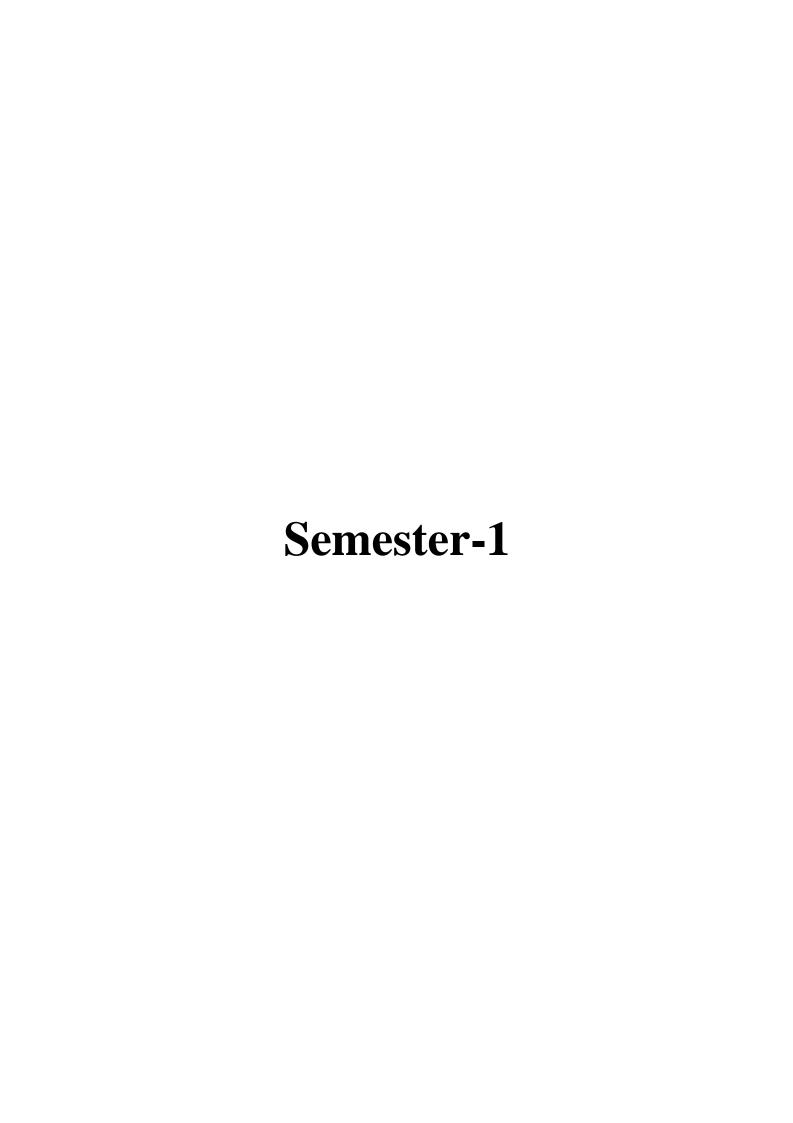# All Syllabus of 1st Year B. Tech (all streams) for 2022 Admission Batch

Semester-1

Course Name: Chemistry
Course Code: BSC102

Course Outcome

The course will enable the student to

1. Analyze nano- structures and microscopic properties in terms of orbital concept of hydrogen atoms and bands of solid extending to Crystal field of transition metal ions using quantum mechanical approach.

2. Rationalize bulk properties using thermodynamic considerations and equilibrium conditions predicting intermolecular forces and interactions in different systems.

3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels and its subsequent applications.

4. Able to apply stereo chemical approach for structure prediction and drug design in fundamental organic reactions.

Detailed Contents

Atomic and molecular structure (12 lectures)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Chemistry of Materials, Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Spectroscopic techniques and applications (8 lectures)

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 characterisation techniques. Diffraction and scattering. AICTE Model Curriculum for First Year Undergraduate degree courses in Engineering & Technology 6

Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

Chemical kinetics and reaction equilibrium

Concept of preequilibrium, equilibrium and related quantities. Concept of preequilibrium, equilibrium and related quantities Reaction laws: rate and order; molecularity; zero, first and second order kinetics. Pseudounimolecular reaction, Arrhenius equation. Mechanism and theories of reaction rates (Transition state theory, Collison theory:). Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics).

Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Periodic properties (4 Lectures)

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.

Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Text Books:

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition

2. Chemistry by Prasanta Rath and Subhendu Chakraborty

3. Physical Chemistry by P. W. Atkins

4. Fundamentals of Molecular Spectroscopy by C. N. Banwell

5. Physical Chemistry, P.C. Rakshit, Sarat Book distributors, Calcutta, 7th ed

6. University Chemistry by B. H. Mahan

7. A Textbook of Nanoscience and Nanotechnology Author: T. Pradeep. Publisher: McGraw Hill Education, ISBN: 9781259007323

8. The Chemistry of Nanomaterials, Prof. C.N.R. Rao, Publisher-Wiley-VCH, ISBN: 3527306862

Course Name: Physics

Course code: BSC101

Course Outcome

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

1: Develop knowledge of classical mechanics for applications in engineering.

2: Develop the knowledge of electromagnetic wave (optics) and theory in variety of technologies like optical instruments, optical software, communication etc.

3: Develop knowledge of Electronic Materials and Semiconductor Physics for applications in engineering.

4. Formulate and solve the engineering problems on Quantum Physics and its practical applications. Develop the understanding of Statistical Physics and their applications.

