linked list.
7. Implementation of Queue using array and linked list.
8. Implementation of Circular Queue using array and linked list.
9. Implementation of Priority Queue.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

COURSE CODE & NAME: ETUCCS302P/ Computer Organization & Architecture Lab

Lab Course Outcomes :

1. Students learn basic principles about computer architecture, machine language, and low level programming.
2. Students understand enough assembly language to enhance their knowledge on today's most widely used microcomputer family.
3. Improving students systems programming skills through programming exercises carried out by students.
4. Students are able to implement solutions to problems using the concepts they will take through the course

List of Experiments:

1. To Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

COURSE CODE & NAME: ETUCCS304P / Python Programming Lab

Lab Course Outcomes :

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and to use Python data structure- lists, tuples, dictionaries
4. To do input/output with files in Python
5. To do searching ,sorting and merging in Python

List of Experiments:

1. Write a program to demonstrate different number data types in Python
2. Write a program to compute distance between two points taking input from the user using Pythagorean Theorem.
3. Write a Program for checking whether the given number is a even number or not.
4. Write a Python script that prints prime numbers less than 20.
5. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
6. Write a program to create, append, and remove lists in python.
7. Write a program to demonstrate working with tuples in python.
8. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
9. Write a python program to define a module and import a specific function in that module to another program
10. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
11. Write a Python class to implement pow(x, n).

COURSE CODE & NAME: ETUCCS310P / Database Management System Lab

Lab Course Outcomes :

1. Use the techniques of SQL data manipulation language to create and query a sample data
2. Modify the database and provide provide different constraints by implementing techniques like PL/SQL, cursors and triggers.
3. Implement VIEWS, transactions in Database which solve the security problem in databases.
4. Demonstrate and understand relational algebra in Database which is helpful to design related database software components.
5. Effectively participating in team based activities by designing and development of a database application system

List of Experiments:

1. Student should decide on a case study and formulate the problem statement.

2. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)

Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.

3. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys)

Note: Student is required to submit a document showing the database tables created from ER Model.

4. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalizeup to Third Normal Form

5. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables(along with Primary and Foreign keys), Altering Tables and Dropping Tables

6. Practicing DML commands- Insert, Select, Update, Delete

7. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.

9. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).

10. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.

11. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger

12. Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.

COURSE CODE & NAME: ETUCCS401T / Operating Systems

COURSE OUTCOMES

1. Understanding of communication interface between user and computer hardware
2. Structure, Functions, Services, components, working of Operating System
3. Process Representation and Handling, scheduling, synchronization
4. Understanding of Memory management, File and Security issues.

UNIT I:

I ntroduction: Definition and types of operating system, Evolution, Batch Processing System, Multiprogramming, Time Sharing, Parallel System, Real Time System, Distributed System, Network System, Operating System Structure, Components of Operating System, services, functions, System Calls, System programs, Kernel and its types, Virtual Machines.

UNIT II:

Process Management: Concept of Process, process queues, process Scheduling, Cooperating Process, Threads, Inter-Process Communication, CPU scheduling Criteria, Scheduling algorithms, Multiple Processor Scheduling, Real Time Scheduling, Algorithm Evaluation.

UNIT III:

Process Synchronization and Deadlock: The Critical Section Problem, Synchronization Hardware, Semaphores, Monitors, Classical Problems of Synchronization, Critical Region, Deadlock System Model, Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock, Combined approach to handle Deadlock, Banker's Algorithm

UNIT IV:

Memory Management: Logical and Physical Address Space, Swapping, Contiguous Allocation, Dynamic Memory Allocation, Fragmentation, Memory Freeing, Virtual Memory Concepts and Its Implementation, Demand Paging and its Performance, Page Replacement Algorithms, Allocation of Frames, Thrashing, Page size and other consideration, Demand Segmentation.

UNIT V:

File Management: File System, Concept of File, Access Methods, Directory Structure, Allocation Methods, Efficiency and Performance, Disk Structure, Disk Scheduling

Protection & Security: Goals, Principles and Domain of Protection, Access Matrix, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool: RSA algorithm, User Authentication

TEXTBOOKS

1. Silberschatz, P. B. Galvin, and G. Gagne, Operating System Principles, 9/e, John Wiley,2013.
2. S. Tanenbaum, Modern Operating Systems, 4/e, Pearson Education, 2017.
3. G. J. Nutt, Operating Systems - A Modern Perspective, 3/e, Pearson Education, 2009.

4. W. Stallings, Operating Systems:Internals and design Principles , 7/e, Pearson Education, 2012.

REFERENCE BOOKS

1. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearsonm Education, India.
2. Andrew S. Tanenbaum (2007), Modern Operating Systems, 2nd edition, Prentice Hall of India, India.
3. Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India.

COURSE CODE & NAME: ETUCCS402T / Design & Analysis of Algorithm

COURSE OUTCOMES

5. Argue the correctness of algorithms using inductive proofs and invariants.
6. Analyze worst-case running times of algorithms using asymptotic analysis.
7. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
8. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
9. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
10. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyse them.

UNIT I:

Introduction: Algorithms, Analyzing Algorithms, Growth of Functions, Solving Recurrences using Substitution method, Recursion-tree, Master's method (Master's Theorem)
Sorting Algorithms: Selection Sort , Bubble Sort, Insertion Sort, Shell Sort, Heap Sort, Comparison of Sorting Algorithms
Sorting in Linear Time: Count Sort, Bucket Sort, Radix Sort

UNIT II:

Divide and Conquer: Quick Sort, Merge Sort, Strassen's Matrix Multiplication, Convex Hull and _Binary Search

Advanced Data Structures: Red-Black Trees, Binomial Heaps, Fibonacci Heaps

UNIT III:

Exhaustive Search: Depth-First Search and Breadth-First Search

Greedy Methods with Examples such as Optimal Reliability Allocation, Fractional Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.

UNIT IV:

Dynamic Programming with Examples: 0/1 Knapsack, All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Assembly Line Scheduling, Matrix Chain Multiplication, Longest Common Subsequence

Backtracking: Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets

Branch and Bound: 0/1 Knapsack Problem, Travelling Salesman Problem

UNIT V:

String Matching Algorithms: Naïve, Rabin Karp, KMP, String Searching with Finite Automata

Theory of NP Completeness: Introduction to P, NP, NP Complete and NP Hard Problems, Reducibility

Approximation Algorithms: Vertex Cover Problem, Set Cover Problem

TEXTBOOKS

5. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
6. Thomas H. Coreman, "Algorithms Unlocked", MIT Press, 2013
7. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms"
8. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
9. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.

REFERENCE BOOKS

4. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
5. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
6. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
7. Harsh Bhasin,"Algorithm Design and Analysis", First Edition, Oxford University Press.
8. Gilles Brassard and Paul Bratley, Algorithmics: Theory and Practice, Prentice Hall,1995.

COURSE CODE & NAME: ETUCCS403T / Object Oriented Techniques using Java

COURSE OUTCOMES

1. Understand the concepts & principles of OOPs. Ability to develop Object oriented programs in java.
2. Understand the concept of package, interface and handling the exceptions, multithreading in Java, & Java applets.
3. To implement the GUI using AWT, Swings and event handling, concepts of networking and database access using JDBC.
4. To understand the concepts of RMI & Java Beans.

