SEMESTER-I

B.E. (COMMON FOR MECH, CIVIL & AERO) & B.TECH. (CHEM& BT)

S.No.	Course Code	Course Title	Category	L	T	P	C
-	122IP001	INDUCTION PROGRAMME	-	-	-	-	0
THEORY							
1	122ENI01	Professional English-I*	HS/EEC	2	0	2	3
2	122MAT02	Matrices and Calculus	BS	3	1	0	4
3	122PHT03	Engineering Physics	BS	2	0	0	2
4	122CYT04	Engineering Chemistry	BS	2	0	0	2
5	122EGT05	Engineering Graphics	ES	2	0	4	4
6	122EET06	Basic Electrical Electronics and Instrumentation Engineering	ES	3	0	0	3
7	112HST07	தமிழர் மரபு / Heritage of Tamils	HS	1	0	0	1
PRACTICALS							
7	122CYP07	Engineering Chemistry Laboratory	BS	0	0	2	1
8	122EPP08	Engineering Practice Laboratory	ES	0	0	2	1
		TOTAL		15	1	10	20

SEMESTER II

COMMON TO B.E (ME, CE & AE)

S.No.	Course Code	Course Title	Category	L	T	P	C
THEORY							
1	222ENI01	Professional English-II*	HS/EEC	2	0	2	3
2	222MAT02	Probability and Statistics	BS	3	1	0	4
3	222EST03	Environmental Science and Engineering	BS	2	0	0	2
4	222PPT04	Python Programming	ES	3	0	0	3
5	222MST05	Material Science	BS	2	0	0	2
6	222EMT06	Engineering Mechanics	ES	3	0	0	3
7	222HST07	Tamils and Technology	HS	1	0	0	1
PRACTICALS0							
8	222PHP07	Engineering Physics Laboratory	BS	0	0	2	1
9	222PPP08	Python Programming Laboratory	ES	0	0	2	1
		TOTAL		16	1	6	19

*(Theory + Lab – Embedded / Integrated)

122ENT01	PROFESSIONAL ENGLISH-I	L	T	P	C
	(Common to all branches)	2	0	0	2

Objectives:

The Course prepares first semester Engineering and Technology students to:

- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.
- Present information in an appropriate oral form.
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write anything convincingly with grammatical accuracy.

UNIT I   **09**

Listening – News - Speaking – Everyday activities - Reading – Newspaper - Writing - Definitions – Instructions – Checklists – Recommendations - Vocabulary Development - Technical vocabulary - Language Development – Parts of speech – Articles – Word formation.

UNIT II   **09**

Listening – Motivational speech - Speaking – Extempore/Impromptu - Reading – Comprehension– Writing – Essay - Vocabulary Development - Vocabulary used in formal letters/emails and reports - Language Development – Tenses - Voices - Numerical adjectives – Question tags.

UNIT III   **09**

Listening – Technical talks - Speaking – Self introduction - Reading – Novels – Writing – Invitation and quotation letter - Vocabulary Development - Misspelled words – One-word substitution - Language Development - Singular and plural nouns - Compound nouns - Editing

UNIT IV   **09**

Listening – Classroom lecture - Speaking – Public speaking - Reading – Biography/Autobiography – Writing - Email etiquettes - Vocabulary Development – Synonyms and antonyms – Paraphrasing - Language Development – Modals – Conditionals.

UNIT V   **09**

Listening - Comprehension - Speaking – Movie reviews – Reading – Technical articles – Writing – Reports - Minutes of a meeting - Vocabulary Development - Verbal analogies - Phrasal verbs - Language Development - Concord - Reported speech.

Total: 45 Hours

COURSE OUTCOMES:

At the end of the course, learners will be able to:

CO1: Listen and comprehend lectures and talks in their area of specialization successfully.

CO2: Speak appropriately and effectively in varied formal and informal contexts. CO3: Read and comprehend texts effortlessly.

CO4: Write any formal documents effectively.

CO5: Understand the basic grammatical structures and its applications. **TEXT**

BOOKS:

1. Board of editors. Fluency in English: A Course book for Engineering and TechnologyOrient Blackswan, Hyderabad: 2016.
2. Sudharshana. N. P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. Technical English (with work book). Sahana Publications, Coimbatore, 2016.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007.

122MAT02	ENGINEERING MATHEMATICS-I	L	T	P	C
	(Common to all branches)	3	1	0	4

Objectives:
The Course prepares first semester Engineering and Technology students to:
- To understand the eigenvalue problems.
- To study sequences and series and tests of convergence.
- To understand the concepts of curvatures, evolutes and envelopes.
- To learn the total derivatives and apply the same to find maxima and minima.
- To solve differential equations of certain types, including systems of differential equations that they might encounter in engineering subjects.

UNIT I MATRICES 9+3
Eigenvalues and eigenvectors of a real symmetric matrix –Properties – Cayley - Hamilton theorem (Statement and applications only) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form–Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II SEQUENCES AND SERIES 9+3
Limits and Continuity - Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms –Tests of convergence: Comparison test, Integral test and D'Alembert's Ratio test, Raabe's test and Cauchy's Root test – Alternating series
– Leibnitz's test – Series of positive and negative terms: Taylor's series, Binomial series, Exponential series, and Logarithmic series – Absolute and conditional convergence.

UNIT III DIFFERENTIAL CALCULUS 9+3
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolutes as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9+3
Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Jacobians – Taylor's expansion– Maxima and Minima – Method of Lagrangian multipliers.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 9+3
Higher order linear differential equations with constant coefficients – Method of variation of parameters –Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant Coefficients-Applications to Engineering Problems- Electric Circuits, Simple Harmonic Motions and bending of beams.

TOTAL: 45+15= 60 PERIODS

Course Outcomes:
After completing this course, the student will be able to

CO 1: Develop the knowledge of linear algebraic concepts. CO 2:
Apply convergence or divergence concept in series.
CO 3: Use the differential calculus tools application to seek solutions for many problems in engineering subjects.

CO 4: Acquire the knowledge of partial differential concepts and apply to find maxima and minima of a function.

CO 5: Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects.

TEXT BOOKS
1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10 th edition New Delhi 2016.
2. Grewal. B.S, "Higher Engineering Mathematics", 44 th Edition, Khanna Publications, Delhi, 2017.

REFERENCES
1. T.Veerarajan, "Engineering Mathematics" ,Tata McGraw-Hill Publishing company, New Delhi, 2014.
2. Kandasamy.P, Thilagavathy,K., &Gunavathi.K., "Engineering Mathematics for first year "., S.Chand &Company Ltd., New Delhi,2014.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
5. V.Prameelakaladharan and G.Balaji, "Engineering Mathematics - I", 3rd Edition, Amrutha marketing, Chennai, 2017.

122PHT03	ENGINEERING PHYSICS	L	T	P	C
	(Common to all branches)	2	0	0	2

Objectives:
At the end of the course the students would be exposed to fundamental knowledge in
- Different engineering subjects and applications.
- Acoustics in building and Non-destructive techniques.
- Application of lasers in engineering and technology.
- Basics of Quantum theory.
- Identification of structure of engineering materials.
- Atomic and nuclear related theories.

UNIT-1: ACOUSTICS AND ULTRASONICS 9

Sound – classification – characteristics of musical sound – loudness – Decibel – Intensity of sound – Weber-Fechner law – Reverberation and Reverberation time – Sabine's law – derivations – Absorption coefficient – Measurement of absorption coefficients – Factors affecting acoustics of buildings and their remedies.

Ultrasonics – production – Magnetostriction effect – Magnetostriction oscillator – Piezoelectric effect – Inverse piezoelectric effect – Piezoelectric oscillator-Detection of ultrasonic waves-properties-Cavitations-Applications-NDT-pulse echo system- Determination of depth of sea.

UNIT-2: OPTICAL PHYSICS 9

Lasers – Spontaneous and Stimulated Emissions-Types of lasers-Nd-YAG, Helium-Neon, CO_2 -Semiconductor lasers [Homojunction and Heterojunction (qualitative)]-Interference- Air wedge and its applications- Michelson interferometer: construction, working, determination of wavelength and thickness.

UNIT-3: QUANTUM PHYSICS 9

Blackbody Radiation-Laws of blackbody Radiation-Planck's quantum theory of blackbody radiation(derivation)-Photo Electric Effect-Compton effect(derivation)-Matter Waves-De- Broglie's Concept-Schrodinger wave Equation-Time independent and Time dependent equations(derivations)-Physical significance of wave function-particle in a box (one dimensional case).