Detailed Contents

Module 1: Classical Mechanics and Oscillations (9 L)

Constraints- Holonomic and Non-Holonomic Constraints, Generalized Coordinates and Momentum, Degrees of Freedom, Lagrange's equation of motion, application of Lagrang's equation, Cyclic coordinate; Potential energy function F = -grad V, Equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Curl of a force field, Conservation laws of energy & momentum; Concept of Central forces, Kepler's law; Non-inertial frames of reference, Rotating coordinate system, Centripetal and Coriolis accelerations.

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly damped oscillators; Examples of mechanical and electrical simple harmonic oscillators, energy decay in a damped harmonic oscillator, Forced oscillations and resonance, quality factor, power absorbed by oscillator.

Module 2: Optics (6L)

Huygens' principle, superposition of waves and interference of light by wavefront splitting andamplitude splitting; Young's double slit experiment, Newton's rings, Fraunhofer diffraction from a single slit and a circular aperture, Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Spontaneous and Stimulated emission,Einstein's theory of A and B coefficients; amplification of light bypopulation inversion, different types of lasers: gas lasers, solid-state lasers, dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionalityand brightness, applications of lasers.

Module 3: Introduction to Electromagnetic Theory (6 L)

Concept of Bound charges due to electric polarization in dielectric medium, Electric displacement current;

Introduction to Maxwell's equations of Electromagnetic fields, Continuity equation for current densities, Modifying equation for the curl of magnetic field to satisfy continuity equation.

Maxwell's equation in vacuum and non-conducting medium, Energy in an electromagnetic field, Flow of energy and Poynting vector with examples, The wave equation, Plane electromagnetic waves in vacuum and their transverse nature and polarization, Relation between electric and magnetic fields of an electromagnetic wave, Energy carried by electromagnetic waves.

Module 4: Electronic Materials and Semiconductors (6 L)

Free electron theory of metals, Fermi level, density of states in 1, 2 and 3 dimensions, Bloch'stheorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands, Metals, semiconductors, and insulators. Intrinsic and extrinsicsemiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibriumcarrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p – njunction.

Module 5: Introduction to Quantum Mechanics for Engineers (10 L)

Introduction to Quantum Mechanics, Wave nature of particles, Time-dependent and time-independent Schrödinger equation for wavefunction, Born interpretation, Probability current density, Expectation values, Free-particle wavefunction and wave-packets, Uncertainty principle and de-Broglie hypothesis, Concept of Operator.

Applications of Schrödinger equation: One-dimensional problems - particle in one dimensional potential box, step potential, concept of tunnel effect, qualitative summary of linear harmonic oscillator; Three-dimensional problems - particle in three dimensional potential box, hydrogen atom problem, Occupation probability & examples, nuclear alpha decay.

Module 6: Statistical Mechanics (3 L)

Statistical Distributions functions (Three different kinds- Maxwell Boltzmann, Fermi-Dirac, Bose Einstein), Comparison of these three statistical distribution functions, Mention the form of the functions and graphical explanations of them, Concept of Fermions and Bosons, Mention the importance of statistical mechanics in perspective of thermodynamics, Concept of thermodynamical probability, Concept of Microstates and Macrostates.

Suggested Text Books:

1. Theory and problems of Theoretical Mechanicsby Murray R. Spiegel SI(Metric) edition
2. Advanced Acoustics – Dr. D. P. Raychaudhuri, The new book stall, Revised Ninth Edition, 2009
3. A textbook on Optics, B. Ghosh and K. G. Majumder, Sreedhar Publishers, fifth edition.
4. Introduction to Electrodynamics by David J. Griffiths 3rd Edition
5. Introduction to Solid State Physics (January 2019) by Charles Kittel (Published by Wiley)
6. Concepts of Modern Physics (Sixth Edition) by Arthur Beiser (Published by McGraw-Hill)

Course Name: Mathematics – I
Course Code: BSC103

Course Outcome: -

1. Understand the domain of applications of mean value theorems to engineering problems.

2. Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals, surface and volume of revolutions.

3. Apply the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extremum points of different surfaces of higher dimensions.

4. Learn different types of matrices, concept of rank, methods of matrix inversion and their applications. Understand Vector spaces, apply the concept of eigen values, eigen vectors, diagonalisation of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems.

Detailed Contents

Module 1: Calculus (Differentiation) (6 lectures)

Rolle's Theorem, Mean Value Theorems, Taylor's and Maclaurin's Theorems with Remainders; Taylor's Series, Series for Exponential, Trigonometric and Logarithm Functions, Indeterminate forms and L'Hospital's Rule; Maxima and Minima; Evolutes and Involutes.

Module 2: Calculus (Integration) (6 lectures)

Evaluation of Definite and Improper Integrals; Beta and Gamma Functions and their properties; Applications of Definite Integrals to evaluate surface areas and volumes of revolutions.

Module 3: Multivariable Calculus (Differentiation) (11 lectures)

Limit, Continuity and Partial Derivatives; Homogeneous Functions, Eulers Theorem of second and third order (Statement only), Change of variables, Composite function, Derivative of implicit functions, Total Derivative, Jacobian, Maxima, Minima and Saddle points; Method of Lagrange multipliers; Gradient, Directional Derivatives, Tangent Plane and Normal Line, Curl and Divergence.

Module 4: Matrix and Determinant (11 lectures)

Matrices, Addition and Scalar Multiplication, Matrix Multiplication, Symmetric and Skew-symmetric Matrices, Hermitian and Skew-Hermitian Matrices, Determinants, Cramer's Rule, Inverse of a Matrix, Orthogonal Matrices, Linear Systems of Equations, Gauss Elimination and Gauss-Jordan Methods, Rank of a Matrix.