UNIT I:

OOPS concept & Java Language Basics: Object oriented approach. Basic terms and ideas Abstraction, Encapsulation. Inheritance& Polymorphism. Structured vs. Object Oriented Programming. Benefits of Object oriented programming. Introduction To Java, basic features, Java Virtual Machine Concepts, java environment. Primitive data types, tokens, variables constants & Java keywords. Java Operators. Java program structure. A simple Java program. Expressions, Statements, Control Statements, Selection Statements, Iterative Statements, Jump Statements. Arrays, Vector. String handling & wrapper classes

UNIT II:

OOP, Package, Exception Handling & Multithreading: Classes and Methods- Implementing & designing classes, constructors, polymorphism & inheritance. Interfaces. Interface: defining Interface, Extending Interface, implementing Interface & Accessing Interface Variable Package: System packages, using system package, import. Adding a class to a package, Hiding classes. Exception Handling: Concepts of Exceptions, types of exceptions, try; catch & finally keywords, throwing exceptions & nested try and catch. Multithreaded Programming: Life cycle of a Thread, creating Threads, extending Threads class, Stopping& blocking a thread, using thread methods, thread exceptions, thread priority, and synchronization.

UNIT III:

Java Applets & GUI: Java applets-Life cycle of an applet, adding images & sound to an applet. Passing parameters to an applet. Graphics & GUI: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers, Event Handling & Menus. Swingbased GUI

UNIT IV:

JDBC & Networking: JDBC- Overview, JDBC implementation, Connection class & Statements. Catching Database Results, handling database Queries.

Networking– InetAddress class, URL class. TCP/IP & UDP sockets. RMI

UNIT V:

Advance Java: Web programing- Web page Designing using HTML, Introduction to Javascript features.

Java Servlets- life cycle of a servlet. The Servlet API, Get and Post Methods, using Cookies & Session Tracking.

JSP-JSP life cycle & JSP tags. Java Beans- types of beans, Stateless & stateful beans,

TEXTBOOKS

10. S Balagunisamy. "Programming in Java", TMH Publications.
11. Java The Complete Reference, Herbert Schildt 7th Edition. Tata McGraw- Hill Edition.

REFERENCE BOOKS

9. S. Horstmann, Gary Cornell - "Core Java 2 Volume II - Advanced Features" Addison Wesley.

COURSE CODE & NAME: ETUCCS405T / Theory of Automata & Formal Language

COURSE OUTCOMES

1. Understand the basic concepts of formal languages, automata and grammar types, as well as the use of formal languages and reduction in normal forms
2. Analyze the syntax and formal properties, parsing of various grammars such as LL(k) and LR(k)
3. Design push down automata, cellular automata and turing machines performing tasks of moderate complexity.
4. Use of Automata and Language theory in the development of different modules of a compiler as a case study.

UNIT I:

Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Chomsky Classification, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill - Nerode Theorem, Simulation of DFA and NFA.

UNIT II:

Regular Expression and Language: Regular Expression, Transition graph, statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs and Regular Expressions Arden's theorem, Algebraic Method Using Arden's Theorem, Closure properties of Regular Language, Non-Regular Languages, Pumping Lemma, Application of Pumping Lemma . Myhill Nerode Theorem.

UNIT III:

Push down Automata and Context Free Languages: Context Free Grammar (CFG), designing context free grammar, ambiguity in CFG and its removal Parse Trees, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Push Down Automata (deterministic and nondeterministic) (PDA), graphical notations, Language accepted by PDA, Equivalence of CFGs and PDAs.

UNIT IV:

Turing Machines and Computability Theory: Definition of Turing Machine, Extensions of Turing machines, non – deterministic Turing machines, Equivalence of various Turing Machine Formalisms, Church – Turing Thesis, Decidability, Halting Problem, Reducibility, Post Correspondence Problem.

UNIT V:

Complexity Theory: Time and Space measures, Hierarchy theorems, Complexity classes P, NP, space complexity, Savich theorem, L, NL, PSPACE complexity.

TEXTBOOKS

1. J. C. Martin, "Introduction to Languages and the Theory of Computation", TMH
2. J. Hopcroft, R. Motwani, and J. Ullman, "Introduction to Automata Theory, Language and Computation", Pearson.
3. J. Martin, "Introduction to languages and the theory of computation", McGraw Hill
4. Y.N.Singh," Mathematical Foundation of Computer Science", New Age International.
5. M. Sipser, "Introduction to the Theory of Computation", Cengage Publication.

REFERENCE BOOKS

1. H. R. Lewis and C. H. Papadimi Triou, "Elements of the Theory of Computation", Pearson.
2. K. L. Mishra and N. Chandrasekharan, "Theory of Computer Science Automata Language Computation", PHI.
3. Peter Linz, "Introduction to Formal Languages and Automata", Narosa.
4. Sudkamp, "Languages and Machines", Pearson Education.
5. Bernard Moret, "Theory of Computation", Pearson Education.

COURSE CODE & NAME: ETUCCS412T / Discrete Mathematical Structure

COURSE OUTCOMES

1. Understand the basic principles of sets and operations in sets.
2. Demonstrate an understanding of relations and functions and be able to determine their properties.
3. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.
4. Demonstrate different traversal methods for Graphs.

UNIT I:

Sets: Definition of sets, Types of Sets, Operations on Sets, Cartesian Product of Sets. Relation: Definition, types of relation, composition of relations, equivalence relation, partial ordering relation, Closure of Relations. **Functions:** Definition, type of functions, composition of functions, recursively defined functions.

UNIT II:

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, examples and standard results.

UNIT III:

Hasse Diagram and Lattices: Introduction, ordered set, Posets, Hasse diagram of partially ordered set, isomorphic ordered set, well ordered set, properties of Lattices, and complemented lattices.

UNIT IV:

Mathematical Logic: Proposition, First order logic, Basic logical operations , truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, Theory of Inference, predicates, Universal and existential quantifiers

UNIT V:

Graphs: Simple graph, multi graph, graph terminology, representation of graphs, Adjacency and Incidence Matrices, Spanning, Euler graphs, Hamiltonian path and circuits, Shortest Path, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Graph coloring , chromatic number, isomorphism and Homomorphism of graphs. Combinatorics: Basic Counting Technique, Pigeon-hole Principle, Recurrence Relation, Generating function, Polya's Counting Theorem

TEXTBOOKS

1. Discrete Mathematics and Its Applications, By Kenneth H Rosen, McGraw Hill
2. B. Kolman, R.C Busby and S.C Ross, "Discrete Mathematics Structures", Prentice Hall

3. Discrete Mathematical Structures with Applications to Computer Science, By J. P. Tremblay, R.Manohar, McGraw Hill.

REFERENCE BOOKS

1. Graph Theory With Applications to Engineering and Computer Science, By Prentice Hall, Englewood Cliffs, N. J
2. Combinatorics: Theory and Applications, By V. Krishnamurthy, East-West Press Pvt. Ltd., New Delhi

CORSE CODE & NAME: PTSPPET41T / Professional Proficiency

COURSE OUTCOMES

5. Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
6. Students will cultivate relevant technical style of communication & presentation at their work place & also for academic uses
7. Students will apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing
8. Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.

UNIT I:

Components of Technical Writing and Functional Grammar, Fundamentals of Technical Communication, Technical Style & Written Communication-Level 3

UNIT II:

Quantitative and Qualitative Aptitude-Level 3.

UNIT III:

Reasoning and Logic Building- Level 3

UNIT IV:

Advanced Programming Practices-1:

Graphs- Concepts, Applications and Examples, Operations- DFS, BFS, Finding Spanning Trees, Shortest Path Algorithms, Flow Control, Cut, Max Flow Min Cut Algorthm etc.

UNIT V:

Advanced Programming Practices-2:

Greedy Algorithms- Concept, Applications and Examples

Back Tracking Algorithms - Concepts, Applications and Examples

TEXTBOOKS

10. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
11. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.

12. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
13. Ashraf Rizvi, "Effective Technical Communication", 2ndEdition, McGraw Hill Education, 2017.
14. Salaria, R. S. Data Structures & Algorithms Using C++. KHANNA PUBLISHING HOUSE, 2012.
15. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
16. Elmasri, Navathe, "Fundamentals Of Database Systems", Pearson Education New Delhi India.
17. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication Pvt. Ltd. New Delhi.
18. Majumdar& Bhattacharya, "Database Management System", Tata Mcgraw-hill Education (India) Pvt. Ltd.

REFERENCE BOOKS

6. Business Correspondence and Report Writing by Prof. R. C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
7. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
8. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi
9. Kanetkar, Yashavant. Data Structures Through C: Learn the fundamentals of Data Structures through C. Bpb Publications, 2019.
10. Kanetkar, Yashavant P. Understanding Pointers In C. Bpb Publications, 2003.

COURSE CODE & NAME: ETUCCS401P / Operating system Lab

Lab Course Outcomes :

1. Understand and apply knowledge of basic UNIX/LINUX commands to solve various software problems and to automate real time applications.
2. Understand and implement the concept of process synchronization tool like semaphore to solve mutual exclusion problem in order to coordinate concurrent process
3. Apply knowledge of process management techniques to design and solve various process synchronization problems like Producer Consumer problem, Reader Writer problem and dining philosopher's problem.
4. Compare and contrast among various CPU scheduling algorithms and apply knowledge to identify the best scheduling algorithm as per software requirement.
5. Understand and apply the concepts of deadlock in operating systems to design and implement various deadlock avoidance algorithms like Banker's algorithm used in banking system.
6. Understand and apply knowledge of basic UNIX/LINUX commands to solve various software problems and to automate real time applications.

List of Experiments:

1. Write programs using the following system calls of UNIX operating system:
   fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
3. Practice Shell Programming.
4. Write programs to
   a) Implement various CPU Scheduling Algorithms
   b) Implement of the concept of Semaphores
   c) Implement the concept of Shared memory and IPC
   d) Implement Bankers Algorithm for Deadlock Avoidance
   e) Implement Deadlock Detection Algorithm
5. Write C program to implement Threading & Synchronization Applications
6. Implementation of following Memory Allocation Methods for fixed partition
   a) First Fit b) Worst Fit c) Best Fit
7. Implementation of Paging Technique of Memory Management
8. Implementation of the following Page Replacement Algorithms
   a) FIFO b) LRU c) LFU
9. Implementation of the various File Organization Techniques
10. Implementation of the following File Allocation Strategies

COURSE CODE & NAME: ETUCCS402P / Design & Analysis of Algorithm Lab

Lab Course Outcomes :

Student will be able to :

1. Select appropriate data structures as applied to specified problem definition.
2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
3. Implementation of greedy approach for solution of the optimization problems.
4. Implementation of dynamic programming for solution of the optimization problems.
5. Implementation of backtracking for solution of the different large state space problems.

List of Experiments:

1. Time Complexity Analysis: Implement different sorting algorithms (e.g., Bubble Sort, Insertion Sort, Merge Sort) and analyze their time complexities for various input sizes.
2. Space Complexity Analysis: Implement recursive and iterative algorithms for problems like Fibonacci numbers and factorial and analyze their space complexities.
3. Divide and Conquer: Implement algorithms such as Binary Search, QuickSort, and Strassen's Matrix Multiplication using the divide and conquer approach. Analyze their time complexities and compare with other methods.
4. Dynamic Programming: Implement algorithms for problems like the Knapsack problem, Longest Common Subsequence, or Matrix Chain Multiplication using dynamic programming. Analyze time and space complexities and discuss optimal substructure and overlapping subproblems.
5. Greedy Algorithms: Implement algorithms for problems like the Fractional Knapsack, Huffman Coding, or Dijkstra's Shortest Path using the greedy approach. Compare their solutions with optimal results.
6. Backtracking Algorithms: Implement algorithms for problems like the N-Queens problem or Subset Sum using the backtracking approach. Discuss the concept of a state space tree and pruning techniques.
7. Graph Algorithms: Implement graph algorithms like Breadth-First Search (BFS) and Depth-First Search (DFS). Apply them to find connected components, detect cycles, and perform topological sorting.
8. Minimum Spanning Tree: Implement Prim's and Kruskal's algorithms to find the Minimum Spanning Tree in a weighted graph. Compare their time complexities and discuss the differences.
9. Shortest Path Algorithms: Implement Dijkstra's algorithm and Bellman-Ford algorithm to find the shortest path in a weighted graph with positive and negative edge weights, respectively.
10. NP-Hard Problems and Approximation Algorithms: Implement approximation algorithms for NP-hard problems like the Traveling Salesman Problem or the Vertex Cover problem. Compare their solutions with optimal results and analyze the approximation ratio.
11. Hashing and Hash Tables: Implement hash functions and collision resolution techniques like chaining and open addressing. Analyze their performance based on load factor and collision handling.
12. Sorting Algorithms Comparison: Implement various sorting algorithms (e.g., Merge Sort, QuickSort, Heap Sort, Tim Sort) and compare their performances on different types of input data (e.g., random, sorted, reverse sorted).

13. Median Finding Algorithms: Implement algorithms to find the median of a set of elements (e.g., Quick Select, Median of Medians) and analyze their time complexities.
14. Graph Traversal Techniques: Implement algorithms like Depth-First Search (DFS) and Breadth-First Search (BFS) to solve practical problems like finding connected components in a graph or traversing a maze.
15. Network Flow Algorithms: Implement algorithms like Ford-Fulkerson and Edmonds-Karp to find maximum flow and minimum cut in a flow network.

COURSE CODE & NAME: ETUCCS403P / Object Oriented Techniques using Java Lab

Lab Course Outcomes :

Student will be able to :

1. Analyze the necessity for Object Oriented Programming paradigm and over structured programming and become familiar with the fundamental concepts in OOP.
2. Demonstrate an ability to design and develop Java programs, analyze, and interpret object oriented data and report results.
3. Analyze the distinguish between various types of inheritance.
4. Demonstrate an ability to design an object oriented system, AWT components or multithreaded process as per needs and specifications.
5. Demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks like console and windows applications for standalone programs.

List of Experiments:

1. To write programs to illustrate the uses of decision control structures: if, nested if, switch case etc.
2. To write programs to illustrate the uses of loop control structures: do, while, for etc.
3. To write programs to illustrate the uses of array, Vector & String.
4. To write programs to illustrate the uses of creating and working with class and object.
5. To write programs to illustrate the uses of OOPs concepts: data abstraction, data hiding, encapsulation, inheritance & polymorphism (method overloading and overriding).
6. To write programs to illustrate the uses of Interfaces and packages.
7. To write programs using Multithreading & exceptions handling mechanism.
8. To write GUI programs using AWT controls.
9. To write GUI programs to implement various layouts
10. To write GUI programs to handle mouse & key events.
11. To write network programs using TCP/IP & UDP sockets.
12. To write programs to retrieve data from data base using JDBC drivers.
13. To write servlet program using Generic and HTTP servlets.
14. To write servlet program that handles the user request by using doGet () and doPost () methods.
15. To write servlet program to implement Session Tracking.
16. To write programs to create a web page using JSP.
17. To write programs using RMI &Java Beans.

COURSE CODE & NAME: ETUCCS413P / Mini Project- I

Project Outcomes

Student will be able to :

1. Develop and describe the idea
2. Formulate clear work plan and procedures
3. Demonstrate skills and knowledge of state-of-the-art and technological tools and techniques
4. Design and apply modern tools for designing and drafting
5. Compose and defend report using effective written and visual communication and presentation.

COURSE CODE & NAME: ETUCCS502T/ Computer Network

COURSE OUTCOMES

1. Understanding of communication interface between user and computer hardware
2. Structure, Functions, Services, components, working of Operating System
3. Process Representation and Handling, scheduling, synchronization
4. Understanding of Memory management, File and Security issues.