UNIT-4: PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity-Hook's law-stress- strain diagram-factors affecting Elasticity-Poisson's ratio- Bending Moment-Cantilever-Heavy Cantilever-Young's Modulus-Uniform and Non- uniform bending (Theory and Experiment). Modes of heat Transfer-Thermal Conductivity-Newton's Law of Cooling-Lee's disc Method-Radial Heat Flow-Cylindrical Shell Method-Thermal conductivity of Rubber-Heat conduction through a compound media.

UNIT-5: NUCLEAR AND ATOMIC PHYSICS 9

Nuclear fission-chain Reaction-Nuclear reactor-condition for sustained chain reaction- Controlled chain reaction-Pressurized water reactor (PWR)-Boiling water reactor (BWR)- Nuclear power plant-Nuclear fusion- Differences between fission and fusion-Raman effect-applications-Raman spectroscopy.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1: Apply the Acoustics and NDT techniques and modern engineering tools necessary for engineering practice.

CO2: Categorize and illustrate the Lasers and its application to engineering CO3: Apply the quantum concepts in engineering field.

CO4: Examine the elastic and thermal properties in various materials. CO5: Discuss the role of nuclear physics in energy production.

REFERENCES:

1. Dr. R.N. Jayaprakash, Engineering Physics, Dhanam Publications, 2018.
2. Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
3. Palanisamy P.K.,Engineering Physics I,Scitech Publications, Chennai,2011.
4. Avadhanulu M.N. and Kshirsagar P.G., A Textbook of Engineering physics, S.Chand & Company Ltd, New Delhi,2005.

122CYT04	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to all branches)	2	0	0	2

Course objectives:

At the end of the course the students would be exposed to fundamental knowledge in
- To understand the chemistry behind water technology
- To understand the chemistry of Corrosion
- To acquaint the student with concepts of important photo physical and photochemical processes and spectroscopy
- To acquaint the students with the basics of fuels, and chemistry behind combustion process.
- To understand the basic concepts of phase equilibrium

UNIT I WATER TECHNOLOGY 9

Physical, Chemical & Biological characteristics -Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen –determination and significances, Alkalinity
– determination and significances - disadvantages of using hard water in boilers- Internal conditioning - phosphate, calgon and carbonate conditioning methods – External treatment: Zeolite, ion exchange methods - desalination – reverse osmosis and electrodialysis - domestic water treatment.

UNIT II CORROSION SCIENCE 9

Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion –Measurement of corrosion (wt. loss method only) - factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method and impressive cathode current method. Electroplating (Copper plating) and Electroless plating (Nickel plating).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency –Photophysical Process-Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation – applications.

UNIT IV FUELS AND COMBUSTION 9

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) – petroleum – Fractional distillation - manufacture of synthetic petrol (Bergius process)- knocking- octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG). Combustion of fuels – (simple problems) flue gas analysis (ORSAT Method).

UNIT-V PHASE EQUILIBRIA **9**

Gibbs phase rule-definition of terms involved- Thermal analysis-application of phase rule to one Component system-water system – Sulphur system. Reduced Phase rule- application of phase rule to two Component system- lead-silver system - KI-water system and Ferric Chloride water system

Course Outcomes:

At the end of the course, the student will be able to
- CO1: Developing the knowledge of chemistry behind water technology
- CO2: Understanding the chemistry of Corrosion
- CO3: Applying the basic concepts of photon on matter
- CO4:Understanding basics of fuels, and chemistry behind combustion process.
- CO5: Understanding the basic concepts of phase equilibrium

Text Books
1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai and Sons, NewDelhi 2004.16th Edition.
2. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry,2nd Edition.PHI Learning PVT., LTD, New Delhi, 2008. 3rd Edition.
3. K. Sivakumar, Applied Chemistry, Sahana Publishers, Coiambatore 2022.4th Edition.

Reference Books
1. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. NewDelhi. 2008. Reprint edition.
2. B. K. Sharma, Engineering Chemistry, 3rd edition Krishna Prakashan Media (P)Ltd., Meerut, 2001.
3. ArunBhal, B.S. Bhal, G. D. Tuli, Essentials of Physical Chemistry, S. Chand & Co., Ltd. New Delhi. 26th Edition.
4. P. W. Atkins & Julio de Paula, Atkins' Physical Chemistry, Oxford University Press York, 7thEdn, 2002.
5. ShashiChawla, A Text Book of Engineering Chemistry, 3rd Edition, DhanpatRai&New Delhi, 2007.
6. S. Vairam, P. Kalyani&Suba Ramesh, Engineering Chemistry, IstEdn, John Wiley &Sons, India, 2011.
7. Lee J.D., Concise Inorganic Chemistry, 7th Edn, Blackwel Science Publications Oxford, London, 2004.

122EGT05	ENGINEERING GRAPHICS	L	T	P	C
	(Common to all Non-Circuit branches)	2	0	4	4

OBJECTIVES:
- To gain knowledge on graphical skills for drawing the object.
- To comprehend the principle of orthographic projection of points, lines and plane surfaces.
- To study the principle of simple solids.
- To comprehend the principle of section and development of solids.
- To comprehend the principle of Isometric and Orthographic projections.

Concepts and conventions (Not for Examination)   **03**
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE AND SPECIAL CURVES   **09**
Conics – Construction of ellipse, Parabola and hyperbola by Eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES   **12**
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS   **12**
Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   **12**
Sectioning of simple solids like prisms, pyramids, cylinders and cones in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other
– Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS   **12**
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Representation of Three-Dimensional objects – General principles of orthographic projection –Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial.
views of objects.

TOTAL HOURS :60

COURSE OUTCOMES

The student will be able to

CO1: Recognize the conventions and apply dimensioning concepts while drafting simple objects.

CO2: Draw the orthographic projection of points, line, and plane surfaces. CO3: Draw the orthographic projection of simple solids.

CO4: Draw the section of solid drawings and development of surfaces of the given objects.

CO5: Apply the concepts of Isometric and Orthographic projections in engineering practice.

TEXT BOOKS:

1. Ranganath G, "Engineering Graphics", Second Edition, Sahana Publishers, Reprint, 2021.
2. Bhatt. N.D., "Engineering Drawing" Charotar Publishing House, 53th Edition, 2014.

REFERENCE BOOKS:

1. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2017.
2. Gopalakrishnana. K. R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2014.
3. Basant Agarwal and C.M.Agarwal, "Engineering Drawing", Tata McGraw Hill, 2013.
4. Natrajan K. V, "A Text book of Engineering Graphics", DhanalakshmiPublishers,
5. Chennai, 2012.
6. M.B.Shaw and B.C.Rana, "Engineering Drawing", Pearson Education India, 2011.

122EET06	Basic Electrical Electronics and Instrumentation Engineering	L	T	P	C
	(Common to CSE, IT, MECH, CHEM, AERO, BT, CIVIL)	3	0	3	3

OBJECTIVES:
- To learn the basics of electrical elements.
- To introduce the fundamental concepts of DC and AC circuits.
- To interpret the principle and characteristics of semiconductor devices.
- To analyze the various logic gates and switching theory.
- To understand the principles of measurement systems and transducers.

UNIT – I INTRODUCTION TO BASIC ELECTRICAL ELEMENTS   9

Electrical circuit: passive elements - Resistor, Inductor and Capacitor; active elements- Current, Voltage, Power and Energy – Ohm's Law and limitations - Kirchhoff's Laws – relationship between current, voltage and power – Resistors in series, parallel and series
-parallel circuits

UNIT – II FUNDAMENTALS OF DC AND AC CIRCUITS   9

DC Circuits: Sources of Electrical Energy - Independent and Dependent Source, Source Conversion - Star –Delta conversion- Mesh and Nodal Analysis.
AC Circuits: Generation of sinusoidal - voltage, average - RMS value, form factor and peak factor- Phasor diagrams of R, L, C, combination of R-L, R-C and R-L-C circuits.

UNIT – III SEMICONDUCTOR DEVICES AND APPLICATIONS   9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics
– Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT - IV DIGITAL ELECTRONICS   9

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip- Flops – Registers and Counters – A/D and D/A Conversion (single concepts).