Eigenvalues, Eigenvectors, Eigen values of some special matrices, Similarity Matrix, Diagonalization.

Module 5: Sequences and Series (11 lectures)

Sequence: Monotonic and bounded sequence, Convergence and divergence of sequence, Algebra of sequences (Statement only).
Infinite series: Series of positive terms - Notion of Convergence and Divergence, Convergence of infinite G.P. series and p-series (Statement only), Tests of Convergence [Statement only] – Comparison Test, Integral Test, D'Alembert's Ratio Test, Raabe's Test, Cauchy's Root Test. Alternating Series- Leibnitz's test [Statement only], Absolute and conditional convergence.

Fourier series: Even function, Odd function. Periodic function, Euler's formula, Dirichlet's conditions. Half Range Sine and Cosine Series, Parseval's Theorem, Introduction to typical wave form like Periodic square wave, Saw-toothed wave, Triangular wave, Half wave rectifier, Full wave rectifier, Unit step function etc. and their corresponding Fourier series expansions.

Suggested Text Books:

1.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,

2002.

2.Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

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.

5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

(viii) V. Krishnamurthy, V.P. Mainra and J.L. Arora, An Introduction to Linear Algebra, Affiliated

East–West Press, Reprint 2005.

8. B.Basu Mallik & Krishanu Deyasi, Engineering Mathematics-1A, Cengage Learning, First Edition, 2020

9. B.Basu Mallik & Krishanu Deyasi, Engineering Mathematics-1B, Cengage Learning, First Edition, 2020

Course Name: Basic Electrical Engineering
Course Code: ESC101

Course Outcome:

1. Understand the basic laws of electrical circuits and network theorems using DC excitation and study transient response of RL, RC circuits

2. Explain the fundamentals of AC circuits and resonance conditions for RLC circuits

3. Illustrate the basic concepts of magnetic circuits and working of electrical machines

4. Outline the basic concepts of power converters and interpret the components of low voltage electrical installations

Detailed Contents

DC Circuits &Network Theorems: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, Kirchhoff's law, Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, star-delta conversion. Maximum power transfer theorem with proof.

Electrostatics: Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of gauss's law, its applications to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored in a capacitor.

Electromagnetism: Biot-savart law, Ampere's circuital law, field calculation using Biot-savart &ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy stored in a magnetic field, B-H curve, Hysteretic and Eddy current losses.

AC Circuit Analysis: RMS Values, average value, phasor representation of alternating quantities. Concept of j-operator, Steady state AC circuit analysis for R, L, C, RL, RC & RLC series and parallel circuits. Series and parallel resonance condition. AC power calculations. Introduction to three phase systems, balanced. Star and delta connections. Measurement of three phase power.

DC Machines: Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control)

Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

3 phase induction motor: Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control).

Suggested Text Books:

1.Basic Electrical Engineering -Abhijit Chakrabarti, Sudipta Nath,Chandan Kumar Chanda
2.Basic Electrical Engineering (vol2)-B.L.Thereja
3.Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
4.Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education

Course Name: Biology for Engineers
Course Code: BSC109

Course Outcome (CO):

After studying the course, the student will be able to:

1. Identify the major biological discoveries which revolutionized science. Highlight the classification of the organisms including the microorganisms

2. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse. The enzymes and their varied properties and functions which distinguishes one from the other is a classic example of it.

3: Apply thermodynamics principles to biological systems and also analyse biological processes at the reductionistic level.

4. Identify DNA as a genetic material in the molecular basis of information transfer, impart the concept of recessiveness and dominance during the passage of genetic material from parent to offspring

Detailed Contents

Module 1: Introduction (2 lectures)

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing comparison between eye and camera, Bird flying and aircraft. Mention the most excitingaspect of biology as an independent scientific discipline. Why we need to study biology?

Evolution of life: Origin of Life; Darwin's concepts of evolution

Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module 2: Classification (3 lectures)

Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster,C. elegance, A. Thaliana, M. Musculus.

Module 3: Genetics (4 lectures)

Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics.Emphasis to be give not to the mechanics of cell division nor the phases but how geneticmaterial passes from parent to offspring. Concepts of recessiveness and dominance. Conceptof mapping of phenotype to genes. Discuss about the single gene disorders in humans.Discuss the concept of complementation using human genetics.

Concepts in population biology.

Module 4: Biomolecules (4 lectures)

Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discussabout sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA.Two carbon units and lipids.

Module 5: Enzymes (4 lectures)

Purpose: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Module 6: Information Transfer (4 lectures)

Purpose: The molecular basis of coding and decoding genetic information is universalMolecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Genetic engineering/Cloning and its applications

Module 7: Macromolecular analysis (5 lectures)

Purpose: How to analyse biological processes at the reductionist level

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8: Metabolism (4 lectures)

Purpose: The fundamental principles of energy transactions are the same in physical and

biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versusendergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy Charge.

Module 9: Microbiology (3 lectures)

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Suggested Text Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.;Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H.John Wiley and Sons

3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman andcompany, Distributed by Satish Kumar Jain for CBS Publisher

5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C.Brown Publishers.

Course Name: Engineering Mechanics-I
Course Code: ESC201

Course Outcome: -

1. understand the application of force, couple and develop free body diagram of different arrangements.

2. Elaborate the theory of friction.

3. understand the concept of CG & MI.