UNIT I:

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design, Physical Layer Transmission Media, Line coding scheme, switching methods (circuit switching, Packet switching), TDM.

UNIT II:

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs.

UNIT III:

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT IV:

Transport Layer: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

UNIT V:

Application Layer: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.

TEXTBOOKS

9. A. S. Tanenbaum (2003), Computer Networks, 4th edition, Pearson Education/ PHI, New Delhi, India.

10. Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India.

REFERENCE BOOKS

1. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India.

COURSE CODE & NAME: CSPEAI001T / Artificial intelligence

COURSE OUTCOMES

1. Understand the fundamental concepts of AI: Students will be able to grasp the different types of intelligent agents, such as reactive, deliberative, goal-driven, and utility-driven agents, and comprehend the roles they play in AI systems. They will also gain knowledge about learning agents and their significance in AI applications.
2. Analyse and implement knowledge-based agents: Students will learn about knowledge representation using logic, including propositional and first-order logic. They will understand the principles of inference in first-order logic, unification, and lifting. They will be able to implement knowledge-based agents using forward and backward chaining, gaining practical experience in knowledge representation techniques.
3. Master different search algorithms and optimization techniques: Students will acquire a comprehensive understanding of local and adversarial search algorithms used in solving optimization problems. They will be able to apply algorithms such as hill climbing search, simulated annealing, local beam search, and genetic algorithms to address real-world challenges.
4. Develop problem-solving agents and apply in unknown environments: By the end of the course, students will be proficient in designing problem-solving agents and searching through state spaces. They will understand how to apply search algorithms like A*, AO*, and constraint propagation to tackle challenging problems in unknown environments and adversarial settings.
5. Grasp probabilistic reasoning and uncertainty handling: Students will become well-versed in handling uncertainty in AI systems. They will learn about basic probability notation, Bayes' theorem, and probabilistic reasoning. Furthermore, they will explore the representation of conditional distributions and gain insights into probabilistic reasoning over time using Hidden Markov Models (HMMs).
6. Apply AI techniques to real-world applications: Upon completing the course, students will be able to apply AI techniques, such as search algorithms, knowledge representation, and probabilistic reasoning, to real-world problems and scenarios. They will understand the issues in the design of search programs and will have hands-on experience in developing AI solutions for various practical applications.

UNIT I:

Introduction to AI: Intelligent agents, reactive, deliberative, goal-driven, utility-driven, and learning agents, defining problems at state space search, Production system, Problem and production, solving problems by searching, problem-solving agents, well defined problems and solutions with examples.

UNIT II:

Knowledge and reasoning: knowledge based agents, Logic, propositional logics and horn clauses, first order logic, Inference in first order logic, Propositional versus first order inference, unification and lifting, forward & backward chaining, resolution.

UNIT III:

Local & Adversarial search: Optimization problems, hill climbing search, simulated annealing, local beam search, genetic algorithms. Online search agents and unknown environments. Optimal decisions in games, alpha-beta pruning, cutting of search, forward pruning, Constraint satisfaction problems:-Inference in CSPs, back tracking search for CSPs.

UNIT IV:

Knowledge Representation: Forward Chaining, Backward Chaining, state-space, blind, heuristic, problem reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications. Issues in design of search programs

UNIT V:

Handling Uncertainty: Quantifying uncertainty, basic probability notation, Baye's theorem, Probabilistic reasoning, representation of conditional distributions, probabilistic reasoning overtime, Hidden-Markov model, Sample Applications of AI

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TEXTBOOKS

1. Artificial Intelligence: A Modern Approach, by Stuart Russell and Peter Norvig.
2. Artificial Intelligence by Eliane Rich, Kevin Knight and Shivashankar B Nair.

REFERENCE BOOKS

1. Introduction to Artificial Intelligence by Charniak, McDermott.
2. Fundamental of Biostatistics, by Bernard Rosner.
3. Artificial Intelligence: A Modern Approach – Stuart J. Russell & Peter Norvig.
4. On Intelligence – Jeff Hawkins, Sandra Blakeslee

COURSE CODE & NAME: CSPEAI002T / Machine Learning

COURSE OUTCOMES

1. Understand the fundamentals of Machine Learning: Students will grasp the foundational concepts of machine learning, including supervised, unsupervised, and reinforcement learning techniques, gaining insights into their applications in various domains.
2. Analyse and apply supervised learning algorithms: Students will be able to analyze and implement various supervised learning algorithms, including kNN, Centroid Method, Perceptron, Support Vector Machines, Multi-level Perceptron, and Decision Trees, to solve classification and regression problems effectively.
3. Explore unsupervised learning techniques: Students will gain knowledge about unsupervised learning approaches, such as Centroid-based Clustering, Density-based Clustering, Distribution-based Clustering, and Hierarchical Clustering. They will also understand Dimensionality Reduction methods like PCA (Principal Component Analysis) and LDA (Linear Discriminant Analysis).
4. Understand Bayesian and Computational Learning: Students will grasp the principles of Bayesian learning, including Bayes Theorem, Maximum Likelihood, and Minimum Description Length Principle. They will also be familiar with Bayesian classifiers such as Naïve Bayes and Bayesian Belief Networks, along with concepts related to finite and infinite hypothesis spaces and sample complexity.
5. Explore Neural Networks and Deep Learning: Students will gain an introduction to neural networks and understand fundamental concepts such as neuron models and basic learning rules. They will learn about single-layer neural networks, multi-layer neural networks, and the backpropagation algorithm for training. Additionally, students will be familiarized with the basics of Deep Learning, including Gradient Descent and Convolutional Neural Networks (CNNs).
6. Explore Advanced Deep Learning Techniques: Students will delve into advanced deep learning techniques, including Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks. They will understand the applications and benefits of using RNNs and LSTMs in handling sequential data and time-series problems.

UNIT I:

Introduction to Machine Learning: Fundamentals of ML, supervised, unsupervised, reinforcement learning;

Supervised Learning:

Classification: kNN, Centroid Method, Perceptron, Support Vector Machines, Multi-level Perceptron, Decision tree

Regression: Linear Regression

UNIT II:

Unsupervised Learning:

Clustering: Centroid-based Clustering, Density-based Clustering, Distribution-based Clustering, Hierarchical Clustering

Dimensionality Reduction: PCA, LDA

UNIT III:

Bayesian and Computational Learning: Bayes Theorem, Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Naïve Bayes

Classifier, Bayesian Belief Network, Probability Learning, Sample Complexity, Finite and Infinite Hypothesis Spaces.

UNIT IV:

Neural Network: Introduction to neural networks, Fundamental concepts- neuron models and basic learning rules; Single layer neural Networks, input layer, output layer, hidden layers, Multilayer Neural Networks, Backpropagation.

UNIT V:

Deep Learning Techniques: Gradient Descent; Convolutional Neural Network (CNN)- Convolution, activation, pooling.

Advanced Deep Learning Techniques: Recurrent Neural Networks (RNN) - Long-short term memory (LSTM).

TEXTBOOKS

1. Kevin Murphy , Machine Learning: a Probabilistic Perspective, 2012.
2. Chris Bishop, Pattern Recognition and Machine Learning, 2006.

REFERENCE BOOKS

1. Rishal Hurbans, Grokking Artificial Intelligence Algorithms, 2020.

COURSE CODE & NAME: : CSPEAI004T / Soft Computing

COURSE OUTCOMES

1. Explain soft computing with brief overview of fuzzy system, neural networks and swarm and evolutionary algorithms, and demonstration of fuzzy logic system.
2. Interpret swarm and evolutionary algorithms.
3. Implementation of neuro, fuzzy, evolutionary, and swarm algorithms using open source tools.

