FACULTY OF ENGINEERING & TECHNOLOGY

Proposed Course Structure aligned with NEP-2020

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. Programme

[Academic Session 2025-26 onwards]

- **B.TECH – Computer Science & Engineering (CSE)**
- **B.TECH. (HONS) – CSE (Artificial Intelligence & Machine Learning)**
- **B.TECH. (HONS.) – CSE (Data Science & Analytics)**
- **B.TECH. (HONS.) – CSE (Networking & Cyber Security)**
- **B.TECH. (HONS.) – CSE (Cloud Computing & Artificial Intelligence) in Association with IBM**

UNITED UNIVERSITY

PRAYAGRAJ

[Established under the U.P.Private Universities Act. No. 12 of 2019

FACULTY OF ENGINEERING & TECHNOLOGY

Proposed Course Structure aligned with NEP-2020

B. Tech. Computer Science & Engineering
4 Year (8 Semester) Programme

United University, Prayagraj
[Academic Session 2025-26 onwards]

COURSE STRUCTURE
B. Tech. Computer Science & Engineering
4 Year (8 Semester) Programme
[Academic Session 2025-26 onwards]
Entry Level -1

Sr. No.	Course Code	Course Title	Category	Teaching			Credit
				L	T	P	
Semester – I							
1	ETUCAS101T	Engineering Mathematics I	BS	4	-	-	4
2	ETUCAS102T	Engineering Physics	BS	3	-	-	3
3	ETUCEE101T	Basic Electrical Engineering	ES	3	-	-	3
4	ETUCCS111T	Programming & Problem Solving	ES	3	-	-	3
5	ETUCAS116T	Environmental Science	BS	3	-	-	3
6	PTSPPET14T	Professional Proficiency	HS	1	-	2	2
7	ETUCAS102P	Physics Lab	BS	-	-	2	1
8	ETUCEE101P	Electrical Engineering Lab	ES	-	-	2	1
9	ETUCCS101P	Computer Programming Lab	ES	-	-	2	1
10	UUSCVA001P	Yoga/NSS/Music/Sports		-	-	2	0
Total				**17**	**-**	**10**	**21**

COURSE STRUCTURE
B. Tech. Computer Science & Engineering (Hons.)
4 Year (8 Semester) Programme
[Academic Session 2025-26 onwards]

Entry Level -1

Sr. No.	Course Code	Course Title	Category	Teaching			Credit
				L	T	P	
Semester – I							
1	ETUCAS101T	Engineering Mathematics I	BS	4	-	-	4
2	ETUCAS203T	Engineering Chemistry	BS	3	-	-	3
3	ETUCEC101T	Basic Electronics Engineering	ES	3	-	-	3
4	ETUCME101T	Elements of Mechanical Engineering	ES	3	-	-	3
5	ETUCAS204T	Emerging Technology for Engineering	ES	2	-	-	2
6	PTSPPET14T	Professional Proficiency	HS	1	-	2	2
7	ETUCAS203P	Chemistry Lab	BS	-	-	2	1
8	ETUCEC101P	Electronics Engineering Lab	ES	-	-	2	1
9	ETUCME101P	Workshop Practices	ES	-	-	2	1
10	ETUCME211P	Engineering Graphics & Design Lab	ES	-	-	2	1
11	UUSCVA001P	Yoga/NSS/Music/Sports		-	-	2	0
Total				**16**	-	**12**	**21**

COURSE STRUCTURE
B. Tech. Computer Science & Engineering (Hons.)
In Association with IBM
4 Year (8 Semester) Programme
[Academic Session 2025-26 onwards]
Entry Level -1

Sr. No.	Course Code	Course Title	Category	Teaching			Credit
				L	T	P	
Semester – I							
1	ETUCAS101T	Engineering Mathematics I	BS	4	-	-	4
2	ETUCAS203T	Engineering Chemistry	BS	3	-	-	3
3	ETUCEC101T	Basic Electronics Engineering	ES	3	-	-	3
4	ETUCME101T	Elements of Mechanical Engineering	ES	3	-	-	3
5	ETUCAS204T	Emerging Technology for Engineering	ES	2	-	-	2
6	PTSPPET14T	Professional Proficiency	HS	1	-	2	2
7	ETUCAS203P	Chemistry Lab	BS	-	-	2	1
8	ETUCEC101P	Electronics Engineering Lab	ES	-	-	2	1
9	ETUCME101P	Workshop Practices	ES	-	-	2	1
10	ETUCME211P	Engineering Graphics & Design Lab	ES	-	-	2	1
11	UUSCVA001P	Yoga/NSS/Music/Sports	HS	-	-	2	0
12	ETUICS102T	Programming in Python	PC	3	-	-	3
13	ETUICS102P	Programming in Python Lab	PC	-	-	2	1
Total				**19**	-	**14**	**25**

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: 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: ETUCAS116T/ 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: PTSPPET14T/Professional Proficiency

COURSE OUTCOMES

1. Learner can demonstrate understanding by their ability to describe various parts of speech like noun, pronoun, verb adverb, adjective, conjunction, interjection and preposition.
2. Learner will be able to understand the articles and use effectively.
3. Learner can demonstrate understanding by their ability to define what will be do's and don'ts in an interview.
4. Students will be able to introduce themselves in a professional manner with the correct and sufficient information.
5. Students will learn advance tricky approaches for solving Quant.
6. It will enhance student's skill to appear in various aptitude test within limited time constrain.

UNIT-1

Basic Grammar-Tenses, Subject-Verb- Agreement ,Article, formation of sentences.Introduction to technical terms.

