

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI
REGULATIONS – 2025 (R-25)
For I B.Tech. SYLLABI – I & II Semesters

LINEAR ALGEBRA AND CALCULUS

Credits: 3**Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	CH1101C, CE2101C, EE3101C, EC4101C, ME5101C, CS46101C	CH, CE, EE, EC, ME, CS (All Branches)

Course Objectives: The objective of this course is to familiarize the prospective engineers with techniques in basic linear algebra and calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics to handle various real-world problems and their applications that they would find useful in their disciplines. The students will learn:

1. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations.
3. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form.
4. Geometrical approach to the mean value theorems and their application to the mathematical problems.
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Partial differentiation, concept of total derivative and Finding maxima and minima of function of two and three variables.
7. Evaluation of multiple integrals and their applications

Course Outcomes: At the end of the course, the student will be able to

1. Develop matrix algebra techniques that is needed by engineers for practical applications.
2. Find the Eigenvalues and Eigen vectors and Reduce the quadratic form to canonical form using orthogonal transformations.
3. Learn important tools of calculus in higher dimensions.
4. Find the extreme values of functions of two variables with/ without constraints
5. Familiarize with double and triple integrals of functions of several variables in two and three dimensions.

UNIT - I: Matrices 10 L

Matrix multiplication. Rank of a matrix by Echelon form and Normal form, determinants, Cramer's Rule, inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method and Gauss-Jordan elimination.

UNIT - II: Linear Transformation and Orthogonal Transformation 9 L

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation. orthogonal Matrices, eigen bases, Diagonalization, Inner

product spaces, Gram-Schmidt orthogonalization.

UNIT - III: Calculus**8 L**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT - IV: Partial differentiation and Applications (Multi variable calculus) 8 L

Definitions of Limit and continuity, Euler's Theorem, Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, maxima and minima of functions of two variables, and three variables using method of Lagrange multipliers.

UNIT-V: Multiple Integrals (Multi variable Calculus) 8 L

Multiple Integration: Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2018.
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, 5th Edition, Alpha Science International Ltd., 2021 (9th reprint).

REFERENCE BOOKS:

1. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
2. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi, 2021.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	3-0-0	CH1201C,CE2201C,EE3201C, EC4201C,ME5201C,CS6201C	CH, CE, EE, EC, ME, CS (All Branches)

Pre-requisites: Mathematical Knowledge at pre-university level**Course Objectives:** To learn

- Methods of solving the differential equations of first and higher order.
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals
- To furnish the learners with basic concepts and techniques to lead them into advanced level by handling various real-world applications.

Course Outcomes: At the end of the course, the student will be able to:

1. Identify whether the given differential equation of first order is exact or not and Solve the differential equations related to various engineering fields.
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Identify solution methods for partial differential equations that model physical processes.
4. Interpret the physical meaning of different operators such as gradient, divergence and curl.
5. Evaluate the line, surface and volume integrals and converting them from one to another and Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I Differential equations of first order and first degree**8L**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: orthogonal trajectories (only in Cartesian Coordinates). Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits (RL & RC)

UNIT II Linear differential equations of higher order (Constant Coefficients)**9L**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Second order linear differential equations with constant coefficients, method of variation of parameters. Simultaneous linear equations, Applications to Electric Circuits problems and Simple Harmonic motion.

UNIT-III: Laplace transforms**10 L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT IV Vector differentiation**8 L**

Scalar and vector point functions, vector operator ∇ , ∇ applies to scalar point functions- Gradient, ∇ applied to vector point functions-Divergence and Curl, Directional derivatives, Tangent plane and normal line, vector identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT V Vector integration**8 L**

Line integral-circulation-work done, surface integral-flux, and Volume Integrals, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2017.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, 5th Edition, Alpha Science International Ltd., 2021 (9th reprint).
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2018.

REFERENCE BOOKS:

1. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
2. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. Dennis G. Zill and Warren Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
5. Michael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson education
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

APPLIED PHYSICS**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	EE3102C, EC4102C, CS6102C	EE, EC & CS

Pre-requisites: 10 + 2 Physics**Course Objectives:** The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

Course Outcomes: At the end of the course the student will be able to:

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

Unit I: QUANTUM MECHANICS

Wave – particle duality – de Broglie Concept of Matter Waves – Properties of Matter Waves – Division and Germer Experiment – G. P. Thomson Experiment – Heisenberg's Uncertainty Principle – Schrodinger's Time Dependent and Independent Wave equation – Significance of Wave Function – Electron in Infinite Square Potential Well – Probability Densities and Energy Levels.

Unit II: SEMICONDUCTORS AND DEVICES

Introduction to Semiconductors - Intrinsic and Extrinsic semiconductors – Hall effect – Direct and Indirect Band gap of Semiconductors – Construction, Principle of Operation and Characteristics of P-N Junction Diode, Zener diode and LED and solar cells, their structure, materials, working principle and characteristics.

Unit –III: DIELECTRIC AND MAGNETIC MATERIALS

Introduction – Dielectric polarization – Dielectric polarizability – Susceptibility – Dielectric constant – Types of polarizations – Electronic (Quantitative), Ionic (Quantitative) and Orientation Polarizations (Qualitative) – Clausius – Mossotti equation.

Introduction – Magnetic dipole moment – Magnetization – Magnetic Susceptibility and Permeability – Classification of magnetic materials: Dia, Para, Ferro, Anti Ferro and Ferri magnetic materials – Hysteresis – Soft and hard magnetic materials.

Unit IV: NANOPHYSICS AND NANOTECHNOLOGY

Introduction to Nanomaterials – Properties: Optical properties – Quantum confinement – Electrical properties. Synthesis of nanomaterials: Ball Milling, Arc Deposition Method – Chemical Vapour Deposition – Pulsed Laser Deposition. Characteristics of C_{60} (Zero dimensional), Carbon Nanotubes (One dimensional) and Graphene (Two dimensional). Applications of Nanomaterials.

Unit V: LASER AND FIBER OPTICS

Laser beam characteristics – Three quantum processes – Einstein Coefficients and their relation – Lasing action – Pumping Methods – Ruby Laser – He-Ne Laser – Semiconductor laser – Applications of laser.

Introduction to Optical fiber – Advantages of Optical fiber – Total internal reflection – Construction of optical fiber – Acceptance angle – Numerical aperture – Classification of optical fibers – Losses in optical fiber – Optical fiber for communication system – Applications.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1st Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

ENGINEERING PHYSICS**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	3-0-0	CH1202, CE2202C, ME5202C	CH, CE, & ME

COURSE OBJECTIVES

- 1 Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.
- 2 To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
- 3 Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law
- 4 To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- 5 Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.
6. To Understand the Physics of Semiconductors and their working mechanism, Concepts utilization of transport phenomenon of charge carriers in semiconductors.

COURSE OUTCOMES

- CO1 : Explain the need of coherent sources and the conditions for sustained interference and Identify the applications of interference in engineering and Analyze the differences between interference and diffraction with applications and Illustrate the concept of polarization of light and its applications.
- CO2 : Classify various crystal systems. Identify different planes in the crystal structure (L3). Analyze the crystalline structure by Bragg's X-ray diffractometer.
- CO3 : Explain the concept of dielectric constant and polarization in dielectric materials and Classify the magnetic materials based on susceptibility and their temperature dependence.
- CO4 : Understand the quantum mechanics and ultimately the quantum behavior of charged particles when they are in motion.
- CO5 : Understand size dependent properties of Nano dimensional materials and their effective utilization in making Nano and micro devices.

Unit –I: Wave Optics

Interference: Huygens's Principle – Principle of Superposition – Interference of Light– Young's double slit experiment– Newton's Rings.

Diffraction: Introduction– Fresnel and Fraunhofer Diffractions– Fraunhofer Diffraction due to single slit, double slit and Diffraction grating

Polarization: Introduction – Types of polarization – polarization by reflection and Double refraction – Nicol's prism – Half wave and Quarter wave plates.

Unit– II: Crystallography

Space lattice, Basis, Unit Cell and Lattice parameters– Bravais Lattice– Crystal systems Coordination number – Packing fraction of SC, BCC and FCC – Miller indices– Separation between successive (hkl) planes– Bragg's law – X-Ray Diffractometer.

Unit –III: Dielectric and Magnetic Materials

Introduction– Dielectric polarization – Dielectric polarizability– Susceptibility– Dielectric constant – Types of polarizations – Electronic (Quantitative), Ionic (Quantitative) and Orientation Polarizations (Qualitative) – Clausius – Mossotti equation.

Introduction – Magnetic dipole moment – Magnetization– Magnetic Susceptibility and Permeability– Classification of magnetic materials: Dia, Para, Ferro, Anti Ferro and Ferri magnetic materials– Hysteresis – Soft and hard magnetic materials

Unit IV: Quantum Mechanics

Wave – particle duality – de Broglie Concept of Matter Waves – Properties of Matter Waves– Division and Germer Experiment – G. P. Thomson Experiment – Heisenberg's Uncertainty Principle – Schrodinger's Time Dependent and Independent Wave equation – Significance of Wave Function – Electron in Infinite Square Potential Well – Probability Densities and Energy Levels.

Unit V: Nanophysics and Nanotechnology

Introduction to Nanomaterials – Properties: Optical properties – Quantum confinement – Electrical properties. Synthesis of nanomaterials: Ball Milling, Arc Deposition Method – Chemical Vapour Deposition – Pulsed Laser Deposition.

Characteristics of C_{60} (Zero dimensional), Carbon Nanotubes (One dimensional) and Graphene (Two dimensional). Applications of Nanomaterials.

Text books:

1. "A Text book of Engineering Physics" - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. "Engineering Physics" - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. "Engineering Physics" - P.K.Palanisamy SciTech publications.

Reference Books: 1. "Fundamentals of Physics" - Halliday, Resnick and Walker, John Wiley & Sons.

2. "Engineering Physics" - M.R. Srinivasan, New Age international publishers (2009).
3. "Engineering Physics" - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
4. "Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
5. "Semiconductor physics and devices: Basic principle" - A. Donald, Neamen, Mc Graw Hill.
6. "Engineering Physics" - B.K. Pandey and S. Chaturvedi, Cengage Learning
7. "Solid state physics" – A.J.Dekker, Pan Macmillan publishers
8. "Introduction to Solid State Physics" - Charles Kittel, Wiley.

ENGINEERING CHEMISTRY**Credits: 3****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	CE2102C, ME5102C	CE & ME
II	3-0-0	EE3202C, EC4202C, CS6202C	EE, EC & CS

UNIT I : ATOMIC AND MOLECULAR STRUCTURE (12 LECTURES)

Postulates of quantum chemistry. Schrodinger equation. Particle in a box solutions, Molecular orbitals of diatomic molecules and plots of the multicenter orbitals, Equations for atomic and molecular orbitals, Energy level diagrams of diatomics, Pi-molecular orbitals of butadiene and benzene. Band structure of solids and the role of doping on band structures

UNIT II: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques.

UNIT III: CHEMICAL EQUILIBRIA, INTERMOLECULAR FORCES AND POTENTIAL ENERGY SURFACES

Use of free energy in Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Use of free energy considerations in metallurgy through Ellingham diagram. Equations of state of real gases and critical phenomena.

UNIT IV: PERIODIC PROPERTIES

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries, Born- Haber cycle, The use of reduction potentials, Properties of ionic and covalent compounds.

UNIT V : STEREOCHEMISTRY, ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings Synthesis of a commonly used drug molecule.

Reference/Textbooks

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane


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3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5th Ed.
[http:// bcs.whfreeman.com /vollhardtschore5e/default.asp](http://bcs.whfreeman.com/vollhardtschore5e/default.asp)
7. Engineering, Puri, by Manisha Agrawal

Course Outcomes:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometre levels, one has to base the description of all chemical processes at molecular levels. The course will enable the students:

1. To analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. To rationalize bulk properties and processes using thermodynamic considerations.
3. To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. To rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. To list major chemical reactions that are used in the synthesis of molecules.