UNIT I:

Introduction of learning: intelligence vs autonomy, statistical learning theory, regression analysis, Feature scaling and regularization principle, representing large data with PCA & amp; concept of recognition.

UNIT II:

Introduction to computing: Differentiate Soft computing versus hard computing, properties of soft computing

Fundamentals of Fuzzy Logic Systems: Fuzzy sets, Fuzzy logic operations, generalized operations, Fuzziness and fuzzy resolution, fuzzy relations, composition and interface, considerations of fuzzy decision-making.

UNIT III:

Fuzzy logic control: Basic of fuzzy control, Fuzzy control architecture, Properties of fuzzy control, robustness and stability. Learning and acquisition of knowledge, fundamentals of connectionist modeling.

UNIT IV:

Major classes of neural networks: The multi-layer perceptrons, radial basis function networks, Kohonen's self-organizing network, The Hopfield network, industrial and commercial application of ANN. Dynamic Neural Networks, Neuro Fuzzy Systems: Architecture of neuro fuzzy systems, construction of neuro fuzzy systems.

UNIT V:

Evolutionary computing: Overview of Evolutionary computing, Genetic algorithms and optimization, Genetic algorithms -operations, integration of Genetic algorithms with neural networks, integration of Genetic algorithms with fuzzy logic

Swarm computing: Overview of swarm computing, Optimization with particle swarm optimization, integration of particle swarm optimization with neural networks and fuzzy logic.

TEXTBOOKS

1. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications.
2. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication.

COURSE CODE & NAME: ETUCCS502P/ Computer Network Lab

LAB COURSE OUTCOMES :

1. Simulate different network topologies.
2. Implement various framing methods of Data Link Layer.
3. Implement various Error and flow control techniques.
4. Implement network routing and addressing techniques.
5. Implement transport and security mechanisms

List of Experiments:

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in Detail.
3. Study of network IPv4 and IPv6.
4. Connect the computers in Local Area Network.
5. Study of basic network command and Network configuration commands.
6. Configure a Network topology using packet tracer software.
7. Configure a Network topology using packet tracer software.
8. Configure a Network using Distance Vector Routing protocol.
9. Configure Network using Link State Vector Routing protocol.

COURSE CODE & NAME: CSPEAI001P / Artificial intelligence Lab

COURSE OUTCOMES

1. Apply various pre-processing techniques on different datasets.
2. Construct Machine learning programs for Supervised, Unsupervised and Semi supervised learning models.
3. Develop Deep learning programs for Supervised & Unsupervised learning models.
4. Identify and Apply Artificial Intelligence concepts to solve real world problems.

List of Experiments:

1. Implementing Intelligent Agents Objective: Implement different types of intelligent agents - reactive, deliberative, goal-driven, utility-driven, and learning agents - and demonstrate their behavior in simple environments
2. State Space Search and Production Systems Objective: Design and implement a state space search algorithm for a well-defined problem Use production systems to represent knowledge and rules, and apply them to problem-solving tasks
3. Knowledge-Based Agents and First-Order Logic Objective: Create a knowledge-based agent using first-order logic Implement inference techniques like forward and backward chaining to reason about the knowledge base
4. Local and Adversarial Search Objective: Implement various local search algorithms such as hill climbing, simulated annealing, and genetic algorithms to optimize problem-solving Design online search agents to operate in unknown environments
5. Optimal Decisions in Games Objective: Develop an AI agent capable of making optimal decisions in games using techniques like alpha-beta pruning, forward pruning, and cutting off search
6. Constraint Satisfaction Problems (CSPs) Objective: Implement backtracking search for solving Constraint Satisfaction Problems (CSPs) and infer solutions using constraint propagation techniques
7. Knowledge Representation and Search Algorithms Objective: Implement forward chaining and backward chaining algorithms for knowledge representation Compare different search algorithms like A*, AO*, and minimax on specific problem domains
8. Handling Uncertainty with Probabilistic Reasoning Objective: Explore quantifying uncertainty using basic probability notation and Bayes' theorem Implement probabilistic reasoning and Hidden-Markov models for sample applications that deal with uncertain environments

COURSE CODE & NAME: CSPEAI002P / Machine Learning Lab

COURSE OUTCOMES

1. Understand the implementation procedures for the machine learning algorithms
2. Design Java/Python programs for various Learning algorithms.
3. Apply appropriate data sets to the Machine Learning algorithms
4. Identify and apply Machine Learning algorithms to solve real world problems

List of Experiments:

1. Supervised Learning - Classification Objective: Implement and compare classification algorithms, including k-Nearest Neighbors (kNN), Centroid Method, Perceptron, Support Vector Machines (SVM), Multi-level Perceptron, and Decision Trees, on various datasets.
2. Supervised Learning - Regression Objective: Implement Linear Regression for regression tasks. Use different datasets to understand the concept of fitting a linear model to the data.
3. Unsupervised Learning - Clustering Objective: Implement different clustering algorithms, such as Centroid-based Clustering, Density-based Clustering, Distribution-based Clustering, and Hierarchical Clustering. Apply these algorithms on various datasets to group similar data points together.
4. Unsupervised Learning - Dimensionality Reduction Objective: Implement Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) to reduce the dimensionality of datasets. Visualize the reduced data and analyze the impact of dimensionality reduction on classification tasks.
5. Bayesian and Computational Learning Objective: Explore Bayes Theorem and its applications in Concept Learning, Maximum Likelihood estimation, and Minimum Description Length Principle. Implement the Naïve Bayes Classifier and Bayesian Belief Networks to perform probabilistic classification tasks.
6. Neural Networks - Single Layer Perceptron Objective: Implement a Single-layer Neural Network (Perceptron) for binary classification tasks. Understand the basic neuron model, learning rules, and the concept of weights and biases.
7. Neural Networks - Multilayer Perceptron with Backpropagation Objective: Implement a Multilayer Neural Network and the Backpropagation algorithm for training. Train the network on different datasets and observe the impact of hidden layers on performance.
8. Deep Learning - Convolutional Neural Network (CNN) and LSTM Objective: Implement a basic Convolutional Neural Network (CNN) with operations like convolution, activation, and pooling. Then, explore the concept of Recurrent Neural Networks (RNN) and implement Long Short-Term Memory (LSTM) for sequence data tasks.

COURSE CODE & NAME: : CSPEAI004P / Soft Computing Lab

COURSE OUTCOMES

1. Understand the fundamental theory and concepts of neural networks
2. Illustrate the soft computing techniques like neural network and fuzzy logic and their roles in building intelligent systems.
3. Illustrate and implement the various learning rules
4. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
5. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
6. Design and Implement real life examples using fuzzy logic and genetic algorithms.

List of Experiments:

1. Regression Analysis and Feature Scaling Objective: Implement regression analysis to predict a continuous output based on input features. Explore feature scaling techniques to improve the performance of regression models. Understand the concept of regularization and its impact on model complexity.
2. Principal Component Analysis (PCA) for Data Representation Objective: Implement PCA to represent large datasets in a lower-dimensional space. Study the concept of recognition using PCA for dimensionality reduction and pattern recognition tasks.
3. Introduction to Fuzzy Logic Systems Objective: Implement basic fuzzy logic operations and explore fuzzy sets. Study the principles of fuzzy resolution and fuzzy relations. Understand fuzzy decision-making using fuzzy logic.
4. Fuzzy Logic Control and Fuzzy Control Architecture Objective: Implement fuzzy logic control and design a fuzzy control architecture for a specific control problem. Analyze the properties of fuzzy control and evaluate its robustness and stability.
5. Introduction to Neural Networks Objective: Implement the Multi-layer Perceptron (MLP) and explore its applications. Study radial basis function networks and Kohonen's self-organizing network. Understand the Hopfield network for associative memory.
6. Industrial and Commercial Applications of ANN Objective: Explore real-world industrial and commercial applications of Artificial Neural Networks (ANN). Implement ANN for specific tasks such as image classification, natural language processing, or time series prediction.
7. Neuro Fuzzy Systems Objective: Design a neuro fuzzy system and construct the architecture using neural networks and fuzzy logic. Implement a neuro fuzzy system for a pattern recognition or control problem.
8. Swarm Computing and Particle Swarm Optimization (PSO) Objective: Implement particle swarm optimization for optimization problems. Integrate PSO with neural networks and fuzzy logic for improving their performance in optimization tasks. Explore the concept of swarm computing and its advantages.