4. Understand application of stress strain in simple & truss member.

Detailed Contents

Module-1: Force & Equilibrium Systems

Basic concepts, Rigid Body equilibrium (2-D & 3-D); System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Concept of Free body diagrams, Equations of Equilibrium of Coplanar Systems, Lami's Theorem, Introduction to Vectors and tensors and their applications

Module-2: Friction

Laws of Friction, Static and Dynamic Friction, friction on inclined surface and threaded screw.

Module-3: Basic Structural Analysis:

Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members.

Module-4: Properties of area - Centre of Gravity & Moment of Inertia:

Centre of Gravity and its implications; Centroid of simple figures from first principle, centroid of composite sections;

Area moment of inertia of plane sections from first principles, principal axes, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Concept of Mass moment inertia.

Module-5: Basic Concept of Bending Moment :

Transverse loading on beams, Concept of shear force and bending moment, Different type of beams and loading., relationships between shear force and bending moment, shear force and bending moment diagrams of point loading on cantilevers and simply supported beams.

Module-6: Virtual Work and Energy Method

Virtual displacements, principle of virtual work for rigid bodies, degrees of freedom. Mechanical efficiency, energy equation for equilibrium. Applications of energy method for equilibrium.

Suggested Text Books:

1.B B Ghosh, Satyajit Chakrabarti, Samir Ghosh "Engineering Mechanics" S Chand Publisher.

2.J. L. Meriam, L. G. Kraige, J. N. Bolton "Engineering Mechanics: Statics", Wiley, 2011.

3.F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I – Statics. 9th Ed, Tata McGraw Hill

4.R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press

5. S. Timoshenko, D.H. Young, J.V. Rao, SukumarPati, Engineering Mechanics (In SI Units) (SIE).

6. M. F. Beatty, "Principles of Engineering Mechanics", Springer Science & Business Media, 1986.

7.Manoj K. Harbola, "Engineering Mechanics", Cengage Learning India Pvt. Ltd, 2018

8. D.S. Bedi& M.P. Poonia, "Engineering Mechanics", Khanna Publishing House, 2019

9. R.K. Bansal, "Engineering Mechanics", Laxmi Publications

10. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall

11. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,

12. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Course Name: Engineering Graphics & Design
Course Code- ESC102

Course Outcomes

1. Prepare students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. Prepare students to communicate effectively.
3. Prepare students to use the techniques, skills, and modern engineering tools necessary for engineering practice
4. Helping students to increase their visualization power

Detailed Contents

Module :-1: Introduction to engineering drawing:

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering; Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal Scales

Module-2: Orthographic projections:

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module-3: Projections of regular solids:

Solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale.

Module-4: Sections and sectional views of right angular solids

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids.

Module-5: Isometric projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Module-6: Overview of computer graphics

The computer technologies that impact on graphical communication, 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 as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids

Module-7: Customization & cad drawing

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module-8: Annotations, Layering & other Functions

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of

composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Module-9: Demonstration of a simple team design project

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid- modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Suggested Text books:

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

Course Name : Essential Studies for Professionals – I
Course Code: HSMC102

Course Outcome :-

1. Students will learn advance tricky approach for solving Quantitative Aptitude questions.

2. It will enhance students skill to appear in various aptitude test within limited time constrain.

3. This module will enhance student's Analytical skill &will also improve quick decision making skill.

4. Students can prepare various competitive exams and different placement aptitude test as well.

- **Module 1: Quantitative Aptitude**
- Quant foundation
- Basic Multiplication
- Division
- Squaring numbers
- Percentage
- Ratio
- Simple equation
- Variation
- Partnership
- Profit & Loss
- **Module 2: Logical Mental ability -1**
- Coding and Decoding & Direction Sense
- Series & Numbers
- Blood Relations
- Analogy

Suggested Text Books:

1. Fast Track Arithmetic- Rajesh Verma

2. Verbal & non-verbal reasoning- R.S Agarwal

3. Quantitative Aptitude- R.S Agarwal

4. Analytical Reasoning –Peeyush Bhardwaj

Course Name: Skill Development for Professionals – I

Course Code: HSMC182

Course Outcome: -

1. It will improve verbal ability skill among students.

2. Students will communicate effectively & appropriately in real life situation.

3. It will enhance students' problem solving skill.

4. Students will be able to prepare for various public and private sector exams & placement

drives.

Module 1: Objective English-1

Introduction of Parts of speech, What is noun, Kinds of Noun, Rules & Application, Definition of Pronoun, Examples, Rules & Application, Definition of Verb, Kinds of Verb, Rules & Application, Definition of Tense, Different types of Tenses, Examples, Rules & Application, Definition of Adjective, Kinds of Adjective, Rules & Application, Definition of Adverb, Kinds of Adverb, Rules & Application, Definition of Preposition, Examples , Rules & Application,
Definition of Interjection, Examples, Rules & Its Application, Definition of Conjunction, Examples, Rules & Application, Different types of Articles, Examples, Rules & Application English Grammar.
Newspaper reading: The Hindu & Economic Times.

Module 2: Data Interpretation level-I

Suggested Text Books:

1.Objective English- Arihant Publications

2. Data Interpretation - R.S Agarwal

3.Objective English Grammar- Kiran Publications

Course Name: Programming for Problem Solving with Python
Course Code: IVC101

Course Outcome :

1: To impart the basic concepts of the problem-solving approach with the core syntax and semantics of the Python programming language through character set, expression, operators.

2: Fundamentals of programming through Standard Input / Output, Flow of Control and Program Structures.