PHYSICAL CHEMISTRY

Credits: 3		Assessment: 40 + 60	
Semester	L-T-P	Course Code	Branches
I	3-0-0	CH1102C	CH

Objectives:

Concepts related to homogeneous and heterogeneous catalysis, mechanisms of industrially important reactions, and spectroscopic methods for identification of compounds.

UNIT- I. Colloids: (12L):

Classification of colloids; Size, shape preparation and applications of sols. Kinetic, Optical & electrical Properties: Electro kinetic phenomena: Electrical Double Layer. Molecular weight determination of Macromolecules. Viscosity: Definition of viscosity, Determination of Viscosity; Surface Tension: Introduction, Surface energy, Contact Angle, Capillarity, Measurement of Surface Tension by Capillary rise method.

UNIT-II: Introduction to quantum theory for chemical systems: (6L + 2T):

Schrodinger equation and Particle in one dimensional box. Applications to Hydrogen atom, concepts of Atomic orbital's, many electrons system.

UNIT-III: Thermodynamics and Surface Chemistry: (12L):

Vander Waals Equation of state, Critical phenomenon, Colligative property. Adsorption: Introduction; Gibb's adsorption equation; Adsorption isotherms: Freundlich, Langmuir, BET adsorption equations.

UNIT-IV: Introduction to quantum mechanics (12L):

Blackbody radiation, Planck's equation and a concept of quanta, basic postulates of quantum mechanics, classical equipartition theorem, Hamiltonian function & Hamiltonian operator, Heisenberg's uncertainty principle.

UNIT-V: Principles of Spectroscopy and Chemical Bonding: (12L + 4T):

Principles of spectroscopy and selection rules. Electronic spectra, Surface characterization techniques. MO Theory, energy levels diagram of homo and hetero atomic molecules. Coordination Chemistry: Formation of coordination complexes, EAN rule for coordination compounds.

Reference Books:

1. Physical Chemistry: G.W.Castellan, Narosa
2. Physical Chemistry: P. W. Atkins: Oxford.
3. A Text book of Physical Chemistry: K. L. Kapoor: Macmillan

Course outcomes:

Students taking the course will

1. To understanding their optical and kinetic behavior and exploring their diverse application in various fields.
2. Describes the physical properties of nature at the scale of atomic and subatomic particle
3. Rationalized bulk properties and processes using thermodynamic considerations.
4. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
5. Get an understanding of the theoretical principles underlying molecular structure, bonding and properties.

ORGANIC CHEMISTRY

Credits: 3		Assessment: 40 + 60	
Semester	L-T-P	Course Code	Branches
II	3-0-0	CH1205C	CH

UNIT-I: Reactivity of organic molecules: (9L + 3T):

Factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. thermodynamic control of reactions. SN^1 and SN^2 reactions and Mechanism.

UNIT-II: Strategies for synthesis of organic compounds: (12L + 4T):

Preparation, stability and reactivity of Reactive intermediates, Substitution, elimination, Addition and rearrangement reaction, Role of solvents. Synthetic applications of - Zn/Hg, Na-NH₃LiAlH₄,

UNIT-III: Introduction to Stereochemistry: (6L+ 2T):

Stereo descriptors – R, S, E, Z. Enantiomers and Diastereomers. Race mates and their resolution. systems. Geometrical isomerism, optical isomerism and Optical activity. Conformations of cyclic and acyclic compounds.

UNIT-IV: Common organic reactions and their mechanisms (12L):

Friedel-Crafts, Claisen Condensation, Cannizzaro, Aldol condensation. Fischer-Troapsch synthesis, Birch reduction, pekings reaction, Riemer Tiemer reaction Wolf Kishner Reductio and Grignard reaction

UNIT-V: Aminoacids (12L):

Classification; General methods of preparation and properties of amino acids, polypeptide synthesis, General properties of proteins, colour tests, enzymes. Lipids, fats and steroids; nucleic acid, DNA & RNA - generation and structure. Carbohydrate: Classification, Glucose and fructose, Disaccharides: Sucrose, maltose.

Reference Books:

1. Organic Chemistry: Finar; I.L. — Vol — I & II, Pearson Education
2. Organic Chemistry: Morrison & Boyd; PHI/Pearson Education.
3. A guide Book to Mechanism in Organic Chemistry: Peter Sykes
4. Organic Chemistry: Loudon: Oxford

Course outcomes:

1. Know the fundamental concepts of structure and function in organic reactions, the use of Kinetics and thermodynamics to elucidate mechanisms of reactions
2. Be able to predict reactivity patterns and propose reasonable mechanisms
3. List major chemical reactions that are used in the synthesis of molecules.
4. To understanding organic reactions involves grasping reactions types, mechanism and their applications
5. To understanding their structure, classification and role in protein synthesis

EFFECTIVE COMMUNICATION SKILLS**Credits: 3****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	2-0-0	CH1103C, CE2103C, ME5103C	CH, CE & ME
II	2-0-0	EE3203C, EC4203C, CS6203C	EE, EC & CS

UNIT I Vocabulary Building

The concept of Word Formation- Root words from foreign languages and their use in English- Acquaintance with prefixes and suffixes from foreign languages in English form derivatives- Synonyms, antonyms, and standard abbreviations.

UNIT II Basic Writing Skills

Sentence Structures – Use of phrases and clauses in sentences –Importance of proper punctuation - Creating coherence – Organizing principles of paragraphs in documents - Techniques for writing precisely

UNIT III Identifying Common Errors in Writing

Subject-verb agreement -Noun-pronoun agreement -Misplaced modifiers -Article - Prepositions - Redundancies -Clichés

UNIT IV Nature and Style of sensible Writing

Describing - Defining - Classifying –Providing examples or evidence –Writing introduction and conclusion

UNIT V Writing Practices

Comprehension - Précis Writing –Essay Writing

Reference/Textbooks:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan. 2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp- Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and Pushpalata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes: At the end of the course, students will be able to

1. learn the elements of grammar and composition of English Language.
2. Learn literary texts such as Short stories and prose passages.
3. maintain linguistic competence through training in vocabulary, sentence structures and pronunciation.
4. develop communication skills by cultivating the habit of reading comprehension passages.
5. develop the language skills like listening, speaking, reading and writing.
6. Make use of self-instructed learner friendly modes of language learning through competence.

EFFECTIVE COMMUNICATION SKILLS LAB**Credits: 1****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	0-0-2	CH1108C, CE2108C, ME5108C	CH, CE & ME
II	0-0-2	EE3208C, EC4208C, CS6208C	EE, EC & CS

Listening Comprehension -Pronunciation, Intonation, Stress and Rhythm -
Common Everyday Situations: Conversations and Dialogues -Communication at
Workplace -Interviews -Formal Presentations

Reference/Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. LizHamp– Lyons and Ben Heasley. Cambridge Univ. Press. 2006
5. Communication Skills. Sanjay Kumar and Pushpalata. Oxford Univ. Press.2011
6. Exercises in Spoken English. Parts I-III. CIEFL, Hyderabad. Oxford Univ. Press

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

ELECTRONIC DEVICES AND CIRCUITS

Credits: 3			Assessment: 40 + 60
Semester	L-T-P	Course Code	Branches
II	3-0-0	EC 4206C	EC

Course Objectives: The objectives of this course are

- Students will be able understand the basic principles of all semiconductor devices.
- Understand the construction and working of PN junction diode, special diodes and also design and analyze basic rectifier circuits using semiconductor diodes.
- Understand the operating regions and need for biasing in transistor circuits.
- Understand the construction and working principles FET.
- Understand the Fundamentals of Optoelectronics.

UNIT I

Energy band theory of solids and transport phenomenon in semiconductors

Energy Band gaps, Energy bands in intrinsic and extrinsic silicon /Germanium, Density of Impurity States, Electrical Conductivity and Mobility, Electronic Properties of N-type and P-type semiconductors, Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors. Generation and recombination of carriers; Poisson and continuity equation, Hall – Effect and its Application.

UNIT II

Junction diode characteristics: Semiconductor Diodes Band structure of PN Junction, Quantitative Theory of PN Diode, and Volt – Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction, Zener and Avalanche Breakdowns, Tunnel Diode, Schottky Barrier Diode, Varactor Diode, LED, Photodiode.

Rectifiers: Diode equivalent circuits, Analysis of diode circuits, Characteristics and comparison of Half-wave, Full-wave and Bridge rectifiers, Analysis of filters (C, L, LC, and CLC) used with Full-wave rectifiers, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits.

UNIT III

Transistor Characteristics: Bipolar Junction Transistor NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Determination of h-parameters from BJT characteristics, Ebers-Moll Model, Multi Emitter transistor. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, α and β Parameters and the relation between them.

Transistor Biasing and Stabilization: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self-Bias, Bias Stability, Thermal Runaway, Thermal Stability, Transistor series and shunt voltage regulators, Illustrative problems.

UNIT IV

Field Effect Transistors: Characteristics and parameters of JFET, Pinch off and saturation regions, MOS capacitor, Depletion and Enhancement type of MOSFET, V-I characteristics, and small signal models of MOS transistor, UJT and its I-V characteristics, Metal Semiconductor FET, FET biasing schemes.

UNIT V

Optoelectronic Devices: Principle of operation and characteristics of LED, LCD, LDR, Photoconductor, Photodiode, Phototransistor, Solar cell, PIN photodiode, Charge-Coupled Devices, APD (avalanche photodiode) and their applications. Power Semiconductor Devices: Device structure, equivalent circuit and characteristics of PNP Diode, SCR, DIAC and TRIAC.

Text /Reference Books:

1. Ben G. Steetman and Sanjay Kumar Banerjee, "Solid State Electronic Devices," 7th edition, Pearson Publishers, 2015.
2. Jacob Millman, Christos Halkias, Chetan D Parikh, "**Integrated Electronics:** Analog and Digital Circuits and Systems", 2nd Edition, Tata Mcgraw Hill Education Private Limited, 2011.
3. Allen Mottershead, "Electronic Devices and Circuits: An Introduction", PHI Learning, 2011.
4. D. Neamen , D. Biswas "Semiconductor Physics and Devices", McGraw-Hill Education.
5. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
6. C.T. Sah, "Fundamentals of solid-state electronics," World Scientific Publishing Co. Inc, 1991.
7. Y. Tsididis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford University Press, 2011.

Course Outcomes: At the end of the course, student will be able to

1. Illustrate fundamentals of semiconductor physics for active devices (L2)
2. Demonstrate the characteristics of PN Junction diodes, special diodes and also evaluate the Performance of rectifiers using parameters such as ripple factor, efficiency, (L2)
3. Analyse the the input and output characteristics of BJT CE, CB, and CC Configuration and also understand the need for in a transistor biasing (L4)
4. Analyse the characteristics JFET and MOSFET. (L4)
5. Understand the characteristics of the transistors and Opto-electronic devices and their application in electronic circuits and also apply thyristors in power Switching and control circuits (L2)

Mapping of course outcomes with program outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2								3	2	
CO2	3	3	3	3								3	3	
CO3	3	3	3	3								3	3	
CO4	3	3	3	3								3	3	
CO5	3	2	3	3								3	3	

ELECTRONICS ENGINEERING WORKSHOP**Credits: 1.5****Assessment: 100 + 0**

Semester	L-T-P	Course Code	Branches
II	0-0-3	EE3209L, EC4209L	EE & EC

Course Objectives:

- To impart knowledge on the principles of electronics and fundamentals of electronic devices and its applications.
- To create interest in Electronic Hardware Technology.