COURSE CODE & NAME: CSPEAI005T/ Artificial Neural Network

COURSE OUTCOMES

1. Recall the functionality of human brain neurons and design the basic artificial model for neuron.
2. Understand the various learning process for artificial neural model.
3. Construct the artificial neural model for pattern mapping, pattern recognition and pattern classification.
4. Explain feed forward and feedback network for artificial neural network.
5. Summarize the concept of artificial neural network and practical application of ANN.

UNIT I:

Basics of ANN: Characteristics of Neural network, Historical development of Neural Network principle, ANN terminology, models of neuron McCulloch – Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN

UNIT II:

Back propagation networks: (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.

UNIT III:

Activation & Synaptic Dynamics: Introduction, Activation Dynamics models, synaptic Dynamics models, learning method, stability and convergence, recall in neural networks, Functional units of ANN for pattern recognition tasks: Pattern recognition Problem, basic functional unit, pattern recognition task by the functional unit.

UNIT IV:

Feed forward neural networks - Analysis of pattern association networks, Analysis of pattern classification networks, Analysis of pattern mapping networks.

Feedback neural networks- Introduction, analysis of linear auto associative FF network, Analysis of pattern storage network, stochastics network and simulated annealing, Boltzmann machine

UNIT V:

Competitive learning neural networks: Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network.

Applications of ANN: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant-vowel (CV) segments, texture classification, and segmentation.

TEXTBOOKS

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

REFERENCE BOOKS

1. S. Raj Sekaran, Vijayalakshmi Pari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

COURSE CODE & NAME: CSPEAI007T / Reinforcement Learning

COURSE OUTCOMES

1. Understand the theoretical foundations and key concepts of reinforcement learning.
2. Implement and apply various reinforcement learning algorithms to solve sequential decision-making problems.
3. Evaluate and analyse the performance of reinforcement learning agents.
4. Design and develop reinforcement learning solutions for real-world applications.

UNIT I:

Introduction and Basics of RL, Defining RL Framework and Markov Decision Process, Polices, Value Functions and Bellman Equations, Exploration vs. Exploitation, Standards and Libraries used in RL (Python/Keras/Tensorflow).

UNIT II:

Policy evaluation and improvement, Policy iteration, Value iteration, Model-based and model-free approaches, Monte Carlo Methods, prediction, control, Exploring starts and epsilon-greedy policies.

UNIT III:

Policy optimization: Introduction to policy-based methods, Vanilla Policy Gradient, REINFORCE algorithm and stochastic policy search, Actor-critic methods (A2C, A3C) Advanced policy gradient (PPO, TRPO, DDPG).

UNIT IV:

Model based RL: Model-based RL approach, Recent Advances and Applications, Meta-learning.

UNIT V:

Multi-Agent Reinforcement Learning, Partially Observable Markov Decision Process, Ethics in RL, Applying RL for real-world problems

TEXTBOOKS

1. " Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019
2. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).
3. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012).

REFERENCE BOOKS

1. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016.
2. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016.

COURSE CODE & NAME: CSPEAI008T / Computer Vision

COURSE OUTCOMES

1. To implement fundamental image processing techniques required for computer vision
2. Understand Image formation process
3. To perform various analysis on image to extract features form Images
4. To develop applications using computer vision techniques

UNIT I:

INTRODUCTION TO COMPUTER VISION Image Processing, Computer Vision and Computer Graphics, Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

UNIT II:

IMAGE REPRESENTATION AND ANALYSIS Image representation, Image processing techniques like color and geometric transforms, Edge-detection Techniques, Filtering, Mathematical operations on image and its applications like convolution, filtering

UNIT III:

MOTION ESTIMATION Introduction to motion, Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion and models.

UNIT IV:

OBJECT RECOGNITION Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition.

UNIT V:

APPLICATIONS Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance, foreground background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis Application: Invehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians.

TEXTBOOKS

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.

REFERENCE BOOKS

1. Computer Vision: Algorithms and Applications (Texts in Computer Science), by Richard Szeliski
2. Computer Vision: Principles, Algorithms, Applications, Learning, by E. R. Davies
3. Multiple View Geometry in Computer Vision, by Richard Hartley & Andrew Zisserman

COURSE CODE & NAME: CSPEAI005P/ Artificial Neural Network Lab

COURSE OUTCOMES

1. Understand the application areas of neural networks
2. Understand building blocks of Neural Networks.
3. Develop neural network models
4. Design and develop applications using neural networks.

List of Experiments:

1. McCulloch-Pitts Model and Perceptron Objective: Implement the McCulloch-Pitts model and Perceptron to understand the basic building blocks of artificial neural networks. Explore the characteristics of these models and compare them with the characteristics of biological neural networks.
2. Backpropagation Neural Networks (BPN) Objective: Implement a feed-forward neural network with multiple layers and apply the backpropagation learning algorithm for training. Experiment with the number of hidden nodes and learning rate to observe their effects on training and convergence.
3. Activation & Synaptic Dynamics Objective: Explore activation dynamics models and synaptic dynamics models in artificial neural networks. Implement these models and study their stability, convergence, and performance in pattern recognition tasks.
4. Feedforward and Feedback Neural Networks Objective: Analyze pattern association networks, pattern classification networks, and pattern mapping networks in feedforward neural networks. Implement linear auto-associative feedforward networks, pattern storage networks, stochastics networks, and simulated annealing. Study the Boltzmann machine for feedback neural networks.
5. Competitive Learning Neural Networks Objective: Implement competitive learning networks for pattern clustering and feature mapping tasks. Explore ART networks and their features. Apply ART networks for character recognition tasks.
6. Pattern Classification and Recognition Objective: Build neural network models for pattern classification and recognition tasks. Implement recognition of Olympic games symbols, printed characters, handwritten characters, and consonant-vowel (CV) segments. Understand the concept of NET Talk for converting English text to speech.
7. Texture Classification and Segmentation Objective: Implement texture classification using neural networks. Study the texture features and develop a neural network model for texture classification and segmentation tasks.

   Real-World Applications of ANN Objective: Explore various real-world applications of artificial neural networks. Implement and evaluate ANN models for tasks like speech recognition, character recognition, and other pattern recognition tasks.