3: To apply the concepts of strings, function, lists, dictionaries, tuples, sets and also the regular expressions and built-in functions to navigate the file systems.

4: To impart the knowledge of real-life projects on the programming language.

Detailed Syllabus

1. Write about different components of Computer system and its functions with proper diagram.

2. Implementation of Various Python operators

   a) Write a program to enter number and display its hexadecimal and Octal equivalent

   b) Write a program to calculate the area of a triangle using herons formula

3. Write a program to convert degrees Fahrenheit to degrees Celsius.

Design of different patterns, accessing lists and other structures using loops, implementation of different conditional statements.

i.   Write a program to calculate the sum of tailor series.

ii.   Write a program to display all the numbers from 1-100 that are not divisible by 2 as well as 3.

iii. Write a program to print the pattern given below.

*

* *

```
*  *  *
*  *  *  *
*  *  *
*  *
    *
```

4. Function definition invocation, keyword argument implementation, Lambda Function.

Fundamental data structure programs

1. Write a function to construct tower of Hanoi
2. Write a function to construct tower of Hanoi
3. Write a program to find out the greatest common divisor using lambda function

5.Fundamental data structure programs

1. Write a program to find a given key from n numbers.
2. Write a program to accept a comma separated sequence of words as input and print the unique word in sorted format.

6.Advanced operations in Data Structure

1. Write a program that creates a dictionary of cubes of odd numbers in the range of 1-10.
2. Write a program that uses dictionary to return the name of employee of an organization when his project name is given.

3. Write a program that calculates fib(n) using dictionary.

7. Creation of Class and Objects in Python

1. Write a program to deposit or withdraw money in a bank account.

2. Write a class that stores a string and all its status details such as number of uppercase characters, vowels, consonants, spaces etc.

8. Polymorphism and Inheritance concept

Write a program that has classes such as student, course, and department. Enroll a student in particular department.

9. Creation of file different file accessing .xlsx and CSV file using Pandas.

10. Implementation of mathematical computation using Numpy and Scipy.

Course Name: Design Thinking & Innovation- Basic
Course Code: IVC102

Course Outcome:

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

1. Understand the concepts of design thinking approaches.

2. Create design thinking teams and conduct design thinking sessions.

3. Apply both critical thinking and design thinking in parallel to solve problems.

4. Understand how to conduct research and how to write a research paper.

Detailed Syllabus

Module 1: Introduction to Design Thinking (4 L)

Empathy: Empathy Building, Empathy Map & Evoking the 'right problem', Introduction to Human-Centered design, Customer Journey Mapping, Divergent Thinking and Convergent Thinking

Module 2: Ideation, Prototyping and Testing (4 L)

Creative process and creative principles, Steps to Enhance Design thinking, Biomimicking- Design by Nature, Types of Prototyping.

Module 3: Introduction to Research and Research Ethics (4 L)

Meaning, Objectives and Motivation in research, Types of research, Research approaches, Significance of research, Research methods versus methodology, Review paper writing, Literature Survey, Indexing of Journal, Citation and Journal Impact Factor.

Suggested Text Books

1. Title: Creative Confidence, Authors: Tom Kelley, David Kelley
2. Title: Change by design, Author: Tim Brown

Course Name: Economics, Finance and Entrepreneurship Skills - Foundation
Course Code: IVC103

Course Outcome:

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

1**.** Develop an entrepreneurial mindset which will be useful in all future endeavors including intrapreneurship.

2. Build a strong knowledge and skills foundation for students to start, build, and grow a viable and sustainable venture.

3. Acquire the knowledge in basic economics and financial skills to develop a business, marketing strategy and revenue streams.

4. Learn critical skills like leadership, presentation, decision making and communication.

Detailed Syllabus

Module 1: Self and Opportunity Discovery (3 L)

Finding Your Flow, Effectuation Principles, Importance of Team, Identify Problems worth Solving, Case Studies, Problem Interviews, Look for Solutions, Brainstorming, Back-of-the-Envelope Calculation.

Module 2: Customer and Solution (2 L)

Customers and Markets Identify Your Customer Segment and Niche, Segmentation and Targeting, Identify Your Customer Segment, Niche Marketing, Identify Jobs, Pains, and Gains and Early Adopters, Value Proposition Design

Module 3: Business Model and validation (4 L)

Basics of Business Model and Lean Approach, Risks and Assumptions, Competition Analysis, Blue Ocean Strategy, Solution Demo, Solution Interviews, Problem-Solution Fit, MVP, MVP Interviews, Product-Market Fit.

Module 4: Economics and Finance (3 L)

Basics of economics, micro-economics and macro-economics, Production, supply and demand (only basics), Break even analysis, Costs, Revenue, Revenue Streams, Profitability Checks, Basics of Finance, Bootstrapping, Sources and Uses of Funds, Positioning and Branding, Channels, Marketing, Sales Planning.

Suggested Text Book

Effectuation: Elements of Entrepreneurial Expertise (New Horizons in Entrepreneurship series) - Saras D. Sarasvathy

Semester-2

Course Name: Mathematics- II
Course Code: BSC104

Course Outcome: -

1. Recognize the methods for evaluating multiple integrals and apply to different physical problems.

2. Appraise different techniques to solve first and second order ordinary differential equations with its formulation to address the modeling of systems and problems of engineering sciences.

3. Appraise the idea of vector space and inner product spaces and orthogonalization for understanding physical and engineering problems.