Course Outcomes: At the end of the course, the student will be able to

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Learn soldering practice to connect various electron components.

CO4: Understand the Assembling of electronic circuits on general purpose PCB.

Electronics Engineering Workshop – List of Practical Experiments	
S.No	Title of Experiment / Demonstration
1	Identification of Basic Electronic Components – Resistors, capacitors, inductors, diodes, LEDs, transistors, ICs
2	Identification of Transistor Terminals (BJT) using multimeter
3	Identification of Common ICs (Analog & Digital) – 555, 7400 series, Op-Amps
4	Use of Breadboard and Basic Circuit Assembly – Resistor, LED, switch
5	Use of Multimeter – Measure resistance, voltage, check continuity
6	Use of Regulated DC Power Supply
7	Use of CRO – Measurement of waveform parameters
8	Use of Function Generator – Generating sine, square, and triangular waves
9	Soldering Practice – Resistors, wires, LEDs on general-purpose PCB
10	Demonstration of PCB Design and Fabrication Process
11	Demonstration of SMD Components Identification – Resistor, capacitor, ICs
12	Demonstration of IC Tester Usage
13	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning
14	Basic Circuit Testing on Breadboard vs. Soldered PCB – LED/resistor circuit

Mapping of course outcomes with program outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2			3				3	3	
CO2	3	2	3	3	2			3				3	3	
CO3	3	2	3	2	2			3				3	3	
CO4	3	2	3	2	3			3				3	3	


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 S. V. U. COLLEGE OF ENGINEERING
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ELECTRONICS ENGINEERING LAB**Credits: 1.5****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	0-0-3	CS6108L	CS

Course Objectives:

- To understand the characteristics and behavior of basic electronic components.
- To Analyze and design basic electronic circuits.
- To introduce the fundamentals of digital logic circuits.

Course Outcomes: At the end of the course, the student will be able to

CO1: Identify and testing of various electronic components

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

Electronics Engineering Lab – List of Practical Experiments	
S.No	Title of Experiment
1	V-I characteristics of PN Junction diode: (a) Forward bias (b) Reverse bias
2	V – I characteristics of Zener Diode and its application as voltage Regulator
3	Implementation of half wave rectifier using diodes
4	Input & Output characteristics of BJT - CE configuration
5	Op-Amp applications – I
6	Op Amp applications – II
7	Study of basic logic gates and their truth tables
8	Half adder / Half Subtractor
9	Binary to Gray converter
10	Multiplexer /Decoder

Mapping of course outcomes with program outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2			3				3	3	
CO2	3	3	3	3	2			3				3	3	
CO3	3	3	3	2	2			3				3	3	
CO4	3	3	3	2	2			3				3	3	

BASIC ELECTRONICS ENGINEERING LAB**Credits: 1****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	0-0-2	ME5209L	ME

Course Objectives:

- To understand the characteristics and behavior of basic electronic components.
- To Analyze and design basic electronic circuits.
- To introduce the fundamentals of digital logic circuits.

Course Outcomes: At the end of the course, the student will be able to

CO1: Identify and testing of various electronic components

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

Basic Electronics Engineering Lab – List of Practical Experiments	
S.No	Title of Experiment
1	V-I characteristics of PN Junction diode: (c) Forward bias (d) Reverse bias
2	V – I characteristics of Zener Diode and its application as voltage Regulator
3	Implementation of half wave rectifier using diodes
4	Input & Output characteristics of BJT - CE configuration
5	Op-Amp applications – I
6	Op Amp applications – II
7	Study of basic logic gates and their truth tables
8	Half adder / Half Subtractor
9	Binary to Gray converter
10	Multiplexer /Decoder

Mapping of course outcomes with program outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2			3				3	3	
CO2	3	3	3	3	2			3				3	3	
CO3	3	3	3	2	2			3				3	3	
CO4	3	3	3	2	2			3				3	3	

BASIC ELECTRICAL ENGINEERING**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	EC4104C	EC

UNIT-I

Basic Circuit Concepts: Electrical circuit elements (R, L and C), Classification of Circuit elements, Voltage and Current sources, Source transformation Techniques– Kirchhoff's laws – Star-delta transformation – Network reduction techniques - Mesh and Nodal Analysis for D.C. Circuits– Concept of mutual inductance – Dot convention.

UNIT-II

Network Topology: Graph, tree, incidence matrix, and tie set and cut set matrices – Formulation of equilibrium equations based on graph theory. Duality and dual circuits

A.C. Fundamentals: Periodic waveforms – Average and effective values of different waveforms - Form factor and crest factor.

UNIT-III

A.C. Circuits: Phase and phase difference – Phasor notation – Concept of reactance, impedance, susceptance and admittance – Power factor -Active and reactive power – Impedance Triangle-Power triangle - Analysis of single-phase A.C. circuits – Series, parallel and Series Parallel circuits, Phasor diagrams, Mesh and Nodal Analysis for A.C. Circuits.

UNIT-IV

D.C. Machines: Construction of a D.C. Machine, **D.C. Generator:** Operation, Classification and EMF equation. **D.C. Motor:** Operation, Back E.M.F, Types, and Applications.

Single Phase Transformers: Principle of Operation, Types, EMF equation.

UNIT-V

Three Phase Induction Motor: Production of Rotating Magnetic Field, Construction and operation of 3-Phase Induction Motor.

Alternators: Construction and working of Alternators.

Text Books:

1. Ravish R. Singh, Network Analysis and Synthesis, Tata Mc. Graw Hill.
2. Sudhakar and Shyammohan, Circuits and Networks: Analysis and Synthesis, 5th Edition, Tata McGraw-Hill
3. Nagrath and Kothari, Basic Electrical Engineering, 4th Edition, Tata Mc. Graw Hill.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Course Outcomes: At the end of this course, students will be able to

1. Solve basic D.C. circuits using simple analysis methods.
2. Understand A.C. fundamentals and use graph theory to study electrical networks.
3. Analyze A.C. circuits and calculate power and impedance.
4. Understand how D.C. machines and transformers work.
5. Explain the working of induction motors and alternators.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	EE3104C, CS 6104C	EE & CS
II	3-0-0	CH1204C, CE 2204C, ME5204C	CH, CE & ME

Unit-I

Basic Circuit Concepts: Electrical circuit elements (R, L and C), Voltage and Current equations of R, L and C. Kirchhoff's laws – Series, Parallel and Series Parallel Circuits.

A.C. Circuits: Concept of Reactance and Impedance, Series and parallel circuits, Active and reactive power. Introduction to three phase circuits. (Simple problems).

Unit-II

D.C. Machines: Construction of a D.C. Machine, **D.C. Generator:** Operation, Classification and EMF equation. **D.C. Motor:** Operation, Back E.M.F, Types, and Applications.

Single Phase Transformers: Principle of Operation, Types, EMF equation.

UNIT-III

Three Phase Induction Motor: Production of Rotating Magnetic Field, Construction and operation of 3-Phase Induction Motor.

Alternators: Construction and working of Alternators.

UNIT-IV

Diodes: PN Junction Diode- Operation, Characteristics, Zener diode and Voltage Regulation, Introduction to rectifiers.

Transistors: Introduction to transistors, BJT Characteristics and applications.

UNIT-V

Integrated Circuits: Operational amplifiers, Applications: adder, subtractor, Integrator and Differentiator.

Digital Circuits: logic gates, Combinational Logic circuits, Flip- Flops, counters and shift registers,

Textbooks:

1. Basic Electrical and Electronics Engineering by D.P. Kothari and I.J. Nagrath
2. Basic Electrical and Electronics Engineering by S.K. Bhattacharya
3. Basic Electrical and Electronics Engineering by R. Muthusubramanian & S. Salivahanan

Course Outcomes: At the end of the course, students will be able to:

1. Understand the basic concepts of D.C. and A.C. circuits and solve simple electrical circuit problems.
2. Explain the working of transformers and D.C. machines.
3. Describe the operation of three-phase induction motors and alternators.
4. Understand the operation and characteristics of diodes and transistors.
5. Learn the basic concepts of integrated circuits and digital circuits.

ELECTRICAL ENGINEERING WORKSHOP**Credits: 1.5****Assessment: 100 + 0**

Semester	L-T-P	Course Code	Branches
I	0-0-3	EE3108L, EC 4108L	EE & EC

List of Experiments: Any Ten Experiments

1. Identification of Basic Electrical Components
2. Identification of Wires and Cables
3. Study of Electrical Wiring Accessories
4. Study and Use of Measuring Instruments
5. Measurement of Current and Voltage in a Simple DC Circuit using Multimeter
6. Connection of a Single-Phase Energy Meter
7. Connection of a Wattmeter
8. Demonstration and Testing of Fuses and MCBs
9. Demonstration of Earthing Systems
10. Identification of Starters
11. Demonstration of a Tachometer

Course Outcomes

After completing this workshop, students will be able to:

1. Identify basic electrical components, cables, and wiring accessories.
2. Use electrical measuring instruments safely and correctly.
3. Measure voltage and current in simple electrical circuits.
4. Make basic electrical connections like energy meters, wattmeters, and protection devices.
5. Recognize and understand the working of starters and tachometers.

BASIC ELECTRICAL ENGINEERING LAB**Credits: 1****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
II	0-0-2	ME 5208L	ME

List of Experiments: Any Ten experiments

1. Measurement of Resistance
2. Verification of Kirchhoff's Laws
3. Determination of Inductance
4. Determination of Capacitance
5. Identification of Starters
6. Demonstration of Earthing Systems
7. Connection of a Single-Phase Energy Meter
8. Connection of a Wattmeter
9. Speed Control of DC Shunt Motor
10. Load Test on DC Shunt Motor
11. Tests on Single-Phase Transformer

Course Outcomes

After completing this lab, students will be able to:

1. Measure resistance, inductance, and capacitance.
2. Verify Kirchhoff's laws.
3. Demonstrate the wattmeter and energy meters.
4. Test and study DC machines.
5. Test single-phase transformers.

ELECTRICAL CIRCUIT ANALYSIS**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	3-0-0	EE3206C	EE

UNIT-I

D.C. Circuit Analysis: Introduction, Voltage and Current Sources, Source transformation Techniques, Kirchhoff's laws, Star-delta transformation, Network reduction techniques, Mesh Analysis, Nodal Analysis, Supermesh and Supernode Analysis for D.C. Circuits.

UNIT-II

Mutual Inductance: Concept of mutual inductance – Relation between self-inductances, Mutual inductance and K, Dot convention for coupled circuits.

Network Topology: Graph, tree, incidence matrix, Tie set and cut set matrices – Formulation of equilibrium equations based on graph theory. Duality and dual circuits.

UNIT-III

A.C. Circuit Analysis: Impedance, Admittance –Power factor -Active and reactive power – Impedance Triangle-Power triangle – Analysis of single-phase A.C. circuits – Series, parallel and Series Parallel circuits, Phasor diagrams, Mesh and Nodal Analysis for A.C. Circuits.

UNIT-IV

Resonance: Series and Parallel Resonance – Resonant frequency, Half power frequencies, bandwidth and Quality Factor.

Locus diagrams: Current locus diagrams of RL and RC series circuits and two branch parallel circuits.