UNIT –V MEASUREMENT SYSTEMS AND TRANSDUCERS   9

Measurements-Significance of measurements-Methods of Measurement-Direct methods, indirect methods-Instrument and measurement systems-Mechanical, Electrical and Electronic instruments- Classification of instruments- characteristics of instruments and measurement systems-Errors-Type of Errors –Units and Standards. Moving coil and moving iron meters, Energy meter and watt meter. Transducers- RTD, Strain gauge, LVDT.

TOTAL HOURS: 45

Course Outcomes:
Upon Completion of this course, students will be able to:
CO1: Recognize the different combinations of circuit elements and solving the circuit by applying
      basic circuital laws.
CO2: Acquire a good understanding of DC and AC circuits.

CO3: Demonstrate the characteristics of semiconductor devices. CO4:
Design the various logic gates for switching applications.
CO5: Understand the principles of measurement systems and transducers.

TEXT BOOKS:
1. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering", Tata McGraw Hill Education Private Limited, 2010.
2. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
3. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9thEdition, Pearson Education / PHI, 2007.
4. A.K.Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation" DhanpatRai & Co, 2016.

REFERENCE:
1. B.L.Theraja, A.K.Theraja, "A Text Book of Electrical Technology, Volume I ", S.Chand and company Ltd., 2006.

122PPT05	PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to all Circuit Branches)	L	T	P	C
		3	0	0	3

OBJECTIVE(S):
- To know the basics of algorithmic problem solving
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I   ALGORITHMIC PROBLEM SOLVING   9

Fundamentals of Computing, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II   DATA EXPRESSIONS, STATEMENTS   9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III   CONTROL STATEMENTS AND FUNCTIONS   9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES   9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: Create- add- delete from a Dictionary- Operations associated with pairs of data, and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V FILES, MODULES, PACKAGES   9

Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file. Case Study: Python Libraries (Numpy, Pandas, SciPy, PyGame).

TOTAL HOURS: 45

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems CO2: Read, write, execute by hand simple Python programs.

CO3: Structure simple Python programs for solving problems and decompose into functions.

CO4: Represent compound data using Python lists, tuples, and dictionaries. CO5: Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, -"An Introduction to Python" – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCE BOOKS:

1. John V Guttag, -"Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, -"Introduction to Programming in Python: An Inter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, -Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, - "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
5. Charles Dierbach, - "Introduction to Computer Science using Python: A Computational Problem"- Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, - "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

122CMT06	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to ECE, BME & EEE)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain the knowledge in surveying and construction materials.
- To understand the building structures.
- The student should familiar with foundry, welding and forging processes.
- To know the working of IC engines and Boilers.
- To gain the knowledge about sources of energy and refrigeration.

PART-A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS   09

Surveying: Objects, types, classification, principles, measurements of distances, angles, leveling, determination of areas, illustrative examples.
Civil Engineering Materials: Bricks, stones, sand, cement, concrete, steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES   10

Foundations: Types, Bearing capacity, Requirement of good foundations. Superstructure: Brick masonry, stone masonry, beams, columns, lintels, roofing, flooring, plastering, Mechanics, Internal and external forces, Stress, Strain, Elasticity, Types of Bridges and Dams, Basics of Interior Design and Landscaping.

PART-B – MECHANICAL ENGINEERING

UNIT III FOUNDRY WELDING AND FORGING   10

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties, Molding procedure. Welding: Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering, Definition and Classification. Brazing – Definition and Classification. Forging: Types of Forging, Differences between Hot working and Cold working processes.

UNIT IV IC ENGINES & BOILERS   08

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines, Boilers: Introduction of boilers, classification, Lancashire boiler, Babcock and Wilcox boiler, list of boiler mountings and accessories and applications (no sketches).

UNIT V SOURCE OF ENERGY & REFRIGERATION   08

Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy, hydro power plant. Introduction to refrigeration and air- conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

TOTAL HOURS:45

COURSE OUTCOMES:

The students will have an ability to

CO1: Explain the usage of construction material and proper selection of construction materials.

CO2: Design building structures.

CO3: Gain knowledge on manufacturing processes like foundry, welding and forging.

CO4: Demonstrate working principles of petrol and diesel engine and the components used in power plants.

CO5: Explain the components of Refrigeration and Air conditioning cycle.

TEXT BOOKS:
1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical", S.S.Publishers, 2014.
2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 3rd Edition, 2018.

REFERENCE BOOKS:
1. Shanmugasundaram. S and Mylsamy. K, "Basics of Civil and Mechanical Engineering", Cenage Learning India Pvt. Ltd, New Delhi, 2012.
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd, 3rd Edition reprint, 2013.
3. Gopalakrishna K R, "Elements of Mechanical Engineering", Subhas Publications, Bangalore, 2008.
4. Khanna O.P, Foundry Technology, Dhanpat Rai Publishing Co. (P) Ltd, 2011.
5. Venugopal.K and Prabhu Raja.V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, 2015.
6. Shantha Kumar S R J, "Basic Mechanical Engineering", Hi-TechPublications, Mayiladuthurai, 2001.

122CYP07	ENGINEERING CHEMISTRY LABORATORY (Common to all Non-Circuit Branches)	L	T	P	C
		0	0	2	1

Objectives:
Students will be conversant with the estimation of various compounds using volumetric and instrumental analysis.

LIST OF EXPERIMENTS
1. Estimation of Total hardness by EDTA
2. Determination of percentage of calcium in Lime Stone by EDTA
3. Estimation of chloride in water sample
4. Estimation of alkalinity of Water sample
5. Determination of DO in Water (Winkler's Method)
6. Determination of Rate of Corrosion of the given steel specimen by weight loss method (Without inhibitor)
7. Determination of Rate of Corrosion of the given steel specimen by weight loss method (With inhibitor)
8. Conduct metric titration (Simple acid base)
9. Conduct metric titration (Mixture of weak and strong acids)
10. Conduct metric titration using $BaCl_2$ vs Na_2SO_4
11. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
12. PH titration (acid & base)
13. Determination of water of crystallization of a crystalline salt -Copper sulphate
14. Preparation of Bio-Diesel by Trans etherification method.

A minimum of TEN experiments shall be offered.

Course Outcomes:

CO1: Carry out the volumetric experiments and improve the analytical skills.
CO2: Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering.
CO3: Understand the principle and handling of electrochemical instruments and Spectrophotometer.
CO4: Apply their knowledge for protection of different metals from corrosion by using different inhibitors

Reference(s):

1. Arthur I. Vogel's, "Quantitative Inorganic Analysis including Elementary Instrumental Analysis", ELBS, Group, 7th Edition, 2000.
2. Dr. K .Sivakumar, "Engineering Chemistry lab manual", S.S publishers, 2022.

122PHP07	ENGINEERING PHYSICS LABORATORY (Common to all Circuit Branches)	L	T	P	C
		0	0	2	1

Course Objectives:
- To understand the practical concepts of interference and diffraction.
- To understand the concept of velocities of sound in different liquids.
- To get better knowledge of modulus of elasticity.
- To understand the concepts of thermal conductivity.
- To understand the concept of viscosity of liquids.

LIST OF EXPERIMENTS
1. (a) Determination of laser Parameters-Wavelength.
   (b) Particle size determination using diode laser.
1. Determination of Young's modulus of the material- uniform bending.
2. Determination of (i) the moment of inertia of the disc and (ii) the rigidity modulus of the material of a wire.
3. Determination of thickness of a thin Wire-Air wedge method.
4. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
5. Determination of wavelength of mercury spectrum-spectrometer grating.
6. Determination of Young's modulus of the material-Non uniform bending.
7. Determination of viscosity of liquid-Poiseuille's method.
8. Determination of acceleration due to gravity 'g' – Compound pendulum.
9. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
10. Determination of wavelength of monochromatic light – Newton's ring method.

Course Outcomes:
At the end of the course students will be able to:
1. Understand the moduli of elasticity of various materials.
2. Understand the phenomenon of diffraction and interference of light using optical components.
3. Acquire knowledge of viscosity and compressibility of various liquids.
4. Understand the concept of heat transfer through conductors and bad conductors using Lee's disc.
5. Acquire knowledge about acceleration due to gravity.

122EPP08	ENGINEERING PRACTICE LABORATORY (Common to all Non-Circuit Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:
- To get the knowledge on welding techniques and sheet metal operation.
- To know the principle involved in plumbing work and in carpentry work.
- To know about wiring various electrical joints in common household electrical and wire work.
- To know about the working procedure of electrical appliances.
- To get the knowledge about basics of electronics and to know the characteristics of switching devices.