4. Explain the concept of Probability and basic Statistics with their properties and applications in physical and engineering environment.

Detailed Contents:

Module 1: Multivariate Calculus (Integration)

Multiple Integration: Double Integrals (Cartesian), Change of Order of Integration in Double Integrals, Change of Variables (Cartesian to Polar), Applications: areas and volumes, Centre of Mass and Gravity (constant and variable densities); Triple Integrals (Cartesian), Orthogonal Curvilinear Coordinates, Simple applications involving cubes, sphere and rectangular parallelepiped; Scalar Line Integrals, Vector Line Integrals, Scalar Surface Integrals, Vector Surface Integrals, Theorems of Green, Gauss and Stokes.

Module 2: ODE

Exact equations, Rules for finding Integrating Factors, Linear and Bernoulli's equations, Equations not of first degree: Equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type.

Second Order Linear Differential Equations with constant coefficients, D-operator Method, Method of Variation of Parameters, Cauchy-Euler Equation; Power series Solutions; Frobenius method, Legendre equation, Legendre Polynomials, Rodrigue's Formula, Bessel equation, Bessel Functions of the First kind and their properties, Orthogonality conditions.

Module 3: Sequences and series:

Vector Space, Vector Subspace, Linear Independence and Dependence of Vectors, Basis, Dimension; Linear Transformations (maps), Range and Kernel of a Linear Map, Rank and Nullity, Inverse of a Linear Transformation, Rank Nullity Theorem, Composition of Linear Maps, Matrix associated with a Linear Map.

Inner Product Space, Gram-Schmidt Orthogonalization.

Module 4: Basic Probability:

Classical & Axiomatic Definition of Probability, Addition Rule for two & three events (statement only), Concept of Conditional Probability, Multiplication Rule of Probability, Bayes' Theorem (statement only), Independent Events.

Measures of Central tendency: Moments, Skewness and Kurtosis, Correlation and Regression – Rank correlation.

Suggested Text Books:

(i) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

(ii) Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(iii) W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition., Wiley India, 2009.

(iv) S. L. Ross, Differential Equations, 3rd Edition., Wiley India, 1984.

(v) E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

(vi) E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.

(vii) N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(viii) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

(ix) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).

(x) S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

(xi) W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

(xii) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005

(xiii) V. Krishnamurthy, V.P. Mainra and J.L. Arora, An Introduction to Linear Algebra, Affiliated East–West Press, Reprint 2005.

(xiv) B.Basu Mallik & Krishanu Deyasi, Engineering Mathematics-1B, Cengage Learning, First Edition, 2020.

(xv) B.Basu Mallik & Krishanu Deyasi, Engineering Mathematics-2B, Cengage Learning, First Edition, 2020.

Course Name: Programming for Problem Solving

Course Code: ESC103

Course Outcome (CO):

1. To impart the basic concepts of problem solving approach.

2. To impart the basic concepts of programming language through character set, expression, operators.

3. Fundamentals of programming through Standard input and output Flow of Control and Program Structures.

4. To impart the basic knowledge on array, function, pointers, data structure and file handling.

Detailed Contents

Module 1: Introduction to C Programming

Operators, Expressions, Program structures, Header files, Fundamental examples

Module 2: Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching , If, else , if-elseif statements, Switch-case, Iteration and loops (2 lectures)

Module 3: Arrays

- Arrays (1-D, 2-D), Character arrays and Strings

Module 4: Basic Algorithms

Notion of order of complexity through example programs, Searching, Basic Sorting Algorithms (Bubble, Insertion).

Module 5: Function

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: Call by reference, Return by refence

Module 6: Recursion

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc, Tail recursion concept

Module 7: Structure and union

Structures, Defining structures and Array of Structures, Union concept

Module 8: Pointers

Idea of pointers, defining pointers, Use of Pointers in self-referential structures, Basic of linked list creation, Linked list insert and delete operation

Module 9: File handling

Create, open, close files, opening modes, File copy using command line argument

Suggested Text Books

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

(ii) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

(iii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books

(i) Reema Thareja, Computer Fundamentals and programming in C, Oxford University Press

(ii) Yashavant Kanetkar, Let Us C, BPB Publications

Course Outcomes

Course Name: English

Course Code: HSMC101

Course Outcome:

1) To enable students to attain competence in the fundamentals of Grammar, Syntax and Vocabulary.

2) To Facilitate students communicate effectively in academic and social contexts.
3) To make students industry ready and enable them in understanding corporate ethics
4)The student will acquire basic proficiency in English including reading and listening, comprehension, writing and speaking skills.

Detailed Contents

Module 1. Vocabulary Building (4L)

The concept of Word Formation (1)

Root words from foreign languages and their use in English (1)

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. (1)

Synonyms, antonyms, and standard abbreviations. (1)

Module 2. Basic Writing Skills (6L)

Sentence Structures (1)

Use of phrases and clauses in sentences (1)

Importance of proper punctuation (1)

Creating coherence (1)

Organizing principles of paragraphs in documents (1)

Techniques for writing precisely (1)

Module 3. Identifying Common Errors in Writing (7L)

Subject-verb agreement (1)

Noun-pronoun agreement (1)

Misplaced modifiers (1)

Articles (1)

Prepositions (1)

Redundancies (1)

Clichés (1)

Module 4. Nature and Style of sensible Writing (5L)

Describing (1)

Defining (1)

Classifying (1)

Providing examples or evidence (1)

Writing introduction and conclusion (1)

Module 5. Writing Practices (4L)

Comprehension (1)