COURSE CODE & NAME: CSPEAI007P / Reinforcement Learning Lab

COURSE OUTCOMES

1. Apply Markov Decision Processes to solve real-world problems.
2. Understand the dynamic programming for policy Evaluation.
3. Implement reinforcement learning problems based on averaging sample returns usingMonte Carlo method.
4. Recognize current advanced techniques and applications in RL
5. Design *and* apply various reinforcement algorithms to solve real time complex

List of Experiments:

1. Introduction to RL and Basics of Markov Decision Process (MDP) Objective: Understand the fundamentals of RL, MDP, and the RL framework. Define states, actions, and rewards. Implement basic RL algorithms in Python using libraries like Keras or TensorFlow.
2. Policy Evaluation and Improvement Objective: Implement policy evaluation and policy improvement algorithms. Explore policy iteration and value iteration methods for solving MDPs. Use Monte Carlo Methods for prediction and control tasks. Experiment with different exploration strategies like exploring starts and epsilon-greedy policies.
3. Policy Optimization - Policy Gradient Methods Objective: Implement policy-based methods such as Vanilla Policy Gradient and the REINFORCE algorithm for policy optimization. Explore stochastic policy search and understand actor-critic methods like Advantage Actor-Critic (A2C) and Asynchronous Advantage Actor-Critic (A3C). Implement advanced policy gradient algorithms like Proximal Policy Optimization (PPO) and Trust Region Policy Optimization (TRPO).
4. Model-Based Reinforcement Learning Objective: Implement model-based RL approaches and explore their advantages and applications. Study recent advances in model-based RL and meta-learning techniques.
5. Multi-Agent Reinforcement Learning Objective: Design and implement RL algorithms for multi-agent settings. Study partially observable MDPs (POMDPs) and their implications in RL. Discuss the ethical considerations in RL and the challenges of applying RL to real-world problems.
6. Hands-on RL with OpenAI Gym Objective: Use the OpenAI Gym library to experiment with RL environments and algorithms. Implement and evaluate RL agents for various Gym environments.
7. Deep RL with Deep Q-Network (DQN) Objective: Implement the Deep Q-Network (DQN) algorithm for RL tasks. Train deep neural networks to approximate the Q-value function and apply the DQN algorithm to different RL problems.
8. Multi-Agent RL with MADDPG Objective: Implement Multi-Agent Deep Deterministic Policy Gradients (MADDPG) for cooperative multi-agent settings. Study the performance of MADDPG in multi-agent environments.

COURSE CODE & NAME: CSPEAI008P / Computer Vision Lab

COURSE OUTCOMES

1. Apply image processing techniques required for computer vision.
2. Apply shape analysis and implement boundary tracking techniques.
3. Implement 3D vision and motion related techniques.
4. Analyse, evaluate and examine existing practical computer vision algorithms.

List of Experiments:

1. Image Processing Techniques Objective: Implement basic image processing techniques, such as color and geometric transforms, edge-detection, and filtering. Apply these techniques on sample images and analyze the results.
2. Mathematical Operations on Images Objective: Implement mathematical operations on images, such as convolution and filtering. Use these operations for tasks like image enhancement and noise reduction.
3. Motion Estimation and Optical Computation Objective: Study the concept of motion in computer vision and explore different motion estimation techniques. Implement optical computation for motion estimation and investigate the accuracy and limitations of these methods.
4. Object Recognition using Hough Transforms Objective: Implement Hough transforms for simple object recognition tasks. Use shape correspondence and matching techniques along with Principal Component Analysis (PCA) for recognizing objects in images.
5. Face Detection and Recognition Objective: Implement face detection algorithms like Viola-Jones and face recognition using Eigenfaces. Apply these techniques to build a face recognition system and analyze its performance.
6. 3D Shape Models and Structure from Motion Objective: Explore 3D shape models for faces using Active Appearance Models (AAM) and investigate the use of 3D models in face recognition. Study Structure from Motion (SfM) techniques for reconstructing 3D scenes from multiple images.
7. Surveillance and Tracking Objective: Implement techniques for foreground-background separation, object tracking, and handling occlusion in surveillance scenarios. Explore particle filters for object tracking and combine views from multiple cameras for better object localization.
8. In-vehicle Vision System Objective: Implement an in-vehicle vision system for locating roadways, road markings, identifying road signs, and detecting pedestrians. Use computer vision algorithms to process real-time video data and extract relevant information for driving assistance.

COURSE CODE & NAME: ETUCCS604P / Mini-Project II

Mini Project -II Outcomes :

Student will be able to :

1. Develop and describe the idea
2. Formulate clear work plan and procedures
3. Demonstrate skills and knowledge of state-of-the-art and technological tools and techniques
4. Design and apply modern tools for designing and drafting
5. Compose and defend report using effective written and visual communication and presentation.

COURSE CODE & NAME: / Technical Training

Technical Training Outcomes :

1. To provide the learning platform to students to enhance their employ ability skills along with real corporate exposure 1
2. To enhance students' knowledge in current technology
3. To develop leadership ability and responsibility in student to execute the given task.
4. To Increase self-confidence of students and helps in finding their own proficiency.
5. To provide students hands on practice within a real job situation.

COURSE CODE & NAME: CSPEAI006P/ Deep Learning Lab

COURSE OUTCOMES

1. Learn The Fundamental Principles Of Deep Learning.
2. Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains.
3. Implement Deep Learning Algorithms And Solve Real-world problems.
4. Implement Autoencoders and GAN.

List of Experiments:

1. Implementing Perceptrons and Activation Functions Objective: Implement single-layer perceptrons and explore different activation functions. Understand how to create and train simple neural networks using activation functions like sigmoid, ReLU, and tanh.
2. Training Deep Neural Networks Objective: Use deep learning frameworks like TensorFlow or PyTorch to build and train deep neural networks. Experiment with regularization techniques to prevent overfitting. Implement loss functions and optimization algorithms for training.
3. Convolutional Neural Networks (CNNs) for Image Classification Objective: Implement a basic CNN architecture for image classification. Understand the concepts of convolutional layers, pooling layers, and their role in feature extraction. Train the model on a dataset and evaluate its performance.
4. Recurrent Neural Networks (RNNs) for Natural Language Processing Objective: Implement a simple RNN and explore its applications in natural language processing. Use Long Short-Term Memory (LSTM) networks to handle long-term dependencies in sequential data. Train the model on text data and generate text sequences.
5. Transfer Learning and Fine-tuning Pre-trained Models Objective: Learn transfer learning concepts and methodologies. Fine-tune pre-trained models on new datasets for specific tasks. Evaluate the performance of the model and observe how pre-trained features can improve learning.
6. Generative Models - Variational Autoencoders (VAEs) Objective: Understand the concept of variational autoencoders and their applications in generating new data samples. Implement a VAE model and generate samples from a given dataset.
7. 7: Generative Models - Generative Adversarial Networks (GANs) Objective: Explore the idea of Generative Adversarial Networks (GANs) for image generation. Implement a GAN and observe how it generates realistic images by competing against a discriminator model.
8. Ethical Considerations and Limitations in Deep Learning Objective: Discuss the ethical implications of using deep learning in various applications. Address bias and fairness concerns in deep learning models. Study the privacy, security, interpretability, and explainability limitations of deep learning systems.

COURSE CODE & NAME: CSPEAI009T / Natural Language Processing

COURSE OUTCOMES

1. Explain language modeling techniques, including grammar-based language models and statistical language models.
2. Apply regular expressions and finite-state automata for text processing tasks.
3. Implement English morphology techniques and use transducers for lexicon and rules.
4. Perform tokenization of text and detect/correct spelling errors using minimum edit distance.