PART –A (MECHANICAL)

LIST OF EXPERIMENTS

WELDING:
Study of Electric Arc welding equipment's.
Preparation of welding joints:
i) Butt joint   ii) Lap joint   iii) T - joint.

SHEET METAL WORK:
Study of sheet metal tools and operations
Preparation of sheet metal models: i) Rectangular Tray   ii) Funnel

PLUMBING WORKS:
Study of pipeline joints and house hold fittings.
Preparation of plumbing models: Basic pipe connections with PVC and GI pipe fittings.

CARPENTRY:
Study of wooden joints and tools used in roofs, doors, windows, furniture.
Preparation of carpentry models:
i) Lap joint   ii) Dovetail joint   iii) T-Joint

PART B (ELECTRICAL AND ELECTRONICS)

LIST OF EXPERIMENTS

1. Introduction to House Wiring.
2. Staircase Wiring.
3. Fluorescent lamp Wiring.
4. Measurement of single phase energy meter.
5. Measurement of Power, Power factor by using two- wattmeter Method.
6. Study of Electrical iron box and fan with regulator.
7. Characteristics of SCR and Diode
8. Introduction to color coding of resistor.

COURSE OUTCOMES:

The students will be able to

CO1: Weld various joints in steel plates using arc welding work; Assemble simple mechanical assembly of common household equipment's; Make a tray out of metal sheet using sheet metal work.

CO2: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work

CO3: Wire various electrical joints in common household electrical wire work. CO4: Basic knowledge about electrical appliances.

CO5: Basic knowledge about electronics devices.

		L	T	P	C
122PPP08	**PROBLEM SOLVING AND** **PYTHON PROGRAMMING LABORATORY** **(Common to all Circuit Branches)**	0	0	2	1

OBJECTIVE(S):
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS:
1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers and largest number in a list using functions
7. Finding factorial of a given number using recursive function.
8. Take a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions
14. Programs that take command line arguments (word count)
15. To import specific items from a library module.
16. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL HOURS: 45

COURSE OUTCOMES:
Upon completion of the course, students will be able to:
>   CO1: Write, test, and debug simple Python programs.
>   CO2: Implement Python programs with conditionals and loops.
>   CO3: Develop Python programs step-wise by defining functions and calling them. CO4: Use
>   Python lists, tuples, dictionaries for representing compound data.
>   CO5: Read and write data from/to files in Python

LIST OF EQUIPMENTS AND SOFTWARE FOR A BATCH OF 30 STUDENTS

Hardware:
LAN System with 30 Nodes (OR) Stand-alone PCs -30 No's.
Printer – 3 No's.
Software:
Operating System : Linux / Windows.
Open Source Software: Python.
Database : MySQL.
Open Source Platform: XAMPP, Eclipse IDE

222ENI01	PROFESSIONAL ENGLISH-II	L	T	P	C
	(Embedded Course - Common to all branches)	2	0	2	3

OBJECTIVES:
The Course prepares second semester Engineering and Technology students to:
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.
- Present information in an appropriate oral form.
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write anything convincingly with grammatical accuracy.
- Nurture the holistic perspective of industry readiness

UNIT I: Listening
Theory
Conversation - Telephonic conversation - Class memory quiz - Interviews of famous persons - A scene from a film - Podcast - Stories - Product description - Process description
English Laboratory
Scientific lectures - Educational videos - Gap filling exercises - Presentations - Formal job interviews - Introduction to classmates - Debates - Panel discussion - INK talks
UNIT II: Speaking
Theory
Exchanging personal information - Greeting - Leave taking - Introducing friends - Reporting - Role play - Describing a person/place/thing - Small talk - Celebrity interview
English Laboratory
Narrating personal experiences - Presentation - Information gap - Simulations - Find the difference - Giving and asking for directions - News brief - Alibi - Untranslatable
UNIT III: Reading
Theory
Short stories: The Gift of the Magi, A Service of Love and The Last Leaf by O. Henry - Magazines - Jigsaw - Newspaper reports - Newspaper articles - Journals - Travelogues
English Laboratory
Brochures - Social media messages - Excerpts from literature - Editorials - Case studies - Critical reviews - Excerpts of interview with professionals - Technical texts - One word splash

UNIT IV: Writing
Theory
Developing hints - Note-making - Note-taking - Agenda - Advertisement - Transfer of information (Pie chart, Bar chart and Flow chart) - Précis writing and summarizing - Free writing - Short stories
English Laboratory
Letter writing - Essay writing - What if? - Poetry - Cubing - Defining technical terms - Character description - One-minute paper – Feedback.
UNIT V: Language Development
Theory
Consonants & vowels - Phonetic transcription - British and American English - Infinitive and gerund - Types of sentences - Information and emphasis - Cause and effect - Purpose and function - Phrasal verbs.
English Laboratory - Career Skills
Abbreviations and acronyms - Homonyms and homophones - Word formation – One word substitution - Compound nouns - Concord - Life etiquettes - Emotional intelligence - Notable Indian start-ups - Work ethic.

TOTAL: 60 HOURS

Lab Requirements:

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

OUTCOMES:

At the end of the course, learners will be able to:

CO1: Listen and comprehend the various strategies of listening and its significance in their area of specialisation successfully.

CO2: Speak appropriately and effectively in varied formal and informal contexts.

CO3: Read and comprehend texts effortlessly and understand the prevailing practices of testing in the recruitment process by the corporates and the institutional selection processes.

CO4: Communicate the corporate and social requirements in an impressive written mode.

CO5: Understand the basic grammatical structures and its applications and enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.

TEXT BOOKS:

1. Board of editors. **Fluency in English: A Course book for Engineering and Technology**. Orient Blackswan, Hyderabad: 2016.
2. Sudharshana. N. P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. **Professional English - II** (with work book). Sahana Publications, Coimbatore, 2023.
4. Agarwal R. S. A Modern Approach to Verbal and Non-verbal Reasoning. Chand & Co., New Delhi, 2012.
5. Ashraf Rizvi M. Effective Technical Communication. TATA McGraw Hill, New Delhi, 2007.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad, 2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007.
6. Lingua: Essays for TOEFL/IELTS, Dreamtech Press, New Delhi, 2016.
7. Lily Mangalam, Global English Comprehension, Allied Publishers Pvt. Ltd., New Delhi, 2014.
8. Sharon Weiner Green and Ira K. Wolf, Barron's GRE, Glagotia Publications Pvt. Ltd., 18th Edition, New Delhi, 2011.
9. Mohamed Elias, R. Gupta's IELTS/TOEFL Essays, Ramesh Publishing House, 6th Edition, New Delhi, 2016.

222MAT02	PROBABILITY AND STATISTICS (Common to all Branches)	L	T	P	C
		3	1	0	4

Course Objectives
- To impart the knowledge of basic probabilistic theory.
- To learn one dimensional discrete and continuous probability distributions occurring in natural phenomena.
- To extend the probability theory to two dimensional random variable and to study the statistical measures.
- To introduce the concept of sampling distributions and testing hypothesis techniques useful in decision making.
- To expose the statistical methods for analysis of variance and control limits.

UNIT I   PROBABILITY AND RANDOM VARIABLES   **9 + 3**
        Axioms of probability - Conditional probability - Total probability – Baye's theorem- Random variables - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II   PROBABILITY DISTRIBUTIONS   **9 + 3**
        Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties - applications.

UNIT III TWO-DIMENSIONAL RANDOM VARIABLES   **9 + 3**
        Joint Probability Distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Central limit theorem (Statement and applications only for independent and identically distributed random variables).

UNIT IV TESTING OF HYPOTHESIS   **9 + 3**
        Sampling distributions - Tests for single mean, proportion, difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for Independence of attributes using contingency table and Goodness of fit.

UNIT V   DESIGN OF EXPERIMENTS   **9 + 3**
         Analysis of variance – Completely Randomized Design (CRD) (one way classification) – Randomized Block Design (RBD) (two way classification) - Latin Square Design (LSD) - Control charts for measurements - $\bar{x}$ chart, R-chart.

TOTAL: 45 + 15 = 60 PERIODS

Note: Use of approved statistical table is permitted in the examination.