Précis Writing (2)

Essay Writing (1)

Module 6. Oral Communication (6L)

Listening Comprehension (1)

Pronunciation, Intonation, Stress and Rhythm (1)

Common Everyday Situations: Conversations and Dialogues (1)

Communication at Workplace(1)

Interviews (1)

Formal Presentations (1)

Suggested Text Books:

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001

<u>Course Name: Engineering Mechanics II</u>

<u>Course Code: ESC202</u>

<u>Course Outcome:</u>

After completion of this course, the learners will be able to

    1. Explain the motion of rigid bodies.

2. Understand basic dynamics concepts – force, momentum, work and energy;

3. Elaborate the theory of bending moment, torsional motion.

Detailed Contents

Module-1: Review of particle dynamics: Newton's laws of motion, Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion, construction of x-t, v-t and a-t graphs. Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). 3D curvilinear motion; Relative and constrained motion.

Module-2: Introduction to Kinetics of Rigid Bodies: Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of

Module-3: Work and Energy Method:

Displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency.

Module-4: Bending Moment: Transverse loading on beams, shear force and bending moment in beams, analysis of cantilevers, simply supported beams and overhanging beams, relationships between loading, shear force and bending moment, shear force and bending moment diagrams.

Module-5: Torsional Motion: Torsion of circular shafts, derivation of torsion equation, stress and deformation in circular and hollow shafts.

Suggested Text books:

1. B B Ghosh, Satyajit Chakrabarti, Samir Ghosh "Engineering Mechanics" S Chand Publisher.

2. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", Wiley, 2011.

3. M. F. Beatty, "Principles of Engineering Mechanics", Springer Science & Business Media, 1986.

4. Manoj K. Harbola, "Engineering Mechanics", Cengage Learning India Pvt. Ltd, 2018

Course Name: Workshop/Manufacturing Practice
Course Code: ESC104

Course Outcomes

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.

2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

3. By assembling different components, they will be able to produce small devices of their interest.

4. To implement the ideas of manufacturing of various products using molten materials.

Course Content:

Module No. 1: Machine shop: Typical jobs that may be made in this practice module. To make a pin from a mild steel rod in a lathe. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Module No. 2: Fitting shop: Typical jobs that may be made in this practice module. To make a Gauge from MS plate.

Module No. 3: Carpentry: Typical jobs that may be made in this practice module. To make wooden joints and/or a pattern or like.

Module No. 4: Welding shop: Typical jobs that may be made in this practice module. ARC WELDING: To join two thick (approx 6mm) MS plates by manual metal arc welding. GAS WELDING: To join two thin mild steel plates or sheets by gas welding.

Module No. 5: Casting: Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated.

Module No. 6: Smithy: Typical jobs that may be made in this practice module: A simple job of making a square rod from a round bar or like.

Learning Resources:

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. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Name: Essential Studies for Professionals – II
Course Code: HSMC202

Course Outcome: -

1. This part of the syllabus will create base of general knowledge among students which is required to appear in various competitive exams in public sector jobs (UPSC, SSC etc.).
2. It will inculcate their rights & duties to the society, it will help them to act according to law in society.
3. It will also improve basic banking knowledge among students.
4. Students can prepare various competitive exams and different placement aptitude test as well.

Detailed Contents

Module 1: Laws of Society:

History of Constitution, Preamble, Fundamental Rights, Directive Principle of State Policy and Fundamental Duties

Module 2: Our Ancient Past:

Indus Valley Civilization, Vedic Civilization, 16 Mahajanapadas, Mauryan Dynasty.

Module 3: Know Our Country:

Physiographic Division of India- Geological history of India, Northern Mountain, Mineral Resources of India.

Module 4: Financial Planning and Market Laws:

Basic Concept of Economics, National Income, Unemployment and Poverty

Module 5: India and World:

Monthly Current Affairs Magazine

Module 6: Universal Human Values:

Understanding Value Education, Method to fulfill the Basic Human Aspiration, Continuous happiness and Prosperity- the Basic Human Aspiration

Suggested Text Books:

1. Indian Constitution- M. Laxmikant
2. Indian Economy-Ramesh Singh
3. India's Ancient Past- R.S Sharma

4. Geography of India- Majid Hussain

5. Current Affairs Magazine of IEM-UEM

Course Name: Skill Development for Professionals – II
Course Code: HSMC282

Course Outcome: -

1. Students will learn advance tricky approaches for solving Quant.

2. It will enhance student's skill to appear in various aptitude test within limited time constrain.

3. This module will enhance students' Analytical skill &will also improve quick decision-making skill.

4. Students can prepare various competitive exams and different placement aptitude test as well.

Detailed Contents

Module-1 Quantitative Aptitude

a. Average- Concept on average, different missing numbers in average estimation, shortcuts & their application. b. Mixture & Allegation – Proportion & mixtures in percentages, populations & liquids, shortcuts & their application. c. Time & Work- Basic concept, Chain rule, formulae & their application. Pipes & cistern. d. Time and distance - Basic concept, Different problems & their shortcut tricks. Time & Speed & Tides- concept of speed, time & Distance, relative speed, Upstream & Downstream, formulae & their application.