UNIT-V

Three Phase Circuits: Advantages of three phase systems – Phase sequence – Magnitude and phasor relationships between line and phase voltages and currents in balanced star and delta circuits – Analysis of balanced and unbalanced three phase circuits with star and delta connected loads, Measurement of three phase power – Two wattmeter method

Text Books:

1. Ravish R. Singh, Network Analysis and Synthesis, 2nd Edition, Tata Mc. Graw Hill.
2. Sudhakar and Shyammohan, Circuits and Networks: Analysis and Synthesis, 5th Edition, Tata McGraw-Hill
3. Abhijit Chakrabarti: Circuit Theory Analysis and Synthesis, 7th Revised Edition, Dhanpat Rai & Co

Course Outcomes:

After completing this course, students will be able to:

1. Solve D.C. circuits using Kirchhoff's laws, mesh and nodal analysis.
2. Understand mutual inductance and apply basic graph theory to analyze electrical networks.
3. Analyze single-phase A.C. circuits and calculate current, voltage, and power.
4. Explain the concept of resonance and draw current locus diagrams.
5. Analyze three-phase circuits and calculate three-phase power.

PROGRAMMING FOR PROBLEM SOLVING

Credits: 3**Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	EE3103C, EC4103C, CS6103C	EE, EC & CS
II	3-0-0	CH1203C, CE2203C, ME5203C	CH, CE & ME

Course Objectives:

1. To acquire problem solving skills
2. To be able to develop flowcharts and algorithms for the given problem
3. To learn how to write modular programs in C
4. To enable to use arrays, pointers, strings and structures in solving problems.
5. To Understand Concept of Files

UNIT-I

Problem Solving: Problem solving techniques, Computer as a problem-solving tool, Programming Languages – Machine Language, Assembly Language, Low and High-Level Languages, Procedural and Object-Oriented Languages. Algorithm definition, Features, Criteria, Flowchart definition, Basic symbols, Sample flowcharts, Problem solving aspects, Efficiency of algorithms.

Basics of C: Structure of a C program, C tokens, Keywords, Identifiers, Basic data types and sizes, Constants, Variables, Operators in C, Operator Precedence and Associativity, Expressions, Type conversions, Basic input/output statement, Sample programs.

UNIT-II

Conditional Statements: Selection statements, Decision making within a program, Simple if statement, if-else statement, Nested if-else, if-else ladder and switch-case. Iterative statements: while-loop, do-while loop, for loop, Nested loops, Infinite loops, goto, break and continue statements, Sample programs.

Functions: Introduction to modular programming and functions, Basics, Standard Library of C functions, Prototype of a function, Parameter passing, User defined functions, Recursive functions, Passing arguments to a function: Call by reference, Call by value, Storage Classes in a single source file, Scope rules, Header files, C Pre-processor.

UNIT-III

Arrays: Introduction to arrays, Definition, Declaration, Storing elements, Accessing elements, One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array, Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix, Passing array to functions, String fundamentals, String manipulations, Standard library string functions.

Pointers: Definition of pointer, pointer type declaration, pointer assignment, pointer initialization, Pointer arithmetic, Functions and Pointers, Dangling memory, Character pointers and functions, Pointers to pointers, Arrays and Pointers, Pointer arrays, Pointers and structures, Dynamic memory management functions.

UNIT-IV

Structures: Structures declaration, Structure variables, Initialization of structures, Accessing structures, Nested structures, Arrays of structures, Structures containing arrays, Structures and functions, Pointers to structures, Self-referential structures, Unions, Typedef, Bit-fields.

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

UNIT V

Introduction to Object-Oriented Programming (OOP): Need for OOP, Principles of OOP, Basics of C++ Programming, Operator Overloading, Function Overloading, Inheritance: Derived classes, Protected access specifier, Derived class constructors, Overriding member functions, Class hierarchies, Public and Private inheritance, Multiple inheritance.

Course Outcomes: At the end of the course, student will be able to

1. Develop and test programs in C and correct syntax and logical errors.
2. Implement conditional branching, iteration and recursion.
3. Decompose a problem into functions and synthesize a complete program.
4. Use arrays, pointers, strings and structures to formulate algorithms and programs
5. Use files to perform read and write operations.
6. Handle programming assignments based on class, abstraction, encapsulation, overloading and inheritance.

Text Books

1. Ashok N Kamthane, Amit Ashok Kamthane, Programming in C, 3rd Edition, Pearson Education, 2019.
2. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
3. R.G. Dromey, How to solve it by Computer, Pearson Education, 2019.
4. Hanly J R & Koffman E.B, "Problem Solving and Program design in C", Pearson Education, 2019.
5. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw-Hill.

Reference Books

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.
5. The C++ Programming Language, Bjarne Stroustrup, 3rd Edition, Pearson Education.
6. Problem solving with C++: The Object of Programming, 9th Edition, Walter Savitch, Pearson Education.

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course	Name Instructor	Host Institute
1.	Introduction to Programming in C	Prof. Satyadev Nandakumar	IITK
2.	Problem Solving through Programming in C	Prof. Anupam Basu	IIT KGP

PROGRAMMING FOR PROBLEM SOLVING LAB**Credits: 1.5****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	0-0-3	EE3106L, EC4106L, CS6106L	EE, EC & CS
II	0-0-3	CH1207L, CE2206L, ME5206L	CH, CE & ME

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C programming language.

UNIT-I

WEEK 1: Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with the programming environment

- Basic Windows/ Linux environment and its editors.
- Exposure to Visual Studios, GCC, CFree
- Writing simple programs using printf(), scanf()

WEEK 2: Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps using textual and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 2: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- Sum and average of 3 numbers
- Conversion of Fahrenheit to Celsius and vice versa
- Simple interest calculation

WEEK 3: Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- Finding the square root of a given number
- Finding compound interest
- Area of a triangle using Heron's formulae
- Distance traveled by an object

UNIT-II

WEEK 4: Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression, and how operator precedence works.

Suggested Experiments/Activities:

Tutorial 4: Operators and the precedence and as associativity:

Lab 4: Simple computational problems using the operator's precedence and associativity

i) Evaluate the following expressions.

a. $A+B*C+(D*E) + F*G$ b. $A/B*C-B+A*D/3$ c. $c. A+++B---A$ d. $d. J= (i++) + (++i)$

ii) Find the maximum of three numbers using the conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5: Objective: Explore the full scope of different variants of —if constructll, namely if-else, null--else, ifelse if*-else, switch, and nested-if, including in what scenario each can be used and how to use them.

Explore all relational and logical operators while writing conditionals for —if constructll.

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using a switch case.

v) Write a C program to find whether the given year is a leap year.

WEEK 6: Objective: Explore the full scope of iterative constructs, namely while loop, do-while loop, and for loop in addition to structured jump constructs like break and continue, including when each of these statements is more appropriate.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems, e.g., the sum of series

i) Find the factorial of a given number using any loop.

ii) Find whether the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking whether a number is palindrome

v) Construct a pyramid of numbers.

UNIT-III

WEEK 7 : Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 7: Functions, call by value, scope and extent,

Lab 7: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.

ii) Write a C function to find the length of a string.

iii) Write a C function to transpose of a matrix.

iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method.

WEEK 8: Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 8: Recursion, the structure of recursive calls

Lab 8 : Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the Lcm of two numbers.
- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

UNIT-IV

WEEK 9: Objective: Explore the full scope of the Arrays construct, namely defining and initializing 1-D and 2-D and, more generically, n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 9: 1 D Arrays: searching.

Lab 9: 1D Array manipulation, linear search

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on the 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2's complement of the given binary number.
- v) Eliminate duplicate elements in an array.

WEEK 10: Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null characters and get comfortable with strings by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 10: 2 D arrays, sorting and Strings.

Lab 10: Matrix problems, String operations,

- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

WEEK 11: Objective: Explore pointers to manage a dynamic array of integers, including memory allocation value initialization, resizing, changing, and reordering the contents of an array, and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command -line arguments received by C

Suggested Experiments/Activities:

Tutorial 11: Pointers, structures, and dynamic memory allocation

Lab 11: Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()

- ii) Write a C program to find the total average of n students using structures
- iii) Enter n students data using calloc() and display failed students list
- iv) Read student name and marks from the command line and display the student details along with the total.
- v) Write a C program to implement realloc()

WEEK 13: Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers.

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.
- iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

UNIT-V

WEEK 12: Objective: Experiment with C Structures, Unions, bit fields self-referential structures (Singly-linked lists), and nested structures.

Suggested Experiments/Activities:

Tutorial 12: Bitfields, Self-Referential Structures, Linked lists

Lab12: Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields

- i) Demonstrate the differences between structures and unions using a C program.
- ii) Write a C program to shift/rotate using bitfields.
- iii) Write a C program to copy one structure variable to another structure of the same type.

WEEK14: Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

Course Outcomes:

CO1: Read, understand, and trace the execution of programs written in C language.

CO2: Select the proper control structure for solving the problem.

CO3: Develop C programs that utilize memory efficiently using programming constructs like pointers.

CO4: Develop, Debug, and Execute programs to demonstrate the applications of arrays, functions, and basic concepts of pointers in C.

Text books /Reference Books:

1. AICTE's Prescribed Textbook: Programming for Problem Solving, Khanna Book Publishing Co.
2. Ajay Mittal, Programming in C: A practical approach, 1st Edition, Pearson.
3. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, McGraw Hill, 2020.
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India.
5. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, 3rd Edition, CENGAGE.

IT WORKSHOP**Credits: 1****Assessment: 100 + 0**

Semester	L-T-P	Course Code	Branches
I	0-0-2	EE3107L, EC4107L, CS6107L	EE, EC & CS
II	0-0-2	CH1208L, CE2207L, ME5207L	CH, CE & ME

Course Introduction: The IT Workshop for engineers is a training lab course spread over 30 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
- To provide the skill of assembling the computer.
- To demonstrate configuring the system as Dual boot for Windows and other Operating Systems Viz. Linux, BOSS.
- To teach basic command line interface commands on Linux.
- To teach the usage of the Internet for productivity and self-paced life-long learning.
- To impact the knowledge and usage of Compression, Multimedia, Antivirus tools and Office Tools such as Word processors, spreadsheets, and Presentation tools.

Course Outcomes: After successful completion of this course, a student will be able to:

1. Identify various hardware components of a system and can perform Hardware troubleshooting
2. Understand Hardware components and inter dependencies
3. Safeguard computer systems from viruses/worms
4. Document/ Presentation preparation
5. Perform calculations using spreadsheets and Use various Microsoft tools.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU, and functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students must go through the video showing the PC assembling process. A video would be given as part of the course content.

Task 3: Students should install MS windows on their personal computer. The lab instructor should verify the installation and follow it with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have Windows installed. The system should be configured as dual boot (VMWare) with Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate, Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, **LOOKUP/VLOOKUP**

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

PowerPoint

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – Chat GPT

Task 1: Prompt Engineering: Experiment with different prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

Ex: Prompt: “You are a knowledgeable AI. Please answer the following question: What is the capital of France?”

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a scene description, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas.

Ex: Prompt: “In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality.”

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

Ex: Prompt: “Translate the following English sentence to French: ‘Hello, how are you doing today?’”

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, Pearson Education.

DATA STRUCTURES**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	3-0-0	CS6205C	CS

Course objectives:

1. Develop skills to design and analyze linear and nonlinear data structures.
2. Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3. Develop recursive algorithms as they apply to trees and graphs.
4. Strengthen the ability to identify and apply the suitable data structure for the given real world problem
5. Understand the various techniques of sorting and searching

Course Outcomes: After completion of the course the students will be able to

1. Choose appropriate data structure for the specified problem definition.
2. Implement linear and non-linear data structures viz. stacks, queues, linked list, trees, graphs.
3. Apply the concept of trees and graph data structures for the real world problems.
4. Comprehend the implementation of sorting and searching algorithms

UNIT I

Introduction: Data types/Objects/Structures, Abstract definition of Data Structures, Overview of linear and nonlinear data structures, Analysis of algorithms, Algorithm specification, Asymptotic notation, Time-Space trade-off, Searching: Linear, Binary and Fibonacci search and their complexity analysis.

Arrays: Definition, Multidimensional arrays, Pointer arrays, Representation of arrays – Row major and Column major orders, Application of arrays – Polynomials, Sparse matrices representation.