UNIT I:

Overview of NLP: Definition and scope Historical context and evolution Importance and applications; Basic Linguistic Concepts: Syntax, semantics, and pragmatics; Linguistic structures: words, sentences, parts of speech Core NLP Tasks: Tokenization, stemming, lemmatization, Named Entity Recognition (NER), Part-of-Speech (POS) tagging, Parsing and syntactic analysis; NLP Tools and Libraries: NLTK, SpaCy, Hugging Face, Challenges in NLP: Complexities of human language Ambiguity, context understanding, cultural nuances, Ethical Considerations: Importance of ethics in NLP Bias in language models, privacy concerns

UNIT II:

Data Cleaning and Preparation: Handling Missing Values, Noise Removal, Text Normalization, Tokenization, Stopword Removal, Spell Checking and Correction, Stemming and Lemmatization, Removing Duplicates, Handling Outliers, Regular Expressions, Text Vectorization; Data Preparation: One-Hot Encoding, Bag of Words (BoW) , Term Frequency-Inverse Document Frequency (TF-IDF) , Word Embeddings, Word2Vec , GloVe (Global Vectors for Word Representation), FastText

UNIT III:

Introduction to Deep Learning for NLP 1: Word Embeddings: Word2Vec, GloVe, FastText, Contextual embeddings: ELMo, BERT; Recurrent Neural Networks (RNNs) : Basics of RNNs, Long Short-Term Memory (LSTM) networks, Gated Recurrent Units (GRUs); Convolutional Neural Networks (CNNs) for NLP: Applying CNNs to text data, Use cases like text classification and sentiment analysis;

UNIT IV:

Introduction to Deep Learning for NLP 2: Sequence-to-Sequence Models: Encoder-decoder architecture, Applications in machine translation and text summarization; Attention Mechanisms: Introduction to attention, Self-attention and its importance; Transformers: Architecture and components, BERT, GPT, and other transformer-based models; Transfer Learning in NLP: Pre-trained models and fine-tuning, Applications and benefits, Evaluation Metrics: Accuracy, precision, recall, F1-score, BLEU, METEOR, ROUGE, CIDEr for text generation tasks; Advanced Topics: Reinforcement learning in NLP, Generative models like GPT-3

UNIT V:

NLP Applications: Text classification using classical machine learning Algorithms, classification using Deep Learning Models; Image Caption Generation: Collecting and preprocessing image

datasets (e.g., Flickr8k, Flickr30k, COCO), preprocessing captions, Pre-trained CNN models to extract image features (e.g. VGG, ResNet, Inception), Combining CNNs for image encoding and RNNs for caption decoding, Attention mechanisms to improve caption quality, Using transformers for image captioning, Text Generation techniques: Encoder-decoder architecture.

TEXTBOOKS

1. Deep Learning for Natural Language Processing by Stephan Raaijmakers
2. Natural Language Processing with Python by Steven Bird, Ewan Klein, and Edward Loper
3. Natural Language Processing in Action by Hobson Lane, Hannes Hapke, and Cole Howard

REFERENCE BOOKS

1. Transformers for Natural Language Processing by Denis Rothman
2. Applied Natural Language Processing with Python by Taweh Beysolow II
3. Natural Language Processing with Transformers by Lewis Tunstall, Leandro von Werra, and Thomas Wolf
4. Practical Natural Language Processing by Sowmya Vajjala, Bodhisattwa Majumder
5. Deep Learning for Natural Language Processing by Palash Goyal, Sumit Pandey, and Karan Jain

COURSE CODE & NAME: CSPEAI006P/ Deep Learning Lab

COURSE OUTCOMES

5. Learn The Fundamental Principles Of Deep Learning.
6. Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains.
7. Implement Deep Learning Algorithms And Solve Real-world problems.
8. Implement Autoencoders and GAN.

List of Experiments:

9. Implementing Perceptrons and Activation Functions Objective: Implement single-layer perceptrons and explore different activation functions. Understand how to create and train simple neural networks using activation functions like sigmoid, ReLU, and tanh.
10. Training Deep Neural Networks Objective: Use deep learning frameworks like TensorFlow or PyTorch to build and train deep neural networks. Experiment with regularization techniques to prevent overfitting. Implement loss functions and optimization algorithms for training.
11. Convolutional Neural Networks (CNNs) for Image Classification Objective: Implement a basic CNN architecture for image classification. Understand the concepts of convolutional layers, pooling layers, and their role in feature extraction. Train the model on a dataset and evaluate its performance.
12. Recurrent Neural Networks (RNNs) for Natural Language Processing Objective: Implement a simple RNN and explore its applications in natural language processing. Use Long Short-Term Memory (LSTM) networks to handle long-term dependencies in sequential data. Train the model on text data and generate text sequences.
13. Transfer Learning and Fine-tuning Pre-trained Models Objective: Learn transfer learning concepts and methodologies. Fine-tune pre-trained models on new datasets for specific tasks. Evaluate the performance of the model and observe how pre-trained features can improve learning.
14. Generative Models - Variational Autoencoders (VAEs) Objective: Understand the concept of variational autoencoders and their applications in generating new data samples. Implement a VAE model and generate samples from a given dataset.
15. 7: Generative Models - Generative Adversarial Networks (GANs) Objective: Explore the idea of Generative Adversarial Networks (GANs) for image generation. Implement a GAN and observe how it generates realistic images by competing against a discriminator model.
16. Ethical Considerations and Limitations in Deep Learning Objective: Discuss the ethical implications of using deep learning in various applications. Address bias and fairness concerns in deep learning models. Study the privacy, security, interpretability, and explainability limitations of deep learning systems.

COURSE CODE & NAME: CSPEAI009P / Natural Language Processing Lab

COURSE OUTCOMES

1. Use the NLTK and spaCy toolkit for NLP Programming.
2. Analyze various corpora for developing programs.
3. Develop various pre-processing techniques for a given corpus.
4. Develop programming logic using NLTK functions.
5. Build applications using various NLP techniques for a given corpus

List of Experiments:

1. Language Modeling and Tokenization Objective: Implement grammar-based and statistical language models. Explore regular expressions and finite-state automata for text processing. Implement tokenization and use the minimum edit distance algorithm for spelling error detection and correction.
2. Part-of-Speech Tagging Objective: Implement unsmoothed N-grams for word-level analysis. Explore smoothing techniques like interpolation and backoff. Implement part-of-speech tagging using rule-based, stochastic, and transformation-based methods. Evaluate the performance of the tagging approaches.
3. Syntactic Parsing and Ambiguity Resolution Objective: Implement context-free grammars for syntactic analysis. Parse English sentences using dynamic programming parsing techniques. Handle ambiguity in parsing and explore shallow parsing approaches.
4. Word Sense Disambiguation (WSD) Objective: Implement word sense disambiguation using supervised, dictionary-based, and thesaurus-based methods. Explore bootstrapping methods for improving WSD accuracy. Use semantic resources like WordNet for sense annotation.
5. Semantics and Pragmatics Objective: Represent natural language using first-order logic and description logics. Implement syntax-driven semantic analysis and attach semantics to words in sentences. Explore word senses, relations between senses, and thematic roles.
6. Anaphora and Co-reference Resolution Objective: Implement discourse segmentation and coherence analysis. Resolve anaphoric references using Hobbs and Centering Algorithm. Explore co-reference resolution techniques.
7. Lexical Resources and Stemming/Lemmatization Objective: Use lexical resources like Porter Stemmer, Lemmatizer, Penn Treebank, and Brill's Tagger. Apply WordNet, PropBank, FrameNet, Brown Corpus, and the British National Corpus (BNC) for language analysis tasks.
8. Application of NLP Tools and Evaluation Objective: Apply the NLP tools developed in previous experiments to real-world text data. Evaluate the performance of NLP systems using appropriate metrics. Discuss challenges and limitations in NLP applications.

COURSE CODE & NAME: ETUCCS702P / Major-Project I

Major Project -I Outcomes :

Student will be able to :

6. Develop and describe the idea
7. Formulate clear work plan and procedures
8. Demonstrate skills and knowledge of state-of-the-art and technological tools and techniques
9. Design and apply modern tools for designing and drafting
10. Compose and defend report using effective written and visual communication and presentation.

COURSE CODE & NAME: / Technical Training

Technical Training Outcomes :

6. To provide the learning platform to students to enhance their employ ability skills along with real corporate exposure 1
7. To enhance students' knowledge in current technology
8. To develop leadership ability and responsibility in student to execute the given task.
9. To Increase self-confidence of students and helps in finding their own proficiency.
10. To provide students hands on practice within a real job situation.