

Indian Institute of Technology (ISM), Dhanbad

Course Structure & Detailed Syllabus for Preparatory Program **(Effective from 2023-24)**

COURSE STRUCTURE

Semester 1

Sl. No	Course code	Course Name	Lecture	Tutorial	Practical	Contact hours	Type	Credits
1	MCP001	Mathematics - I	3	1	0	4	Theory	11
2	PHP001	Physics - I	3	1	0	4	Theory	11
3	CYP001	Chemistry - I	3	1	0	4	Theory	11
4	HSP001	English - I	3	1	0	4	Theory	11
5	PHP002	Physics Lab - I	0	0	2	2	Practical	2
6	CYP002	Chemistry Lab - I	0	0	2	2	Practical	2
TOTAL						20		48

Semester 2

Sl. No	Course code	Course Name	Lecture	Tutorial	Practical	Contact hours	Type	Credits
1	MCP002	Mathematics - II	3	1	0	4	Theory	11
2	PHP003	Physics - II	3	1	0	4	Theory	11
3	CYP003	Chemistry - II	3	1	0	4	Theory	11
4	HSP002	English - II	3	1	0	4	Theory	11
5	PHP004	Physics Lab - II	0	0	2	2	Practical	2
6	CYP004	Chemistry Lab - II	0	0	2	2	Practical	2
TOTAL						20		48

DETAILED SYLLABUS

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	MCP001	Mathematics I	3	1	0	11

Course Objective
To provide elementary introduction to Differential and Integral Calculus, Matrix theory and differential equations.
Learning Outcomes
Upon successful completion of this course, students will: • have a broad understanding of calculus of one variable. • be able to use Matrix theory for solving variety of problems arising in science and engineering. • learn and use the differential equations to solve many problems in science and engineering .

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Tangents and normals, expansion of function of a single variable, maxima and minima of a function of single variable.	8	Will understand differential calculus of single variables
2	Definite integrals, properties of definite integrals, Application of integral calculus for finding area.	8	Will have knowledge of integral calculus of single variables
3	Adjoint and inverse of a square matrix, Consistency conditions, solution of linear simultaneous equations by matrix methods.	8	Will learn many concepts of Matrix theory
4	Formation of differential equations, Solution of equations of first order and first degree: Variable separable method, homogeneous differential equations and reducible to homogeneous form, exact differential equations,	8	Will learn to form a differential equation and techniques to solve first order differential equations.
5	Higher order differential equations with constant coefficients, Rules for finding C.F. and P.I.	7	Will learn many techniques to solve higher order differential equations.

Text Books:

1. G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry (9th Edition), ISE Reprint, Addison-Wesley, 2010.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics (5th Edition), Narosa (2018).
2. T. M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern 1980.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	PHP001	Physics - I	3	1	0	11

Course Objective

The students are expected to learn about the fundamentals of physics subject with a special focus on Mechanics, Waves, Thermodynamics and Optics

Learning Outcomes

1. To understand the fundamentals of mechanics and physical properties of matter.
2. To understand fundamentals of waves and oscillations
3. To learn the fundamental laws of thermodynamics
4. To learn about the fundamental laws of optics

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Mechanics and Properties of Matter: Laws of motion; Collision; Conservation of linear momentum; Motion with variable mass. Circular motion; Brief qualitative idea of motion in a central field; Conservation of angular momentum; work, energy and power; work-energy theorem. Surface tension and surface energy; angle of contact; Pressure inside a bubble; Experimental determination of surface tension. Viscosity; Streamline and turbulent flow; Critical velocity and Reynold's number; Terminal velocity and Stokes' law, Poiseuille's equation; Experimental determination of the coefficient of viscosity, Hydrodynamics; Equation of continuity; Bernoulli's principle and its applications; Velocity of efflux.	12	To understand the fundamentals of mechanics and physical properties of matter.
2.	Waves & Oscillations: Simple harmonic motion; Simple pendulum; Vibration of springs; Damped vibration, forced vibration and resonance (qualitative discussions only). Transverse and longitudinal wave, phase velocity and group velocity, Superposition principle, Interference, beats and standing waves. Transverse vibration of strings; Formation of stationary waves. Propagation of sound through gaseous and solid media; speed of propagation: Newton formula; Laplace's correction; Effect of pressure, temperature and humidity. Vibrations of air columns; closed and open organ pipes. Doppler effect.	12	To understand fundamentals of waves and oscillations
3.	Kinetic Theory of Gases and Thermodynamics: Pressure of a perfect gas; Kinetic interpretation of temperature; Equation of state for an ideal gas; Mean-free path; Vander waal's equation. Thermal equilibrium; Thermodynamic systems; Zeroth law of Thermodynamics; Isothermal and adiabatic processes; Internal energy; Specific heats of gases.	07	To learn the fundamental laws of thermodynamics
4.	Geometrical and Wave Optics: Refraction of light through prism, Angle of minimum deviation; Dispersion; Dispersion without Deviation and deviation without Dispersion; Refraction through spherical surfaces; Lenses; Lens makers' formula; Conjugate foci relation; Magnification; Combination of lenses. Huygens' principle – reflection and refraction; Interference; Diffraction (Qualitative idea) Young's double-slit experiment; Fresnel's Biprism; Newton's rings.	08	To learn about the fundamental laws of optics