Course outcomes
At the end of the course the student will be able to
CO 1: Apply probability concepts in real life problems.
CO 2: Identify and design probability distribution models and interpret.
CO 3: Use the concept of two dimensional random variables that helps to understand and analyze the
       statistical measures of probability functions.
CO 4: Draw inference & conclusion through hypothesis testing.
  CO 5: Implement the knowledge of analysis of variance and control limits in real time applications.

TEXT BOOKS
1. Miller and Freund., "Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2012.
2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill publishing company Limited, New Delhi, 2014.

REFERENCES
1. Spiegel, M.R, Schiller, J and Alu Srinivasan, R, "Schaum's Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi , 2010.
2. Gupta.S.C., & Kapoor,V.K., "Fundamentals of mathematical statistics", 11th edition, Sultan Chand & Sons publishers, New Delhi, 2013.

3. Ibe, O.C.,"Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.

4. Kandasamy.P,Thilagavathy,K.,&Gunavathi.K., "Probability, Statistics and Queueing Theory"., S.Chand & Company Ltd., New Delhi, 2014.

5. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill edition, New Delhi, 2014.

222EST03	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY (Common to all Branches)	L	T	P	C
		2	0	0	2

OBJECTIVES:
- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyse climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY   6
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION   6
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT III RENEWABLE SOURCES OF ENERGY   6
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT   6
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V SUSTAINABILITY PRACTICES   6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

TOTAL: 30 PERIODS

OUTCOMES:

1. To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
2. To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
3. To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
4. To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
5. To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

222PPI04	PYTHON PROGRAMMING (Integrated Course) (Common to all Non Circuit Branches)	L	T	P	C
		3	0	2	4

OBJECTIVE(S):
1. To know the basics of algorithmic problem solving
2. To develop Python programs with conditionals and loops.
3. To define Python functions and call them.
4. To use Python data structures –- lists, tuples, dictionaries.
5. To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING **9** Fundamentals of Computing, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA EXPRESSIONS, STATEMENTS **9** Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL STATEMENTS AND FUNCTIONS **9** Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search

UNIT IV LISTS, TUPLES, DICTIONARIES **9** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: Create- add- delete from a Dictionary- Operations associated with pairs of data, and methods; advanced list processing - list comprehension; Illustrative programs:To test if a variable is a list or tuple or a set, selection sort, insertion sort, merge sort, histogram, ,Retail Bill Preparation.

UNIT V FILES, MODULES, PACKAGES **9** Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file. Case Study: Python Libraries (Numpy, Pandas, Matplotlib, PyGame)

PYTHON PROGRAMMING LABORATORY
LIST OF PROGRAMS:
1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers and largest number in a list using functions
7. Finding factorial of a given number using recursive function.
8. Take a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions

14. Programs that take command line arguments (word count)
15. Implementing programs using written modules and Python Standard Libraries.
16. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 45 h

COURSE OUTCOMES:
Upon completion of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple python programs
CO3: Structure simple Python programs for solving problems and decompose into functions.
CO4: Represent compound data using Python lists, tuples, and dictionaries.
CO5: Read and write data from/to files and use python packages in developing simple applications

TEXT BOOKS:
1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python
3. Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

REFERENCE BOOKS:
1. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.
2. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.

222MST05	MATERIAL SCIENCE	L	T	P	C
	(Common to ME, AE, CE and CH)	2	0	0	2

COURSE OBJECTIVES:

1. To make the students to understand the basics of crystallography and its importance in studying materials properties.
2. To understand the conducting and Dielectric properties of materials including Classical, Quantum and Band theories.
3. To instill knowledge on physics of semiconductors.
4. To establish a sound, grasp of knowledge on different magnetic properties of materials.
5. To inculcate an idea of significance of modern engineering materials like Shape memory alloys and nano materials with its applications.

UNIT I: PHYSICS OF CRYSTALS   6

Definitions: Crystal, poly-crystal, liquid crystal, lattice, basis, unit cell, primitive cell - Bravais lattices - Characteristics of SC, BCC, FCC and HCP Structures - Miller indices - d-spacing in Cubic structure -relation between lattice parameter and density.

UNIT II: CONDUCTING AND DIELECTRIC MATERIALS   6

Conducting Materials: Classical free electron theory - Expression for electrical and thermal conductivity – Wiedmann - Franz law– drawbacks - Quantum free electron theory - Fermi-Dirac statistics - Density of energy states – Band theory of solids.

Dielectric Materials: Electric force, electric field, electrical susceptibility, dielectric constant, polarization and polarizability - dielectric loss - dielectric breakdown.

UNITIII: SEMICONDUCTING MATERIALS   6

Energy band diagram - Types of Semiconductors: direct and indirect band gap, Elemental and

Compound, Intrinsic and Extrinsic Semiconductors - carrier concentration in intrinsic semiconductors - Hall effect - applications of semiconducting materials.

UNIT IV: MAGNETIC MATERIALS   6

Definition - Magnetic field, magnetic force, magnetic induction, Bohr magneton, permeability, magnetic susceptibility - Dia, para and ferro magnetism - Domain theory - Hysteresis loop - Antiferromagnetism -ferri magnetism - ferrites.

UNIT V: MODERN ENGINEERING MATERIALS   6

Shape memory alloys (SMA): Working principle of SMA - characteristics - Hysisteris, Pseudo elasticity and Super elasticity - applications. Nano materials: Properties - preparation - ball milling - Plasma arcing method - Electro deposition - applications.

TOTAL HOURS: 30

COURSE OUTCOMES:

At the end of the course, the students should be able to

1. Know basics of crystal physics and its importance for various material properties.
2. Gain knowledge on the conducting and dielectric properties of materials and their applications.

3. Understand about physics of semiconducting materials.
4. Understand the properties of various magnetic materials.
5. Gain knowledge about SMA and nano materials and its applications.

TEXT BOOKS:

1. R. N. Jayaprakash, Physics for information science, Sahana publication, 2022
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
3. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.
4. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
5. Parag K. Lala, Quantum Computing: A Beginner& Introduction, McGraw-Hill Education (Indian Edition), 2020.

REFERENCES:

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and
3. Information Science, Academic Press, 2013.
4. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge
1. Univ.Press, 2008.
5. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
6. B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.

222EMT06	ENGINEERING MECHANICS (ME, AE, CE)	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:
1.   To understand the vectorial and scalar representation of forces and moments.
2.   To understand the static equilibrium of particles and rigid bodies in two dimensions.
3.   To understand the concepts of centroids and moment of inertia of composite sections.
4.   To understand the principle of work and energy.
5.   To enable the students to comprehend the effect of friction on equilibrium.

PRE-REQUISITES: Knowledge of Engineering Physics
UNIT I BASICS & STATICS OF PARTICLES   9
Introduction-Units and Dimensions-Laws of mechanics - Lame's theorem, Parallelogram and Triangular law of forces, Polygon force, Resolution and Composition of forces, Equilibrium of a particle-Forces in space - Equilibrium of a particle in space-Equivalent systems of forces-Principle of transmissibility-Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES   9
Free body diagram-Types of supports and their reactions-Requirements of stable equilibrium-Moments and Couples, Moment of a force about a point and about an axis-Vectorial representation of couples- Varignon's theorem-Equilibrium of Rigid bodies in two dimensions- Equilibrium of Rigid bodies in three dimensions – Examples.

UNIT III PROPERTIES OF SURFACES AND SOLIDS   9 Determination of Areas and Volumes-First moment of area and the centroid of sections - rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula, Second and product moments of plane area - Rectangle, triangle, circle from integration-T section, I section, Angle section, Hollow section by using standard formula, Parallel axis theorem and perpendicular axis theorem.

UNIT IV DYNAMICS OF PARTICLES   9
Displacement, Velocity and Acceleration, their relationship, Relative motion- Rectilinear motion-Curvilinear motion, Newton's law-Work Energy Equation of particles-Impulse and Momentum-Impact of elastic bodies.

UNIT V FRICTION   9
Frictional force - Laws of Coloumb friction - Simple contact friction - Rolling resistance - Belt friction - Ladder friction - wedge friction.

                                                                    TOTAL: 45 Hours

COURSE OUTCOMES:
The students will be able to
1. Explain the differential principle applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
2. Find solution for problems related to equilibrium of particles.
3. Solve the Moment of inertia for different 2-D plane figures.
4. Analyse the forces in any structures.
5. Solve rigid body subjected to frictional forces.