Module-2 Logical Reasoning

1.Cube Dice, Miscellaneous Problems 2. Data Sufficiency, Problems on Blood Relation, ages, Numbers, Logical Test Based on Data Sufficiency 3. Non-Verbal Reasoning, Image Formation, Water –Images, Mirror Image, Image completion, Paper Cutting and Folding

Module-3 ObjectiveEnglish-2

Clauses: Definition, Examples, Rules & Application, Types of Sentences (Simple +Complex +Compound) Examples, Rules & Application, Voice- Concept, Types, Examples, Rules & Application, Narration Change- Rules (Direct & Indirect Speech)

Vocabulary-: Synonyms, Antonyms with examples, One-word Substitution, Idioms o & Phrases

Spotting Errors

Reading Comprehension (Level II)

Module-4 Data Interpretation level-II

Newspaper reading: The Hindu & Economic Times

<u>**Suggested Text Books:**</u>

1. Fast Track Arithmetic- Rajesh Verma

2.Verbal & non-verbal reasoning- R.S Agarwal

3. Quantitative Aptitude- R.S Agarwal

4. Analytical Reasoning –Peeyush Bhardwaj

<u>Course Name: Basic Electronics Engineering</u>

<u>Course Code: IVC201</u>

<u>**Course Outcome:**</u>

1: Student will be able to understand the fundamentals of semiconductors, diode circuits and rectifier and working of basic electrical instruments and electronic components.

2: Student will be able to explain the working principle and operations of basic diode, BJT, JFET, MOSFET.

3: Student will be able to understand the concept of feedback, oscillator and fundamentals of operational amplifiers and its application.

4: Student will be to develop the understanding regarding application of elementary ideas of electrical and electronics in modern technology.

Detailed Content:

Module-1: Semiconductors fundamentals

Introduction, Crystalline material and their properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module-2: Diode fundamentals

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave.

Module-3: Bipolar Junction Transistors

Device structure and physical operation, current – voltage characteristics, the BJT as an amplifier and a switch, Biasing BJT Amplifier Circuits, Single stage BJT amplifiers CE, CB, CC.

Module-4: Field Effect Transistors

Device structure and physical operation, current – voltage characteristics, JFET & MOSFET Structure and characteristics; MOSFET as an amplifier and a switch.

Module-5: Operational amplifiers and applications

Introduction to Operational amplifiers; Application of operational amplifier; Pin configuration of 741 OpAmp; Inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

Suggested Text Book:

1. Salivahanan: "Electronics Devices & Circuits", Tata McGraw-Hill Education, 3rd Edition 2012

2. JB Gupta: "Electronic devices and circuits", S K KATARIA & SONS, 1st edition, 2012

3. D. Chattopadhyay, P. C. Rakshit: "Electronics Fundamentals and Applications", 11th Edition, 2010

4. Boylestad&Nashelsky: "Electronic Devices & Circuit Theory", Pearson, 11th Edition, 2015

5. Dr. Barun RayChaudhuri: "Basic Electronics", Chhaya Prakashani Pvt. Ltd.

Course Name: Design Thinking & Innovation-Advance

Course Code: IVC202

Course Outcome:

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

1. Examine Design Thinking concepts and principles
2. Practice the methods, processes, and tools of Design Thinking
3. Apply the Design Thinking approach and model to real world situations
4. Learn about Intellectual Property rights and how to file a Patent.

Detailed contents:

Module -1: Product Innovation

Definition and Examples of Innovations

Levels of Innovations

Importance of Product Innovations (Uber, Ola, Netflix)

Phase of Design Thinking, Design Thinking principles that redefine business

Module-2: SCAMPER Technique

Introduction to Scamper Technique

Application of Substitute and Combine Technique for Design

Application of Adapt and Put to Other Use for Design

Application of Elimination and Rearrange/Reuse for Design

Module-3: Introduction to IPR and Patent Filing

Introduction to Intellectual Property Rights

Various Type of IPR

Importance of Patent Filling

Process of Patent Filling in India

<u>**Suggested Text Books:**</u>

(i)   Title: Creative Confidence, Authors: Tom Kelley, David Kelley

(ii)   Title: Change by design, Author: Tim Brown

<u>Course Name: Economics, Finance and Entrepreneurship Skills – Advance</u>
<u>Course Code: IVC203</u>

<u>**Course Outcome**</u>:

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

1**.** Develop an entrepreneurial attitude that will be useful in future

2. Start, build, and grow a viable and sustainable venture.

3. Acquire the knowledge in basic economics and revenue streams.

4. Learn critical skills like leadership, presentation, decision making and communication.

Detailed Contents

Module 1: Finance
Market Structure, Pricing, Monopoly, Money and Banking, Types of Finances, Financial Management

Module-2: Refining the Business Model
Refining the Business Model and Product/Service, Pivoting, Unit Economics, Types of Business Models, Analyze Competitors, New Customer Segments, PV Profile, Product Management

Module-3: Business Planning
Sales Plan, Business Plan, Sales Organization, People Plan, Basics of a Financial Plan, Forecasting Template, Advanced Revenue Stream, Procurement, Negotiation.

Module-4: Economics and Revenue
Customer Lifecycle, Primary Revenue Source, Secondary Sources of Revenue, Funding Landscape, Funding Plan

Module-5: Branding
Building the team, Team Setup, Creating a Branding and Channel Strategy, Positioning Statement

Module-6: Leveraging Technologies and Available Platforms
Platforms for Marketing and Promotion, Platforms for Communication and Collaboration, Other, Platforms, Tech Plan

Module-7: Financial Metrics
Metrics for Customer Acquisition & Retention, Financial Metrics, Forecast Your Financial Plan to Increase Margin, Pitch Deck.

Module-8: Legal Matters
Professional Help and Legal and Compliance Requirements, IP Protection, Difference between, Different Types of IPs.