UNIT II

Stacks and Queues: Introduction, ADT, Array representation, Operations and Applications of Stacks - Evaluation of expressions, Code generation for stack machines, Implementation of recursion, Factorial calculation and Towers of Hanoi; Circular Queue, Priority Queue, Double ended queue, Applications of Queues - Simulation, CPU Scheduling; Multiple stacks and queues.

UNIT III

Linked Lists: Singly linked lists and chains, Circular linked list, Doubly linked list, Circular doubly linked list, Complexity analysis of the same, Linked representation of Stacks and Queues, Applications of linked lists - Polynomial representation, Sparse matrix multiplication, Dynamic storage management; Generalized list representation, Recursive algorithms for lists, Recursive lists

UNIT IV

Trees: Basic tree terminologies, Binary trees – Definition, Properties, ADT, Representations, Operations and Applications; Binary Search Trees, Heap Trees, Threaded binary trees, Height balanced trees – AVL Trees, Red black tree, Splay tree Their operations and complexity analysis.

UNIT V

Sorting Techniques: Insertion sort, Selection sort, Bubble sort, Quick sort, Radix sort Merge sort, External sort – Introduction, K-way Merge sort.

Graphs: Basic terminologies, Representations, ADT, Operations on graphs – DFS, BFS, Spanning trees, Biconnected components, Minimum cost spanning trees.

Text Books:

1. Ellis Horowitz and Sartaj Sahani, “Fundamentals of Data Structures”, Computer Science Press.
2. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++ Universities Press, Second Edition.
3. Debasis Samanta, Classic Data Structures, Second Edition, Prentice Hall of India

Reference Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++”, PHI Learning Private Limited
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
3. R. Kruse et al, “Data Structures and Program Design in C”, Pearson Education

DATA STRUCTURES LAB**Credits: 1.5****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
II	0-0-3	CS6209L	CS

Course Objectives:

1. To understand the practical application of linear and nonlinear data structures.
2. To develop and execute programs in C++/C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
3. To develop and execute programs in C to implement various sorting and searching techniques.

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Identify the appropriate data structure for given problem.
2. Have practical knowledge on the application of data structures.
3. Analyze the time and space efficiency of the data structure.

Lab programs

1. Develop an algorithm to implement stack using arrays. Code it in C++.
2. Develop an algorithm to evaluate a given postfix expression using stack. Code it in C.
3. Develop an algorithm to convert a given infix expression to postfix form using stacks. Code it in C.
4. Develop algorithms to implement i) Linear queue and ii) Circular queue using arrays. Code it in C++.
5. Develop an algorithm to implement double ended queue (de queue) using arrays. Code it in C++.
6. Develop algorithms using dynamic variables and pointers, to construct a singly linked list consisting of the following information in each node: student id (integer), student name (character string) and semester (integer). The operations to be supported are:
 - a. Inserting a node i) at the front of a list ii) at the rear of the list ii) at any position in the list
 - b. Deleting a node based on student id. If the specified node is not present in the list, an error Message should be displayed.
 - c. Searching a node based on student id. If the specified node is not present in the list an error message should be displayed.
 - d. Displaying all the nodes in the list. Code the same in C++.
4. Develop an algorithm using dynamic variables and pointers to construct a stack of integers using singly linked list and to perform the following operations:
 - i) Push, ii) Pop iii) Display (The program should print appropriate messages for stack overflow and stack empty). Code the same in C++.

- 5 Develop an algorithm using dynamic variables and pointers to construct a queue of integers using singly linked list and to perform the following operations: a. Insert b. Delete. Display. The program should print appropriate messages for queue full and queue empty. Code the same in C++.
- 6 Develop an algorithm to support the following operations on a doubly linked list where each node consists of integer data object:
 - a. Create a doubly linked list
 - b. Insert a new node
 - c. Delete the specific node
 - d. Display the contents of the list. Code the same in C++.
- 7 Develop algorithms to
 - a. Construct a binary tree of integers.
 - b. Traverse the binary tree using inorder, preorder and postorder. (both recursive and non-recursive versions)
 - c. Display the elements in the tree. Code the same in C++.
- 8 Develop algorithms to create a binary search tree (BST) and perform the following operations on it. Find (a) Minimum element (b) Maximum element (c) Search for a given element (d) Find predecessor of a node (e) Find successor of a node (f) Delete a node with specific key value. Code the same in C++.
- 9 Develop an algorithm to construct an AVL tree for the given set of elements. Code it in C++.
- 10 Develop algorithms to Sort the given list of elements (i.e. numbers or strings)
 - (a) Insertion sort (b) Merge sort (c) Quick sort (d) Heap sortCode the same in C.
- 11 Develop algorithms to implement of graph traversals by applying:
 - (a) BFS (b) DFS. Code the same in C/C++.
- 12 Develop algorithms to find out a minimum spanning tree of a simple connected undirected graph by applying: (a) Prim's algorithm (b) Kruskal's algorithm
Code the same in C/C++.

Text Books:

1. Object Oriented Programming with ANSI & Turbo C++, Ashok N.Kamthane, Pearson Education
2. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
3. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++ Universities Press, Second Edition.
4. Data Structures using C and C++, Yedidyah Langsam, Moshe J. Augenstein Aaron M. Tenenbaum, 2nd Edition, PHI
5. ADTs, Data Structures and Problem Solving with C++, Larry Nyhoff, Pearson Education.

INTRODUCTION TO CHEMICAL ENGINEERING**Credits: 3****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	CH1106C	CH

Unit-I:

Chemical Engineering Concepts: Chemical Engineering in everyday life, Scaling Up or Down, Understanding the difference between Chemist & Chemical Engineer, Versatility of a Chemical Engineer, Applications of Chemical Engineering.

Process and process variables: Unit operations, Unit Processes, Batch process, Continuous process, Mass and Volume, Flow rate, Pressure, Temperature, Chemical Composition. Case Studies (Manufacture of Soda Ash and Sulphuric acid)

Unit-II:

Introduction to Engineering Calculations: Units and Dimensions, Conversion of units, System of Units, Force and Weight, Numerical Calculations and Estimation, Dimensional Homogeneity and Dimensionless Quantities.

Fluid Flow: Fluid, Nature & Types of fluid, Newtonian & Non-Newtonian, Compressible & Incompressible fluids, Viscosity, Different Flow Regimes, Flow Meters, Fluid Handling Machinery (Pumps, Fans, Blowers)

Unit-III:

Introduction to Process Heat Transfer: Historical background and Application Areas of Heat transfer, Conduction, Convection, Radiation and Evaporation, Fourier's Law, Flow arrangements in Heat Exchangers, Concept of Thermal Resistance.

Introduction to Thermodynamics: Scope of Thermodynamics, Dimensions and Units, Force, Work, Energy (Internal Energy, Kinetic Energy), Heat, Enthalpy, Entropy, Heat capacity and Laws of Thermodynamics, Ideal gas law, Phase rule.

Unit-IV:

Mass transfer: Classification of Mass Transfer Operations, Fick's Law of Diffusion, Choice of Separation Processes, Basic Principles & Applications of Absorption, Distillation, Adsorption, Extraction, Drying.

Unit-V:

Mechanical operations: Characterization of Solid Particles, Properties of Particulate Masses, Storage and Mixing of Solids, Types of Mixers, Principles of Size Reduction, Types of crushers & Grinders, Screening and Filtration.

Reaction Engineering: Classification of Reactions, Variables Affecting the Rate of Reaction, Concentration & Temperature Dependency of Reaction Rate, Kinetics of Homogeneous Reactions, Types of Reactors.

TEXT BOOKS:

1. Introduction to Chemical Engineering by S. Pushpavanam, PHI, 2012.
2. Elementary Principles of Chemical Processes Richard M. Felder and Ronald W. Rousseau, Third Edition, John Wiley & Sons, INC
3. Unit operations in Chemical Engineering by W.L. McCabe and J.C. Smith and Peter Harriott, McGraw Hill 7th Ed. 2005
4. Introduction to Chemical Engineering by S. K. Ghosal, S. K. Sanyal and S. Dutta, TMH Publications, 1993
5. Introduction to Chemical Engineering Thermodynamics, 6th edition, J.M. Smith, H C Vanss, M M Abbott, TATA McGRAW-HILL Edition
6. Mass transfer Operations by Robert E Treybal, 3rd Edition, McGRAW-HILL Book Company, 1981
7. Chemical Reaction Engineering by Octave Levenspiel, 3rd Edition, John Wiley and Sons.

MATERIAL SCIENCE**Credits: 2****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
II	2-0-0	CH1206C	CH

COURSE DESCRIPTION:

This course is designed to chemical engineering students to understand different types of engineering materials, their physical properties and their structures. The phase diagrams, heat treatment of materials can be studied. Different ceramics, composite and nano material can be studied. The corrosion types in materials can be studied.

Course Educational Objectives:

- 1) To have fundamental knowledge on engineering materials.
- 2) To study Phase diagrams and its applications and can learn different Heat treatment processes.
- 3) To have knowledge on Ceramic and composite materials.
- 4) To study Corrosion, its nature and its prevention
- 5) To learn a basic view of Nano materials.

UNIT - I: ENGINEERING MATERIALS

Classification - levels of structure - properties Mechanical, thermal, electrical, and magnetic properties) - structure - property relationship. Structure of solids - crystalline and non crystalline state - Inorganic solids - Crystal Imperfections (point defects, line defects and surface imperfections, Grain boundaries).

UNIT - II: METALS AND ALLOYS

Elastic and Plastic deformations - Re-crystallization - cold and hot working - creep, fatigue and Fracture. Phase diagrams and their applications - phase rule - completely soluble, partially soluble, Insoluble in solid phase, peritectic phase diagrams. Iron - Iron carbide phase diagram. Heat treatment processes - Annealing -quenching and tempering - Age hardening.

UNIT – III : CERAMIC PHASES AND THEIR PROPERTIES

Structure of ceramics-Mechanical and electrical properties. Abrasives- silicon carbide various silicates - structure of quartz - uses. Piezo and Ferroelectric material - BaTiO₃.

COMPOSITE MATERIALS

Fiber, particle and Plastic reinforced composites. Whiskers. Porosity - Bulk characteristics. Agglomerated materials - concrete - Asphalt and Asphalt mixtures.

UNIT - IV: CORROSION

Definition- Electrochemical principles - Environmental effects-oxidizers, Temperature, Agitation (velocity) and polarization. Passivity. Eight forms of corrosion (brief)-Galvanic, Crevice corrosion, Selective leaching, Erosion and Hydrogen damage. Corrosion of metals and Alloys due to sulfuric, hydrochloric nitric, phosphoric and acetic acids. Corrosion prevention and control - Selection of materials - Design principles - Inhibitors - Alteration of environment - Anodic protection. Inorganic and Metallic coatings. Organic coatings.