TEXT BOOKS:
1. Bhavikatti S S, "Engineering Mechanics", New Age International Publisher, 6th Edition, 2018.
2. Dr. Gujral I S, "Engineering Mechanics", Lakmi Publications, Second Edition, Reprint, 2016.

REFERENCE BOOKS:
1. Ferdinand Beer, Jr. Johnston, David F Mazurek, Philip J Cornwell and Sanjeev Sanghi, "Vector Mechanics for Engineers Static and Dynamics", McGraw Hill Education Private Limited, 2019.
2. Khurmi R S, "Engineering Mechanics", S Chand Publisher, 20th Edition, 2019.
3. Dr. Bansal R K and Sanjay Bansal, "Engineering Mechanics", Lakshmi Publication, 8th Edition, 2015.
4. Rajput R K, "A Textbook of Applied Mechanics", Laxmi Publications, 3rd Edition, Reprint, 2015.
5. Ramamrutham S, "Engineering Mechanics (S.I Units)", Dhanpat Rai Publications, 10th Edition, Reprint 2015.

222PHP01	ENGINEERING PHYSICS LABORATORY (Common to all Non Circuit Branches)	L	T	P	C
		0	0	2	1

Course Objectives:
- To understand the practical concepts of interference and diffraction.
- To understand the concept of velocities of sound in different liquids.
- To get better knowledge of modulus of elasticity.
- To understand the concepts of thermal conductivity.
- To understand the concept of viscosity of liquids.

LIST OF EXPERIMENTS
1. (a) Determination of laser Parameters-Wavelength.
   (b) Particle size determination using diode laser.
1. Determination of Young's modulus of the material- uniform bending.
2. Determination of (i) the moment of inertia of the disc and (ii) the rigidity modulus of the material of a wire.
3. Determination of thickness of a thin Wire-Air wedge method.
4. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
5. Determination of wavelength of mercury spectrum-spectrometer grating.
6. Determination of Young's modulus of the material-Non uniform bending.
7. Determination of viscosity of liquid-Poiseuille's method.
8. Determination of acceleration due to gravity 'g' – Compound pendulum.
9. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
10. Determination of wavelength of monochromatic light – Newton's ring method.

Course Outcomes:
At the end of the course students will be able to:
1. Understand the moduli of elasticity of various materials.
2. Understand the phenomenon of diffraction and interference of light using optical components.
3. Acquire knowledge of viscosity and compressibility of various liquids.
4. Understand the concept of heat transfer through conductors and bad conductors using Lee's disc.
5. Acquire knowledge about acceleration due to gravity.

222HST07	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS

References

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by:
3. International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
6. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
7. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
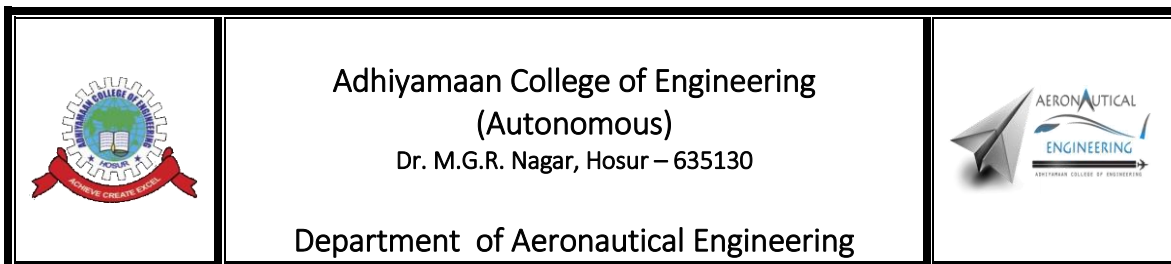
SEMESTER-III

Adhiyamaan College of Engineering, Hosur - 635 130	
Curriculum for the programmes under Autonomous scheme	
Regulation	2022
Programme Name	B.E(Aeronautical Engineering)

Sl No.	III Semester		Hours/Week			
	Course Code	Course Title	L	T	P	C
1	322MAT01	Engineering Mathematics -III	3	1	0	4
2	322AET02	Fundamentals of AerospaceEngineering	3	0	0	3
3	322AET03	Mechanics of Machines	3	0	0	3
4	322AET04	Fluid Mechanics and FluidMachinery	3	0	0	3
5	322AEI05	Solid Mechanics	3	0	2	4
6	322AET06	Aircraft Electrical and Electronics Systems	3	0	0	3
7	322GEV01	Professional Development Course	0	0	2	1
8	322AEP07	Fluid Mechanics Laboratory	0	0	2	1
9	322AEP08	UAV Laboratory	0	0	2	1

SUB. CODE	THEORY	L	T	P	C	IA	EA	TOTAL
322AET02	FUNDAMENTALS OF AEROSPACE ENGINEERING	3	0	0	3	40	60	100

COURSE OBJECTIVES
Students will be able to
   a) Understand and express the concepts and evolution of flight.
   b) Describe different types of flying vehicles.
   c) Introduce basic aerodynamics, structural elements and propulsion of aircrafts
   d) Introduce the fundamental space mechanics
   e) describe the basic concept related to space vehicles

UNIT I   AIRCRAFT CONFIGURATIONS   **9 Periods**
History of flight-different types of flight vehicles, classification, components and functions of typical transport aircraft, three view diagram, helicopter and UAV parts and functions.

UNIT II   BASICS OF AERODYNAMICS   **9 Periods**
Physical properties and structure of the atmosphere, ISA, temperature, pressure and altitude relationships, Newton's law of motions applied to aeronautics - aerofoil and wing geometry, NACA series airfoils, generation of lift, Mach number and ranges, aerodynamic center, pressure coefficients, aspect ratio, types of drag- induced drag, lift and drag curves, sweepback on wing, basics of pitot tube

UNIT III   AIRPLANE STRUCTURES AND MATERIALS   **9 Periods**
General types of construction, monocoque and semi-monocoque, typical wing and fuselage structure. metallic and non-metallic materials, use of aluminium alloy, magnesium alloy, titanium, stainless steel, plastics, composite materials and smart structures, applications.

UNIT IV   POWER PLANTS   **9 Periods**
Classification of propulsive engines -basics about piston, turbojet, turboprop and turbofan - use of propeller and jets for thrust production -equations, principles of operation of rocket, types of rockets and typical applications, exploration into space- India.

UNIT V   BASICS OF SPACE MECHANICS   **9 Periods**
Keplar laws, equation, two body problem, fundamentals of orbital mechanics, orbital elements. Orbital transfers, space environment-atmosphere, radiation and magnetic field, space debris.

                                                                TOTAL: 45 Periods

COURSE OUTCOMES
On completion of the course students will be able to
   a) Identify the component of aircraft
   b) Develop the knowledge on basic aerodynamics
   c) Identify suitable materials for aircraft structure
   d) Analyze the different types of power plants used in aircraft propulsion.
   e) Understanding the basics of space mechanics

TEXT BOOKS
   1. Anderson, J.D., "Introduction to Flight", Tata McGraw-Hill, 2010.

REFERENCE BOOKS / WEB LINKS
   1. Kermode, A.C., "Mechanics of Flight", Pearson Education; 11th edition
   2. Kermode, A.C, "Flight without Formula", Pearson Education; 5th edition

SUB. CODE	THEORY	L	T	P	C	IA	EA	Total
322AET03	MECHANICS OF MACHINES	3	0	0	3	40	60	100

COURSE OBJECTIVES
Students will be able to
a) Understand the principles in the formation of mechanisms and their kinematics.
b) Understand the importance of cams and gear mechanism
c) Understand the effect of friction in different machine elements
d) Understand the static and dynamic forces and toques acting on simple mechanical systems
e) Understand the importance of balancing of revolving and reciprocating masses in machine elements

UNIT I KINEMATIC OF MECHANICS   **9 Periods**
Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain –Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons, develop a prototype of different mechanisms

UNIT II   CAMS AND GEARS   **9 Periods**
Cams – classifications – displacement diagrams - layout of plate cam profiles– derivatives of followers motion - Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains

UNIT III   FRICTION   **9 Periods**
Sliding and Rolling Friction angle – friction in threads – Friction Drives – Friction clutches – Belt and rope drives - Ratio of tensions – Effect of centrifugal and initial tension– Condition for maximum power transmission – Open and crossed belt drive.