UNIT-2

Self Introduction , body language, Voice modulation, E-mail writing ,Letter writing,Minutes writing,Resume building

UNIT-3

Simplification & Approximation
Alpha-Numeric Series & Miscellaneous
Coding-Decoding

Reference Books:

Quantitative Aptitude- R.S Agarwal, Word Power Made Easy by Norman Lewis, English Grammar and Usage by R. P. Sinha

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: 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: 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: ETUICS102T / Programming in Python

COURSE OUTCOMES

1. To identify and use various in-built functions, operators and statements supported by python.
2. To learn how to use lists, tuples, and dictionaries in Python programs and to learn how to identify Python object types.
3. To learn how to write or implement control and decision statements in python.
4. To implement the real-use cases of the functions in python.
5. To learn how to build and package python module for reusability and understand the concepts of file handling.
6. To identify the patterns in the given data and learn how to import in-built library and use the matplotlib for the graphical representation.
7. To learn the implementation of Machine Learning and learn how to create a model in python.

UNIT I:

INTRO OF PYTHON :Definition with Real Use Cases, History of Python, How Python is installed, Execution of the basic program of the python, Character set, Token, core Data types, Variables, input(), eval() & print() function, Formatting String, Operators and Expressions.

UNIT II:

Conditional & Control Statements : Decision Making statements, Conditional Expressions, Boolean type, Boolean operators, String Operators, While Loop, For Loop, Nested loop, Break & continue Statement, range() Function.

UNIT III:

DATA STRUCTURES, FUNCTIONS & OOPS: Syntax and Basics of Functions, Use of functions, Parameters and Arguments, local & global Scope of variable, return statement, recursive function, Str class, inbuilt functions of string, traversal of string, string operator & operations, Creating a list, Tuple, Dictionaries & sets, In-built functions of list, tuple, set & dictionaries, list operators, replacing values in dictionaries, retrieving value from dictionaries, OOPs introduction, classes and objects, methods, operators, inheritance, super() and method() overriding.

UNIT IV:

FILE HANDLING & DATA ANALYSIS : Need of File Handling, Different modes of file handling, Read/Write text and numbers to/from a file, Directories on a disk, Introduction of Pandas, Data frames, Series, Data analysis using Pandas.

UNIT V:

DATA HANDLING : Regular Expression Pattern Matching, Parsing Data, Introduction to Regression, Use Cases of Regression, Types of Regression, Exploratory Data Analysis, Correlation Matrix, Visualisation using Matplotlib, Implementation of Linear Regression.

UNIT VI

MACHINE LEARNING : Introduction of Machine Learning, Algorithms Random Forest, Support Vector Machine, Random Forest, Build your own model in python and difference between the Random Forest and decision tree.

TEXTBOOKS & REFERENCE BOOKS

1. Ashok Namdev Kamthane, Programming and Problem Solving with Python, McGraw Hill Education Publication, ISBN(13):978-93-87067-57-8.
2. Allen B. Downey, Think Python, O'Reilly Media
3. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning

Further suggested Readings

1. Effective Computation in Physics: Field Guide to Research with Python Anthony Scopatz, Kathryn D. Huff (O'Reilly, 2015)
2. Python Cookbook , David Beazley & Brian K. Jones (O'Reilly, 3rd edition, 2013)

COURSE CODE & NAME: ETUICS102P / Programming in Python Lab

LAB COURSE OUTCOMES

1. To identify and use various in-built functions, operators and statements supported by python.
2. To learn how to use lists, tuples, and dictionaries in Python programs and to learn how to identify Python object types.
3. To learn how to write or implement control and decision statements in python.
4. To implement the real-use cases of the functions in python.
5. To learn how to build and package python module for reusability and understand the concepts of file handling.

List of Experiments:

1. Introduction to Python shell, running python script and declaring variables.
2. Programs to implement Control Statements(if, if-else, nested if-else, for loop, while loop, break statement, continue statement):
   1. Display table of number using for-loop statement.
   2. Find sum of Natural numbers from 1 to 10.
   3. Add digits of a number using while loop.
3. Programs to implement Functions, return statement, default argument, keyword arguments and scope of a variable in python.
4. Programs to implement various operations on Lists :
   1. Adding list
   2. Replicating list
   3. Deleting list
   4. List slicing
   5. Updating elements in list
   6. Appending elements
   7. Functions and methods in list
5. Programs to implement the concepts of File Handling:
   a. Read and write data from a file
   b. Illustrate append() mode
   c. Open the file in the read mode and use of for loop to print each line present in the file
   d. Show various ways to read and write data in a file
   e. Illustrate Append vs write mode
6. Programs to implement the functions of re library .
7. Program to introduces the basic functionalities of Matplotlib, the basic figure types and design them.
8. Write or perform the algorithm based on random forest.
9. Write and perform the algorithm based on super vector machine.
10. Write and perform the algorithm k-nearest neighbor algorithm.

Project Statement

Desktop and games development project on python programming for students in a intermediate level python programming course are described. In these projects, students write their own programs to simulate various kinds of applications. Initially, beginners level programmed projects treat the basics of python using OOPS . Then this is followed by more advanced level projects using regular expression and various kind of Machine learning algorithm. The projects can be run on a typical laptop or desktop computer.

Students will need to acquaint themselves with new tools and technologies while working on a python project. The more they learn about cutting-edge development tools, environments, libraries, the broader will be your scope for experimentation with their projects.

TEXT/REFERENCE BOOKS

- IBM Content/Books