UNIT - V: NANOMATERIALS

Evolution of nanotechnology - Electron Microscopy – Principles of SEM, TEM, SPM and STM - Manipulation of atoms (manipulator – tweezer – nanodots – self assembly – nanolithography) - Nano materials - Plasma arcing - Chemical Vapor Deposition - Sol gel - Electrodeposition - Ball milling - Applications of Nanomaterials

TEXT BOOKS:

1. Elements of material science by Van Vlack L.R. Addison Wesley Publishing Co.
2. Corrosion Engineering by Mars G.Fontana
3. Nanotechnology : Basic Science and Emerging Trends – Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and BurkhardReguse, Overseas Press

REFERENCES :

1. Material science and Engineering by V.Raghavan.
2. Material Science by William Smith

Course Outcomes:

1. Able to understand classification, properties and the structures of Engineering materials. Able to have knowledge on Crystal imperfections.
2. To learn various deformations regarding Creep, Fracture, Cold and Hot working.Able to understand Phase diagram and its applications. To learn various heat treatment process regarding Annealing, Quenching and Tempering.
3. Able to understand the Mechanical and Electrical properties of Ceramic materials. Able to understand various forms of Composites.
4. Able to learn various forms of Corrosion. Able to have knowledge on Corrosion prevention and control.
5. Able to have knowledge on Evolution of Nanotechnology, Electron Microscope and its applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								1				1
CO2		1						1	1			
CO3		1						1	1			
CO4						1		1	1			1
CO5	1	1						1	1			1

BASICS OF CIVIL ENGINEERING**Credits: 2****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	2-0-0	EE3204C, EC4204C, CS6204C	EE, EC & CS

Course Objectives:

The course aims to

- Acquire knowledge in various materials used for construction.
- Understand various aspects of surveying
- Acquire knowledge in fluid parameters and soil types
- Understand necessity of irrigation and quality of drinking water
- Prerequisite knowledge on different aspects of civil engineering

UNIT I

Building Materials: Properties and Manufacturing of Bricks, Stones, Cement, Reinforced Cement concrete, Steel, Timber, Paints and Varnishes.

Construction Elements: Stone masonry, Brick Masonry-Bonds in brick masonry, Stairs, Lintels-Roofs, Flooring, Timber floors, Composite floors, Damp proofing, Painting, Varnishing, Distemping, Thermal Insulation and Acoustics.

UNIT II

Surveying: Objective of Surveying, Types of Surveying, Principles of Surveying, Measurement of distance, Measurement of direction, Leveling, Determination of areas/volumes, Contouring, Tachometry.

Basic principles and applications of Remote Sensing and Geographical Information System (GIS), Total Station.

UNIT III

Fluid Properties: Definition of a fluid –Density, Specific weight, Specific volume, Specific gravity – Viscosity – Vapour pressure – Surface tension and capillarity- Pressure at a point – Absolute and gauge pressures.

Soil Mechanics: Phase composition and Soil as 3-Phase system, classification and properties of soils, Site Investigations, essential requirements of a good foundation, types of foundation-their suitability.

UNIT IV

Water Resources Engineering: Hydrologic cycle - components - occurrence and movement of surface water and groundwater, Irrigation – types and structures.

Environmental Engineering: Drinking water - Sources of drinking water – treatment and distribution, drinking water standards - Wastewater – treatment, sludge -utilization and disposal.

UNIT V

Transportation Engineering: Introduction - necessity for highway planning - highway cross-section elements - types of pavements - types of public transportation systems and their relevance in modern day transportation.

Construction Management: Project planning, scheduling techniques, cost estimation, resource management, quality control-safety- CPM and PERT.

Text Books:

1. Anurag Kandya, Elements of Civil Engineering, 3rd Edition, Charotar Publishing House Pvt. Ltd, 2015.
2. S.S. Bhavikatti , Basic Civil Engineering, Vikas Publishing House Pvt. Limited, 2004
3. Palanichamy M S, Basic Civil Engineering, 3rd Edition, Tata McGraw-Hill, 2000

Reference Books:

1. Gopi S, Basic Civil Engineering, Pearson Education, 2010
2. B.C. Punmia, Basic Civil Engineering, Lakshmi Publications Pvt. Ltd., 2003

Course Outcomes

By the end of this course, students will be able to:

- Find the suitability of various building materials in the building construction.
- Measure the distances, areas and volumes using surveying tools.
- Identify types of soils and essential requirements of a good foundation.
- Analyse hydrological cycle and quality standards of drinking water
- Analyse the various aspects of civil engineering applications.

ENGINEERING MECHANICS**Credits: 3****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	CH1104C, CE2104C, ME5104C	CH, CE & ME

Course Educational Objectives (CEOs):

1. Introduce basic knowledge on different forces in a system and their applications
2. Impart knowledge on analysis of trusses, joints and methods of sections
3. Familiarize with evaluation of Centre of Gravity and Moment of Inertia for different geometrical sections.
4. Acquaint with different stress, strains and their relationships.
5. Impart basic understanding on impact of loading on strain energy and its applications.

UNIT I

STATICS : Basic concepts – System of force, Concurrent and non-concurrent coplanar and non-coplanar forces – Resultant – Moment of force and its application – Couples and resultant of force systems – Equilibrium of systems of forces – Free body diagrams, Equations of equilibrium of coplanar systems and spatial systems.

UNIT II

ANALYSIS OF PLANE TRUSSES : Types of supports – Types of trusses – Analysis of trusses using method of joints and method of sections.

UNIT III

CENTRE OF GRAVITY AND MOMENTS OF INERTIA: Theory of Pappus – Centroids of composite figures – Areas of gravity of bodies – Moment of inertia – Parallel and perpendicular axis theorems – Moments of inertia of composite areas (rolled and built up sections) – Radius of gyration of areas.

UNIT IV

SIMPLE STRESSES AND STRAINS : Elasticity and plasticity – Types of stresses and strains – Hooke's law – Stress-strain diagram for mild steel – Working stress – Factor of safety.

Lateral strain – Poisson's ratio and volumetric strain – Elastic moduli and relationship between elastic constants – Bars of varying section – Composite bars – Temperature stresses.

UNIT V

STRAIN ENERGY : Gradual, sudden and impact loading – Principle of virtual work with simple examples.

TEXT BOOKS :

1. Ghose D.N. – Applied Mechanics and Strength of Materials.
2. Timoshenko & Young – Engineering Mechanics.
3. Junarkar SB – Mechanics of Structures – Vol. I.
4. Junarkar SB – Elements of Applied Mechanics.

Course Outcomes(Cos) :

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

1. Apply the basic knowledge of force system.
2. Know the types of supports, trusses and joints that occur in civil engineering structures
3. Know the evaluation methods for geometrical properties of different cross sections.
4. Understand different types of stresses, strains and elastic constants.
5. Understand the impact of internal forces under different types of loading on strain energy.

CIVIL ENGINEERING MATERIALS AND CONSTRUCTION

Credits: 3**Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	CE2106C	CE

Description: To introduce the first year Civil Engineering students to the concepts of the structure of construction materials, as well the common construction practices and equipment.

Course Educational Objective (CEOs):

- To learn and understand the manufacturing, physical and mechanical properties of various construction materials and their testing procedures.
- To study the basic building components.
- To learn the methods to be followed in constructing various components of a building.

UNIT-I

STONES-BRICKS

Stone as building material-Selection of stones for construction-Tests on stones-Qualities of a good building stone-Deterioration of stones-Preservation of stones.

Bricks-composition of good brick earth-Manufacture of bricks-Classification of bricks-Tests for bricks-Absorption, Crushing strength, Hardness, presence of soluble salts, shape and size, soundness, structure-Uses of bricks-Refractories.

UNIT-II

CEMENT-AGGREGATES

Cement ingredients-Manufacturing process of ordinary cement-Types of cement – Field and laboratory tests for cement- Setting action of cement -storage and uses of cement.

Aggregates-Qualities-classification of aggregates-Testing of Aggregates—Grades of aggregates-classification of sand- Bulking of sand- Properties of good sand.

UNIT-III

TIMBER AND OTHER MATERIALS

Timber- Qualities of good timber- Market forms-Industrial timber, Seasoning and Preservation of Timber, Plywood, Vaneer.

Steel-Market forms of steel, Important properties and uses of Iron (Cast iron, wrought iron and steel).

UNIT-IV

CONSTRUCTION ELEMENTS

Types of foundations, Stone Masonry-joints in stone masonry, classification of stone masonry - Brick Masonry-Bonds in brick masonry, types of brick masonry – Doors and Windows -Lintels- Types of lintels – Stairs- Staircase- Roofs and its types - Flooring -types of flooring, timber floors, composite floors. Damp proofing - meaning, causes, effects, materials used for damp proofing, methods of damp proofing.

UNIT-V

Finishing and Special Constructions

Pointing-objects, mortar for pointing, method of pointing, types of pointing. Plastering-requirements of good plaster, methods of plastering. Painting-types of paints, painting on different surfaces failure of paint,

defects in painting. Varnishing- characteristics of ideal varnish, ingredients, types, process of varnishing. Distemping-properties, ingredients of a distemper, process of distemping.

Fire resistant construction: Fire resistant properties of common building materials, requirements for various building components, Thermal insulation and Acoustics.

TEXTBOOKS:

1. Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015, Standard Publishers
2. Dr. B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) Ltd., New Delhi.
3. Rangwala S. C. "Engineering Materials", Charotar Publishing House, India.

REFERENCES:

1. S. K. Duggal, "Building Materials", (Fourth Edition) New Age International (P) Limited, 2016 National Building Code (NBC) of India
2. P C Vergese, "Building Materials", PHI Learning Pvt. Ltd
3. Building Materials and Components, CBRI, 1990, India
4. Jagadish. K.S, "Alternative Building Materials Technology", New Age International, 2007.
5. M. S. Shetty, "Concrete Technology", S. Chand & Co. New Delhi.

Course Outcomes (COs):

After completion of the course the student will be able to:

- Explain the manufacturing, physical and mechanical properties of various construction materials and their testing procedures.
- Describe the basic building components.
- Apply the methods to be followed in constructing various components of a building.

SURVEYING

Credits: 3**Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	3-0-0	CE2205C	CE

Course Objectives: The first step in engineering practice is surveying and the soundness of any civil engineering work is dependent on the reliability and accuracy of surveying. Therefore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: At the end of the course, the student will be able to:

1. Calculate angles, distances and levels
2. Identify data collection methods and prepare field notes
3. Understand the working principles of survey instruments
4. Estimate measurement errors and apply corrections
5. Interpret survey data and compute areas and volumes.

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT - II

Leveling and Contouring

Leveling- Basics - definitions, types of levels and levelling staves, temporary adjustments, methods of leveling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying.

Computation of Areas and Volumes

Areas - Determination of areas consisting of irregular boundary and regular boundary- methods, Use of Planimeter.

Volumes - Computation of areas for level section and two-level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT – III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table.

UNIT - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves – Vertical Curves.

UNIT - V**Modern Surveying Methods:**

Total Station and Global Positioning System - Basic principles, classifications, applications, comparison with conventional surveying - Principles of Remote Sensing and Geographical Information System.

TEXT BOOKS:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

REFERENCE BOOKS:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. AgorKhanna Publishers 2015.

SURVEYING LAB**Credits: 1.5****Assessment : 40 +60**

Semester	L-T-P	Course Code	Branches
II	0-0-3	CE2208L	CE

Course Educational Objective (CEOs):

1. To apply the possess knowledge about survey field techniques
2. To apply the possess knowledge about traverse survey
3. To determine distances, areas of polygons
4. To gain knowledge of modern field measurement tools and techniques
5. To gain knowledge of GPS positioning systems

EXERCISE – 1

Measurement of distance by chain, Tape and Area of a polygon by cross staff survey

EXERCISE – 2

Compass traversing and adjustment of closing error by Bowditch method (Graphical method)

EXERCISE – 3

Plane table survey; finding the area of a given boundary

EXERCISE – 4

Fly levelling: Height of the Instrument method and Rise and Fall method.

EXERCISE – 5

Fly levelling; Longitudinal Section and Cross sections of a given Road profile.

EXERCISE – 6

Theodolite Survey: Determining the Horizontal and Vertical Angles Finding the distance between two inaccessible points.

EXERCISE – 7

Tacheometric survey: Heights and Distance problems using Tachometric Principles.

EXERCISE – 8

Set out simple curve using Perpendicular offsets from long chord and Rankine's deflection angles method.

EXERCISE – 9

Total Station: Determination of area using Total Station.