UNIT IV   FORCE ANALYSIS   **9 Periods**
Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members

UNIT V BALANCING AND MECHANISM FOR CONTROL   **9 Periods**
Static and Dynamic balancing – Single and several masses in different planes –Balancing of reciprocating masses- primary balancing and concepts of secondary balancing Gyroscopes –Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes

TOTAL: 45 Periods

COURSE OUTCOMES
On completion of course students will be able to
a) Assess different mechanisms with their working methods
b) Apply the concepts of cams and gear mechanism
c) Apply the concepts of friction in different machine elements
d) Analyze the static and dynamic forces and toques acting on simple mechanical systems
e) Analyze the unbalanced forces in revolving and reciprocating masses in machine elements

TEXT BOOKS
1. Rattan S. S. - 'Theory of Machines' - McGraw Hill India Pvt. Ltd. - 2014 - 4th Edition
2. Ghosh A. and Mallick A. K. - 'Theory of Mechanisms and Machines' - Affiliated East West Press Pvt. Ltd., New Delhi - 2008

REFERENCE BOOKS / WEB LINKS
1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007
3. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", Oxford University Press, 2003
4. Ramamurthi. V, "Mechanisms of Machine", Narosa Publishing House, 2002.

SUB. CODE	THEORY	L	T	P	C	IA	EA	Total
318AET04	FLUID MECHANICS AND MACHINERY	3	0	0	3	40	60	100

COURSE OBJECTIVES

Students will be able to
   a) give fundamental knowledge of fluid, its properties and behavior
   b) imbibe basic laws and equations used for analysis of static and dynamic fluid flows and to enable determining the losses in a flow system
   c) introduce fluid boundary layer development concept
   d) enable determining performance parameters of hydraulic pimps
   e) enable determining performance parameters of turbines

UNIT I   PROPERTIES OF FLUIDS   **9 Periods**

Introduction- Fluid -Application area of Fluid Mechanics, No-Slip Condition, A brief history of Fluid Mechanics. **Classification of Fluid Flows**- System and Control Volume **-** Continuum-Properties of Fluids and their influence on fluid motion. **Pressure**: -Pressure at a point – Variation of pressure with depth, The barometer and atmospheric pressure, Gauge and vacuum pressures-Static, dynamic and Stagnation Pressures- – measurement of pressure-Piezometer, U-tube and differential manometers-Pitot tube- Buoyancy. Recent developments in pressure measurements (steady & unsteady).

UNIT II   FLUID FLOW GOVERNING EQUATIONS   **9 Periods**

Modeling of Fluid Flow - Control Volume: Fixed and Moving - Infinitesimal Fluid Element: Moving and Fixed - Substantial Derivative - Reynolds Transport Theorem - Type of fluid flows - Governing Equations of Fluid Flows: Continuity, momentum and energy equations in integral and differential form in Cartesian co-ordinate system. Refractive and Surface flow visualization techniques-Plots of Fluid flow data-Equation of continuity for one dimensional flow.

UNIT III   FLUID KINEMATICS AND DYNAMICS   **9 Periods**

Fluid dynamics: Surface and body forces -Euler's and Bernoulli's equations for flow along a stream line, Total energy line-Hydraulic gradient line. General energy equation.

Closed conduit flow: Reynold's experiment- Reynolds number-The Entrance Region-Entry Length-Laminar flow in pipes-Darcy Weisbach equation- Turbulent Flow in Pipes-Minor losses in pipes- Pipes in series and Pipes in parallel-Measurement of flow: Venturi meter and orifice meter, Flow through nozzle-basics. Recent developments in friction and discharge measurements.

UNIT IV   BOUNDARY LAYER CONCEPTS AND DIMENSIONAL ANALYSIS   **9 Periods**

Boundary Layer Concepts: Definition, boundary layer thickness, displacement thickness, momentum thickness and energy thickness, characteristics along thin plate, Development of laminar and turbulent boundary layers, boundary layer in transition, separation of boundary layer, submerged objects – drag and lift-Drag force on a flat plate due to Boundary layer.

Dimensional Analysis and Modeling: Need for dimensional analysis-Dimensional Homogeneity – Dimensional Analysis and Similarity –The Method of Repeating Variables and the Buckingham Pi Theorem – Similitude –Types of similitude - Dimensionless parameters- Application of dimensionless parameters – Model analysis.

UNIT V TURBINES   **9 Periods**

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine - working principle, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Turbine scaling laws- Specific speed, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer

TOTAL: 45 Periods

COURSE OUTCOMES

On completion of the course students will be able to

    a) Define and distinguish and perform calculations to determine fluid properties
    b) Apply conservation principles to formulate governing equations for fluid flows.
    c) Apply fluid kinematic and dynamic relations to measure losses and discharge through pipes of Different arrangements
    d) Outline boundary layer properties and develop non-dimensional numbers to model fluid dynamic Situations
    e) Classify, compare, analyze and experiment to determine the performance parameters of turbines

TEXT BOOKS

1 Yunus A. Cengel and John M. Cimbala. "Fluid Mechanics Fundamentals and Applications", McGraw Hill Edition 2006, Sixth Reprint 2009.
2 Frank M White, "Fluid Mechanics", McGraw Hill, 8th Edition, 2015

REFERENCE BOOKS

1 Dr. R. K. Bansal "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, Revised Ninth Edition
2 Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
3 Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, "Fluid Mechanics and Machinery", 2011

Sub. Code	THEORY	L	T	P	C	IA	EA	Total
322AEI05	SOLID MECHANICS	3	0	2	4	50	50	100

COURSE OBJECTIVES
Students will be able to
a) Understand the theoretical basis about the stress, strain and elastic modulus concepts in various components
b) Assess shear stresses, bending moments and stress variation through mathematical models of beams subjected to axial load, transverse load, couples and combination of loads.
c) Understand the principles underlying in the deflection of solid structural member such as a beam subjected to different types of loads.
d) Apply the basic mechanical principles to solve practical problems related to springs and shafts subjected to axial load, torsion, bending, and transverse shear and combined loading.
e) Analyze the state of stress and strain at any point in a member.

UNIT I INTRODUCTION   9 Periods
Definition of stress, strain and their relations - stress-strain curves – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them Bars of varying section – composite bars – Temperature stresses.

UNIT II STRESSES IN BEAMS   9 Periods
Shear force & bending moment diagrams for various types of beams with different loading conditions - bending and shear stress variation in beams of symmetric sections like rectangular, circular, I and T sections

UNIT III DEFLECTION OF BEAMS   9 Periods
Deflection of beams subjected to different loading conditions through Double integration method – Macaulay's method - Area moment method

UNIT IV TORSION – SPRINGS   9 Periods

Torsion: Torsion of solid and hollow circular shafts – shear stress variation.
Springs: Open and closed-coiled helical springs – stresses in helical springs.

UNIT V BIAXIAL STRESSES   9 Periods
Stresses in thin-walled pressure vessels – combined loading of circular shaft with bending, torsion and axial loadings – Mohr's circle and its construction – determination of principal stresses.

TOTAL: 45 Periods

COURSE OUTCOMES
a) Design and conduct experiments on mechanical testing and also could analyze and interpret data
b) Apply shear force and bending moment diagrams to analyse the resistance offered by the beam and able to solve practical problems and through the software.
c) Apply computational skills to formulate and solve problems related to the deflections of beams subjected to mechanical loads.
d) Describe and recognize the behaviour of materials upon normal external loads on springs and shafts
e) Identify, formulate, and solve structural engineering problems

TEXT BOOKS
1. R. Subramanian, "Strength of Materials", Oxford University Press, Third edition, 2016

REFERENCE BOOKS / WEB LINKS
1. Dym,C.L, and Shames,I.H., „Solid Mechanics", McGraw Hill, Kogakusha, Tokyo, 1973
2. William Nash, "Strength of Materials", Tata McGraw Hill, 2004
3. Timoshenko and Young "Strength of Materials" Vol. I & II
4. Stephen Timoshenko, „Strength of Materials", Vol I & II, CBS Publishers and Distributors, Third Edition.
5. Timoshenko,S. and Young, D.H., "Elements of Strength of Materials", T.Van Nostrand Co. Inc., Princeton, N.J.,

Sub. Code	THEORY	L	T	P	C	IA	EA	Total
322AEI05	Solid Mechanics Laboratory	3	0	2	4	60	40	100

COURSE OBJECTIVES

To have the knowledge in testing of mechanical properties of materials.