Course Outcomes (COs):

After completion of the course the student will have:

1. Ability to use the techniques, skill and surveying equipment for engineering practice.
2. Ability to apply mathematics concepts in the field of surveying.
3. Ability to set out various types of curves.
4. Ability to develop an understanding of modern surveying equipment
5. Ability to use the GPS positioning systems.

BASIC MECHANICAL ENGINEERING**Credits: 2****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	2-0-0	EE3105C, EC4105C, CS6105C	EE, EC & CS

Pre-Requisites: None**COURSE OBJECTIVES:** The main learning objective of this course is to prepare the students to

1. Study the classifications, operation principles, and systems of internal combustion engines, along with the basic concepts of heat transfer mechanisms and their engineering applications.
2. Understand the types, operation, and COP calculation of refrigeration systems, along with the principles behind steam, hydro, and nuclear power plants.
3. Explore the potential and applications of alternative energy sources such as solar, wind, and bioenergy, focusing on their technologies and performance characteristics.
4. Gain knowledge of various manufacturing processes, including casting, machining, and modern techniques like CNC and 3D printing, as well as welding processes, techniques, and applications.
5. Understand the properties and applications of engineering materials, along with the functioning of power transmission elements, material handling systems, and their industrial uses.

COURSE CONTENT:**UNIT I:****(L-6 + P-0 =6)****Thermodynamics:** Introduction, Zeroth Law, First Law and Second Law. Modes and mechanisms of heat transfer. General discussion about applications of heat transfer.**Internal Combustion Engines:** classifications, SI and CI engines, principles of operation- Basic fuel supply system, ignition system, cooling system, lubrication system, Exhaust system.**UNIT II:****(L-6 + P-0 =6)****Refrigeration:** Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, details and principle of operation – calculation of COP.**Power plants** – working principle of Steam, Hydro, Nuclear power plants.**UNIT III:****(L-6 + P-0 =6)****Alternative energy sources:** Role and potential of new and renewable sources.**Solar Energy:** Introduction, Solar applications of solar power and storage systems.**Wind Energy:** Sources and potentials, Horizontal and Vertical axis windmills.**BIO- ENERGY:** Biomass energy sources, Bio-gas plant technology.**UNIT IV:****(L-6 + P-0 =6)****Manufacturing Processes:** Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.**Welding:** Types, Equipment, Techniques employed, welding positions, defects, applications, advantages / disadvantages, Gas cutting, Brazing and soldering.

UNIT V:**(L-6 + P-0 =6)****Introduction to engineering materials-**Metals, ceramics, composites, Heat treatment of metals.**Power Transmission Elements:** Gears terminology of spur, helical and bevel gears, gear trains. Belt drives (types). Chain drives.**Material handling equipment:** Introduction to belt conveyors, cranes, industrial trucks, bull dozers.**TEXT BOOKS:**

1. P.L. Bellany, Thermal Engineering, Khanna Publishes
2. Benjamin J., Basic Mechanical Engineering, Pentex
3. Rai G.D. : Non-conventional Energy Sources, Standard Publishers Distributors.

REFERENCE BOOKS:

1. R.C.Patel, Elements of heat engines, Acharya Publishers -
2. G.R Nagapal, Power plant engineering, Khanna publishes
3. P.K.Nag, Engineering Thermodynamics, McGraw Hill
4. Dr.P.R Modi &Dr.M.S. Seth, Hydraulics & Fluid Mechanics including Hydraulic Machines, Standard Book House

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. Understand the working principles of internal combustion engines and the basic laws of heat transfer.
2. Learn the types and operation of refrigeration systems and the principles of various power plants.
3. Gain knowledge of renewable energy sources, including solar, wind, and biomass, and their applications.
4. Understand key manufacturing processes and welding techniques, including modern methods like CNC and 3D printing.
5. Understand engineering materials, power transmission components, and material handling equipment.

Mapping of Course Outcomes with Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	1	1	2	1	1	1	1	2	1	1
CO2	1	2	1	1	1	1	1	1	1	2	1	2	1	1
CO3	1	1	1	1	1	1	2	1	1	2	1	2	1	1
CO4	1	1	1	3	3	1	1	1	2	2	2	2	1	1
CO5	1	1	1	1	1	1	1	1	1	2	1	2	1	1

1 - Slightly; 2 - Moderately; 3 – Substantially

ENGINEERING GRAPHICS AND CAD**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	2-0-2	EE3205L, EC4205L	EE & EC

Pre-Requisites: None**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students to

1. Construct various engineering curves and geometric figures accurately.
2. Develop skills on scales and orthographic projections of points.
3. Develop skills in orthographic projections of lines, Planes.
4. Draw orthographic projection of solids.
5. Enhance visualization skills through the interpretation of 2D views and the creation of 3D representations.

COURSE CONTENT:

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:**(L-4 + P-8 =12)**

Curves used in Engineering Practice: Basic Geometrical constructions, Curves used in engineering practices: 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:**(L-4 + P-8 =12)**

Scales: Representative Fraction, Classification of scales, Construction of Plain Scales.

Introductions to Projections: Methods of projection, Principles of Orthographic Projections. Concept of Six views of an object.

Projections of points: Projections of Points.

UNIT III:**(L-4 + P-8 =12)**

Projections of lines: Projection of straight lines inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces.

Projections of planes: Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT IV:**(L-4 + P-8 =12)****Projections of Solids:**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

UNIT V:**(L-4 + P-8 =12)**

Orthographic Projections: Conventions Draw simple objects/components, dimensioning and scale. Six views of an object, Conventions. (Limited to three or four views for practice).

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple, compound Solids (Limited to two solids).

Demonstration of CAD Software: (not for End Examination) CAD workstation and peripherals.

Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars Standard, Object Properties, Draw, Modify and Dimension, Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom used in CAD, Select and erase objects.

TEXT BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House
2. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers
3. Shah, M.B. & Rane B.C., Engineering Drawing and Computer Graphics, Pearson Education

REFERENCE BOOKS:

1. Agrawal B. & Agrawal C.M. ,Engineering Graphics, TMH Publication
2. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
3. Corresponding set of CAD Software Theory and User Manuals
4. Computer Aided Engineering Drawing – K Balaveera Reddy et al. – CBS Publishers

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. Construct various engineering curves such as conics, cycloids, and involutes, Also draw tangent and normal to these curves using standard geometric methods.
2. Apply the principles of representative fraction to construct plain scales and understand the concept of projections to draw projections of points.
3. Draw projections of lines, and planes inclined to both principal planes, and determine true length and inclinations using appropriate projection techniques.
4. Construct projections of simple solids with axes inclined to one principal plane using rotating object method.
5. Develop orthographic and isometric projections of simple objects and solids by applying drawing conventions, scales, and visualization techniques.

Mapping of Course Outcomes with Program Outcomes:														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1	1	1	2	1	2	2	1
CO2	3	2	1	1	1	1	1	1	1	2	1	2	2	1
CO3	3	3	2	1	1	1	1	1	1	2	1	2	2	1
CO4	3	3	3	1	1	1	1	1	1	2	1	2	2	1
CO5	3	2	3	1	2	1	1	1	1	2	1	2	2	1

1 - Slightly; 2 - Moderately; 3 – Substantially

ENGINEERING GRAPHICS AND DESIGN**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	2-0-2	CH1105C, CE2105C, ME5105C	CH, CE & ME
II	2-0-2	CS6206L	CS

Pre-Requisites: None**COURSE OBJECTIVES:** The main learning objective of this course is to prepare the students to

1. Construct various engineering curves and geometric figures accurately.
2. Develop skills on scales and orthographic projections of points.
3. Develop skills in orthographic projections of lines, Planes.
4. Draw orthographic projection of solids.
5. Enhance visualization skills through the interpretation of 2D views and the creation of 3D representations.

COURSE CONTENT:

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:**(L-4 + P-8 =12)**

Curves used in Engineering Practice: Basic Geometrical constructions, Curves used in engineering practices: 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:**(L-4 + P-8 =12)**

Scales: Representative Fraction, Classification of scales, Construction of Plain Scales.

Introductions to Projections: Methods of projection, Principles of Orthographic Projections. Concept of Six views of an object.

Projections of points: Projections of Points.

UNIT III:**(L-4 + P-8 =12)**

Projections of lines: Projection of straight lines inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces.

Projections of planes: Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT IV:**(L-4 + P-8 =12)****Projections of Solids:**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

UNIT V:**(L-4 + P-8 =12)**

Orthographic Projections: Conventions Draw simple objects/components, dimensioning and scale. Six views of an object, Conventions. (Limited to three or four views for practice).

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple, compound Solids (Limited to two solids).

Demonstration of CAD Software: (not for End Examination) CAD workstation and peripherals,

Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars Standard, Object Properties, Draw, Modify and Dimension, Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom used in CAD, Select and erase objects.

TEXT BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House
2. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers
3. Shah, M.B. & Rane B.C., Engineering Drawing and Computer Graphics, Pearson Education

REFERENCE BOOKS:

1. Agrawal B. & Agrawal C.M. ,Engineering Graphics, TMH Publication
2. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
3. Corresponding set of CAD Software Theory and User Manuals
4. Computer Aided Engineering Drawing – K Balaveera Reddy et al. – CBS Publishers

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. Construct various engineering curves such as conics, cycloids, and involutes, Also draw tangent and normal to these curves using standard geometric methods.
2. Apply the principles of representative fraction to construct plain scales and understand the concept of projections to draw projections of points.
3. Draw projections of lines, and planes inclined to both principal planes, and determine true length and inclinations using appropriate projection techniques.
4. Construct projections of simple solids with axes inclined to one principal plane using rotating object method.
5. Develop orthographic and isometric projections of simple objects and solids by applying drawing conventions, scales, and visualization techniques.

Mapping of Course Outcomes with Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1	1	1	2	1	2	2	1
CO2	3	2	1	1	1	1	1	1	1	2	1	2	2	1
CO3	3	3	2	1	1	1	1	1	1	2	1	2	2	1
CO4	3	3	3	1	1	1	1	1	1	2	1	2	2	1
CO5	3	2	3	1	2	1	1	1	1	2	1	2	2	1

1 - Slightly; 2 - Moderately; 3 – Substantially

ENGINEERING WORKSHOP PRACTICE**Credits: 1.5****Assessment : 40 + 60**

Semester	L-T-P	Course Code	Branches
I	0-0-3	CH1107L, CE2107L, ME5107L	CH, CE & ME
II	0-0-3	EE3207L, EC4207L, CS6207L,	EE, EC & CS

Pre-Requisites: None**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students to

1. Provide exposure to the students with hands-on experience on various basic engineering practices.
2. Have a study and hands-on-exercise on plumbing and carpentry components.
3. Have a practice on fitting and sheet metal.
4. Have a practice on foundry operations.
5. Have a study on measurement of electrical wiring.

COURSE CONTENTS:

Carpentry: Demonstration and practice of carpentry tools, Preparation of Half lap joint, Dovetail joint and Mitered Mortise and Tenon Joint.

Fitting Trade: Demonstration and practice of fitting tools, Preparation of Straight fit, V-fit and Square fit.

Sheet Metal: Demonstration and practice on Sheet metal tools. Preparation of Round Tin, Square Tin and Truncated Prism.

Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Sand Moulds for given Patterns.

House Wiring: Demonstration and practice on Electrical tools, wiring and earthing.