LIST OF EXPERIMENTS

1. Brinell Hardness test
2. Rockwell Hardness test
3. Vickers Hardness Test
4. Tension test
5. Torsion test
6. Izod Impact test
7. Charpy Impact test
8. Study of Reverse plate bending Fatigue test
9. Study of Rotating Beam Fatigue test
10. Testing of springs
11. Block Compression Test

Total: 45 Periods

COURSE OUTCOME

Students understands the various types of material testing and evaluation of mechanical properties

LIST OF EQUIPMENTS
(For a batch of 36 students)

Sl.No	Details of Equipments	Qty Required	For Experiments
1.	Hardness Testing Machine	1	1, 2, 3
2.	Universal Testing Machine	1	4, 11
3.	Impact Testing Machine	1	6, 7
4	Torsion testing machine	1	5
5	Compressive strength test machine	1	10

SUB. CODE	THEORY	L	T	P	C	IA	EA	Total
322AET06	**AIRCRAFT ELECTRICAL AND ELECTRONICS SYSTEM**	3	0	0	3	40	60	100

COURSE OBJECTIVE

Students will be able to

a) Work with Electrical and Electronics equipment's and Measuring Instruments
b) Design, simulate and build the Signal processing equipment's
c) Design, construct and assemble Block diagram of Electrical Equipment's
d) Integrate the wiring the system of a battery storage and handling.
e) Describe the Autopilot Systems

UNIT I BASICS OF ELECTRICAL SYSTEMS   **9 Periods**

Electronic & Electrical Measuring Instruments: Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors, standard deviation, Gaussian error analysis, Combination of errors. Theory and working principle of galvanometer, Analog Voltmeter, ammeter and Multi meters, Digital Voltmeter, Component Measuring Instruments, Q meter, Vector Impedance meter, Measurement of RF Power ,frequency & Voltage. Introduction to shielding, grounding and interference**.**

UNIT II SIGNAL GENERATION AND TRANSDUCERS   **9 Periods**

CRT Construction, Basic CRO circuits, CRO Probes, Oscilloscope Techniques of Measurement of frequency, Phase Angle and Time Delay, Multi beam, multi trace, storage & sampling Oscilloscopes. Curve tracers. Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis - Measurement Technique, Wave Analyzers, Frequency - selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion analyzer, Spectrum analyzer., Construction, Working Principles,

UNIT III CONTROL SYSTEMS ANALYSIS AND COMPONENTS   **9 Periods**

Open loop and close loop control systems. Block diagram algebra and transfer function. Differential equations, Determination of transfer function by block diagram reduction technique & signal flow graph method. Mason gain formula and calculation of transfer function. Basic component of electrical control system.

UNIT IV AIRCRAFT BATTERIES, DIGITAL AIRCRAFT SYSTEMS   **9 Periods**

Aircraft Storage Batteries: Dry Cells and Batteries; Lead Acid Storage Batteries & their maintenance procedures, Installation of Aircraft Batteries. Digital Aircraft Systems, Trouble Shooting Digital Circuits

UNIT V FLIGHT CONTROL SYSTEM   **9 Periods**

Electronic Flight Systems, Automatic Flight Control Systems, Automatic Flight & Landing Systems, Flight Management System, Ring Laser Gyro.

TOTAL: 45 Periods

COURSE OUTCOMES
a) Solution oriented procedure on the Errors occurring on electrical systems
b) To maintain the Signal processing equipment's and its working
c) Construction of Block diagram of Electrical Equipment's
d) Perform experiments with the thermal management system of a battery pack
e) Can build the Autopilot Systems.

TEXT BOOK
1. Aircraft Electrical and Electronic Systems Principles, operation and maintenance-Mike Tooley and David Wyatt 2016.

REFERENCE BOOKS / WEB LINKS
1. Smarjith Ghosh, "Fundamentals of Electrical and Electronics Engineering", Prentice Hall (India) Pvt. Ltd., 2010.
2. Thomas K Eismin,"Aicraft Electricity and Electronics", Six Edition, McGraw Hill, 2014.

Sub. Code	LAB	L	T	P	C	IA	EA	Total
322GEV01	**PROFESSIONAL DEVELOPMENT**	0	0	2	1	60	40	100

COURSE OBJECTIVE

a) To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.

b) To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered

c) To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD

- Create and format a document
- Working with tables
- Working with Bullets and Lists
- Working with styles, shapes, smart art, charts
- Inserting objects, charts and importing objects from other office tools
- Creating and Using document templates
- Inserting equations, symbols and special characters
- Working with Table of contents and References, citations
- Insert and review comments
- Create bookmarks, hyperlinks, endnotes footnote
- Viewing document in different modes
- Working with document protection and security
- Inspect document for accessibility

MS EXCEL

- Create worksheets, insert and format data
- Work with different types of data: text, currency, date, numeric etc.
- Split, validate, consolidate, Convert data
- Sort and filter data
- Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
- Work with Lookup and reference formulae
- Create and Work with different types of charts
- Use pivot tables to summarize and analyse data
- Perform data analysis using own formulae and functions
- Combine data from multiple worksheets using own formulae and built-in functions to generate results
- Export data and sheets to other file formats
- Working with macros
- Protecting data and Securing the workbook

MS POWERPOINT

- Select slide templates, layout and themes
- Formatting slide content and using bullets and numbering
- Insert and format images, smart art, tables, charts
- Using Slide master, notes and handout master
- Working with animation and transitions
- Organize and Group slides
- Import or create and use media objects: audio, video, animation
- Perform slideshow recording and Record narration and create presentable videos

COURSE OUTCOMES

On successful completion the students will be able to

a) Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
b) Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
c) Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

Sub. Code	LAB	L	T	P	C	IA	EA	Total
322AEP07	**FLUID MECHANICS AND MACHINERY LABORATORY**	0	0	2	1	60	40	100

COURSE OBJECTIVES

To study the flow measurement and the performance of fluid machinery

LIST OF EXPERIMENTS

1. Calibration of venturimeter
2. Pressure measurement with pitot static tube
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem
5. Performance test on centrifugal pumps
6. Performance test on reciprocating pumps
7. Performance test on pelton wheel turbine
8. Performance test on Francis turbine
9. Performance test on Kaplan turbine
10. Determination of Viscosity of Fluid

COURSE OUTCOMES

On completion of the course, the student is expected to be able to

a) Verify and apply Bernoulli equation for flow measurement like Orifice/Venturi meter.
b) Measure friction factor in pipes and compare with Moody diagram and verify
c) Determine the performance characteristics of Rotodynamic pumps.
d) Determine the performance characteristics of positive displacement pumps
e) Determine the performance characteristics of turbines.

LIST OF EQUIPMENTS

(For a batch of 36 students)

Sl.No	Details of Equipments	Qty Req.	Experiment No.
1.	Venturimeter setup	1	1,3
2.	Pipe friction set up	1	3
3.	Pitot tube set up	1	2,4
4.	Centrifugal pump	1	5
5.	Reciprocating pump	1	6
6.	Pelton wheel turbine, Francis and Kaplan turbine,	1 (each one)	7, 8, 9
7.	Viscosity Meter	1	10

Sub. Code	LAB	L	T	P	C	IA	EA	Total
322AEP08	**UAV Laboratory**	0	0	2	1	60	40	100

COURSE OBJECTIVE
   a) Recognize and describe the role of unmanned aerial vehicles (UAVs) in past, present, and future society.
   b) Comprehend and explain various components of UAVs
   c) Comprehend and explain basics of flight and flight control systems
   d) Understand and describe basic regulations applicable to UAV flight
   e) Understand and describe analysis of electric systems

LIST OF EXPERIMENTS
   1. Study of lift generation method
   2. Analysis of LOS / BLOS
   3. Study of ethical implications
   4. Analysis of electric systems
   5. Study of Unmanned Aerial System propulsion
   6. Analysis of on-board flight control
   7. Study of internal combustion engines / electrical motors
   8. Analysis of sensing / surveillance
   9. Study of turbine engines
   10. Building a working model of UAV flight

TOTAL: 45 Periods

COURSE OUTCOME
Students will able to
   a) Define the working of a UAV system
   b) Create the electrical system for UAV
   c) Apply sensing and surveillance
   d) Perform sensing and surveillance using a UAV flight
   e) Solve issues of a UAV system