Detailed Contents

1. Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools.
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding. Glass cutting
7. Metal casting.
8. Welding(arc welding & gas welding), brazing

The above course content is learnt by online videos/ppt presentations

LIST OF EXPERIMENTS:**I. CARPENTRY SHOP**

1. Half Lap Joint
2. Dove Tail Joint
3. Mitred Mortise and Tenon Joint

II. FITTING SHOP

4. Straight Fit
5. V – Fit
6. Square Fit

III. SHEET METAL SHOP

7. Round Tin
8. Square Tin
9. Truncated Prism

IV. FOUNDRY SHOP

10. Mould for Two Stepped Pulley
11. Mould for Three Stepped Pulley
12. Mould for Dumbell

V. ELECTRICAL WIRING SHOP

13. One Light Controlled by One Way Switch
14. Two Lights Controlled by One Switch in Series

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

TEXT BOOKS:

1. B.S. Raghuwanshi, A Course in Workshop Technology Vol I. & II, Dhanpat Rai & Co., 2015 & 2017.
2. Bruce J. Black, Workshop Processes, Practices and Materials, Routledge publishers, 5th Edition. 2015.
3. Rao P.N., "Manufacturing Technology", Vol. I & II, Tata McGraw Hill House, 2017

REFERENCE BOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S. K., Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and Publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P.Hariharanand A. SureshBabu, Manufacturing Technology-I" Pearson Education, 2008.

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. Recognize and follow safety procedures to prevent accidents and ensure a safe working environment.
2. Identify different types of workshop tools, equipment, and materials used in fitting, carpentry and other trades.
3. Perform practical tasks such as sawing, filing, fitting, joining, welding, and assembling components.
4. Read simple technical drawings and translate them into physical work pieces.
5. Collaborate effectively during group / individual assignments or projects in the workshop.

Mapping of Course Outcomes with Program Outcomes:														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	3	2	2	3	1	1	2	2	3
CO2	3	2	3	2	1	3	2	2	3	1	1	2	2	3
CO3	3	2	3	2	1	3	2	2	3	1	1	2	2	3
CO4	3	2	3	2	1	3	2	2	3	1	1	2	2	3
CO5	3	2	3	2	1	3	2	2	3	2	2	2	2	3

1 - Slightly; 2 - Moderately; 3 – Substantially

MATERIAL SCIENCE AND ENGINEERING**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
I	3-0-0	ME5106C	ME

Pre-Requisites: None**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students to

1. Understand the fundamentals of crystallography including unit cells, crystal structures, lattice parameters, crystal imperfections, and mechanisms of plastic deformation in materials.
2. Gain knowledge of mechanical testing methods such as tensile, compressive, hardness, impact, creep, and fatigue tests, and interpret material behavior under various loading conditions.
3. Comprehend phase transformations in metals and alloys by analyzing cooling curves, binary phase diagrams, and the Iron-Carbon equilibrium diagram, and understand the effect of alloying elements.
4. Familiarize with various ferrous and non-ferrous metals and alloys, their classifications, properties, applications, and the influence of alloying elements on their characteristics.
5. Explore thermal and surface treatment processes including TTT diagrams and heat treatment techniques, and understand the principles, processes, and applications of powder metallurgy.

COURSE CONTENT:**UNIT I:****(8)**

Space lattice and unit cells, Crystal structures of common metallic materials – BCC –FCC- HCP – Atomic packing factor – Miller indices –spacing of lattice planes –Relation between density and lattice constant. Crystal imperfections –point, line and surface defects. Edge and screw dislocations – Burger's vector. Plastic deformation by slip and twinning. Critical resolved shear stress for slip.

UNIT II:**(8)**

Testing of Engineering materials –tensile, compressive, hardness and impact tests. Creep –creep test-creep curve- Mechanism of creep. Fatigue – fatigue stress cycles – fatigue test. S-N- curve –Mechanism of fatigue. Fracture – Ductile and brittle fracture –Griffith's criterion.

UNIT III:**(8)**

Construction of cooling curves for a pure metal and a solid solution / alloy – Gibb's phase rule for a metal system– Construction and interpretation of binary phase diagrams-Types of phase diagrams –Eutectic, Eutectoid, Peritectic, Peritectoid. Iron-Carbon system – cooling curve of pure iron. Iron – carbide equilibrium diagram – Effect of alloying elements on Iron-Iron carbide diagram.

UNIT IV:**(8)**

Plain carbon steels – Uses and limitations of plain carbon steels. Alloy steels. Effect of alloying elements in steels. High speed tool steel, stainless steels, High nickel and High chromium steels. Cast irons-grey, white, malleable and SG irons. Non- Ferrous metals and alloys –Copper, Aluminium, Magnesium, Nickel and Zinc-Properties and applications.

UNIT V:**(8)**

Transformation points – Construction of TTT diagram – TTT diagram and cooling curves. Heat treatment of steels – Annealing, Normalizing, Hardening, Tempering, Austempering, Martempering. Surface hardening of steels – Carburizing, Nitriding, Cyaniding, Flame Hardening and induction hardening.

Powder Metallurgy –production of metal powders- Basic steps in powder metallurgy - advantages limitations and applications of powder metallurgy.

TEXT BOOKS:

1. William D. Callister, Jr.: Materials Science and Engineering, John Wiley & Sons Limited.
2. Daniel Yesudian C.D. & Harris Samuel D.G: Materials Science and Metallurgy.
3. Kodgire V.D.: Materials Science and Metallurgy, Second Edition, Tata McGraw-Hill.

REFERENCE BOOKS:

1. Raghavan V: Physical Metallurgy, Second Edition, PHI Learning Pvt. Ltd
2. William F. Hosford: Physical Metallurgy, Second Edition, Taylor and Francis.
3. William F. Smith and Javed Mughal : Fundamentals of Materials Science and Engineering, 6th edition, published in 2020.

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. Explain the basic crystal structures, lattice types, and various crystal imperfections, and analyze their influence on the plastic deformation behavior of engineering materials.
2. Identify different mechanical tests and compare how materials behave under stress, fatigue, and fracture.
3. Interpret binary phase diagrams and the Iron-Carbon system using Gibb's phase rule and cooling curves, and explain the significance of different phase transformations in alloy systems.
4. Classify ferrous and non-ferrous metals and alloys based on composition and properties, and select suitable materials for engineering applications considering their advantages and limitations.
5. Describe various heat treatment processes and analyze the construction and applications of TTT diagrams and powder metallurgy techniques for enhancing material properties.

Mapping of Course Outcomes with Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1	1	1	1	1	2	2	1
CO2	3	2	1	1	1	1	1	1	1	1	1	2	2	1
CO3	3	3	2	1	1	1	1	1	1	1	1	2	2	1
CO4	3	3	3	1	1	1	1	1	1	1	1	2	2	1
CO5	3	2	3	1	2	1	1	1	1	1	1	2	2	1

1 - Slightly; 2 - Moderately; 3 – Substantially

ADVANCED ENGINEERING GRAPHICS**Credits: 3****Assessment: 40 + 60**

Semester	L-T-P	Course Code	Branches
II	2-0-2	ME5205C	ME

Pre-Requisites: None**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students to

1. understand the basics of Projections of planes, solids and Auxiliary projections of solids in different inclinations of the principle planes.
2. provide the knowledge of section of solids and to provide sufficient knowledge to draw section planes perpendicular to HP and inclined to VP and also of solids inclined to both the planes.
3. provide knowledge of development of surfaces, and to know how to unwind an object / solid when it is being cut by an inclined plane.
4. impart the students, the ability to analyze the interpretation of solids intersections.
5. analyze the isometric projections of simple objects.

COURSE CONTENT:**UNIT I:****(L-4 + P-8 =12)**

Auxiliary projections: Projections of Planes, Solids (Simple Solids - Cylinder, Cone, Cube, Prism, & pyramid, Octahedron and Tetrahedron) those inclined to both the planes by Auxiliary projections.

UNIT II:**(L-4 + P-8 =12)**

Sections of solids: Sections of solids of tetrahedron, cube, prism, pyramids and cone, section planes perpendicular to HP and inclined to VP, Section planes perpendicular to VP and inclined to HP, sections plane Perpendicular to both HP and VP, true shape of the sections

UNIT III:**(L-4 + P-8 =12)**

Development of surfaces: Development of lateral surfaces of right regular solids as prisms, pyramids, cylinders and cones which are cut by plane inclined to HP only.

UNIT IV:**(L-4 + P-8 =12)**

Interpenetration of solids: Introduction to interpenetration of solids of intersection of two prisms, cylinders, cone and cylinder.

UNIT V:**(L-4 + P-8 =12)**

Isometric Projections: Isometric Projections and views such as prisms, Pyramids, cylinders and cones. Solids placed one over the other simple mechanical components.

TEXT BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House
2. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers
3. Shah, M.B. & Rane B.C., Engineering Drawing and Computer Graphics, Pearson Education

REFERENCE BOOKS:

1. Agrawal B. & Agrawal C.M. ,Engineering Graphics, TMH Publication
2. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
3. K. Venugopal: Engineering Drawing & Graphics, New age International Publishers.

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. Understand and draw projections of solids, planes through auxiliary vertical and inclined planes.
2. Generate and analyze sectional views of various solids and components to understand internal features.
3. Develop the lateral surfaces of simple solids and apply surface development techniques in practical contexts.
4. Understand and analyse the interpretation of solids and visualization of components.
5. Understand isometric views and drawing of simple and compound solids.

Mapping of Course Outcomes with Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1	1	1	2	1	2	2	1
CO2	3	2	1	1	1	1	1	1	1	2	1	2	2	1
CO3	3	3	2	1	1	1	1	1	1	2	1	2	2	1
CO4	3	3	3	1	1	1	1	1	1	2	1	2	2	1
CO5	3	2	3	1	2	1	1	1	1	2	1	2	2	1

1 - Slightly; 2 - Moderately; 3 – Substantially

UNIVERSAL HUMAN VALUES**Credits: 2****Assessment : 100 + 0**

Semester	L-T-P	Course Code	Branches
I	2-0-0	CH1109C, CE2109C, EE3109C EC4109C, ME5109C, CS6109C,	CH, CE, EE, EC, ME & CS (All Branches)

Pre-Requisites: None**COURSE DESCRIPTION:**

The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence. It is free from any dogma or value prescriptions. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself finally.

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students to

1. To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. To understand (or developing clarity) the harmony in the human being, family, society and nature/existence.
3. To strengthen self-reflection and to develop commitment and courage to act.
4. To understand social responsibility of an engineer.
5. To appreciate ethical dilemma while discharging duties in professional life.

COURSE CONTENT:**UNIT I:****(5)**

Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, Self-Exploration—what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II:**(5)**

Understanding Harmony in The Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility (Sukh and Suvidha). Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.

UNIT III:**(5)****Understanding Harmony in The Family and Society- Harmony in Human-Human Relationship:**

Understanding harmony in the Family - the basic unit of human interaction. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness (Ubhay-tripti); Trust (**Vishwas**) and Respect (**Samman**) as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution (**Samadhan**), Prosperity (**Samridhi**), fearlessness (**Abhay**) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (**Akhand Samaj**), Universal Order (**Sarvabhaum Vyawastha**) - from family to world family.

UNIT IV:**(5)****Understanding Harmony in The Nature and Existence - Whole Existence as Coexistence:**

Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT V:**(5)****Implications of The Above Holistic Understanding of Harmony on Professional Ethics:**

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

REFERENCE BOOKS:

1. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
2. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
3. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
4. A Nagaraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
5. Susan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.

8. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.
9. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
- 10 India Wins Freedom - Maulana Abdul Kalam Azad.

Relevant CDs, Movies, Documentaries & Other Literature:

1. value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story.

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to:

1. To become more aware of themselves, and their surroundings (family, society, nature)
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. To become sensitive to their commitment towards what they have understood (human values, human relationship and human society)
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Mapping of Course Outcomes with Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1							3	3	2	1	3	1	3
CO2	1							3	3	2	1	3	1	3
CO3	1							3	3	2	1	3	1	3
CO4	1							3	3	2	1	3	1	3
CO5	1							3	3	2	1	3	1	3

1 - Slightly; 2 - Moderately; 3 – Substantially