Text Books:

1. Halliday & Resnick, Fundamentals of Physics (Extended), Wiley
2. H. C. Verma, Concepts of Physics Vol. 1 & 2, Bharati Bhawan Publishers

Course Type	Course Code	Name of the Course	L	T	P	Credit
PP	CYP001	Chemistry-I	3	1	0	11
Course Objective						
Preparatory students should develop a basic conceptual understanding of chemical reactions and their kinetics, and thermodynamics, which will be useful for most engineering branches. They also need to develop an understanding of the relationship between the structure and function of organic and inorganic materials they may work with in the future. This preparatory course will help them to prepare for the advanced Chemistry courses that they have to take up during their first year of B Tech course.						
Learning Outcomes						
• Understanding the physical principles that govern the properties of atoms and molecules. • Knowledge of different states of matter and their properties. • Understanding of chemical reactions and their thermodynamics that is the backbone of physical chemistry. • Develop an understanding of the structure and property relationship of aliphatic and aromatic compounds. • Understand basic organic reactions and their mechanisms. • Understand the basic nature of chemical bonding in inorganic compounds. • Knowledge of transition metal elements and their compounds.						

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Module 1: General topics Concept of atoms and molecules; Dalton's atomic theory; Mole concept; Chemical formulae; Balanced chemical equations; Calculations (based on mole concept) involving common oxidation-reduction, neutralization, and displacement reactions; Concentration in terms of mole fraction, molarity, molality and normality.	3	Fundamental concepts of chemical reactions.
	Module2: Gaseous and liquid states Absolute scale of temperature, Ideal gas equation; Deviation from ideality, Van der Waals equation; Kinetic theory of gases, average, root mean square and most probable velocities and their relationship with temperature; Law of partial pressures; Vapor pressure; Diffusion of gases.	3	Different states of matter and atomic/molecular interactions in these states.

	Module3: Solutions Raoult's law; Molecular weight determination from lowering of vapor pressure, elevation of boiling point and depression of freezing point.	2	Different properties of solute and solvents that controls the properties of a solution.
	Module 4: Energetics First law of thermodynamics; Internal energy, work and heat, pressure-volume work; Enthalpy, Hess's law; Heat of reaction, fusion and vaporization; Second law of thermodynamics; Entropy; Free energy; Criterion of spontaneity.	3	Fundamental concepts of thermodynamics that control different chemical processes.
	Module 5: Chemical equilibrium Law of mass action; Equilibrium constant, Le Chatelier's principle (effect of concentration, temperature, and pressure); Significance of ΔG and ΔG° in chemical equilibrium; Solubility product, common ion effect, pH and buffer solutions; Acids and bases (Bronsted and Lewis concepts); Hydrolysis of salts.	2	Basic understanding of chemical equilibrium and factors that affect them.
2	Module 1: Basics concepts of organic chemistry IUPAC nomenclature of simple organic compounds (only hydrocarbons, mono-functional and bi-functional compounds); Hybridization of carbon; Sigma and pi-bonds; Shapes of simple organic molecules; Structural and geometrical isomerism; Optical isomerism of compounds containing up to two asymmetric centers, (R,S and E,Z nomenclature excluded); Conformations of ethane and butane (Newman projections); Resonance and hyperconjugation; Keto-enol tautomerism; Determination of empirical and molecular formulae of simple compounds (only combustion method); Hydrogen bonds: definition and their effects on physical properties of alcohols and carboxylic acids; Inductive and resonance effects on acidity and basicity of organic acids and bases; Polarity and inductive effects in alkyl halides; Reactive intermediates produced during homolytic and heterolytic bond cleavage; Formation, structure and stability of carbocations, carbanions and free radicals.	5	Fundamental concepts of organic chemistry that describes the properties of organic molecules. Different electronic effects that control the structure and function of organic molecules. Conformation and configuration or organic molecules.
	Module 2: Preparation, properties and reactions of alkanes Physical and chemical properties of alkanes; Homologous series, Preparation of alkanes.	2	Structure function relationship of alkanes and their chemical synthesis.
	Module 3: Preparation, properties and reactions of alkenes and alkynes Physical and chemical properties of alkenes and alkynes; Acidity of alkynes; Acid catalyzed hydration of alkenes and alkynes; Reactions of alkenes with	4	Synthesis and structure function relationship of alkenes and alkynes. C

	KMnO ₄ and ozone; Reduction of alkenes and alkynes; Electrophilic addition reactions of alkenes with X ₂ , HX, HOX and H ₂ O (X=halogen); Addition reactions of alkynes; Metal acetylides.		
	Module 4: Structure and aromaticity of benzene Halogenation, nitration, sulphonation, Friedel-Crafts alkylation and acylation; Effect of o-, m- and p-directing groups in monosubstituted benzenes. substitution reactions.	2	Provides a brief idea about aromatic/anti-aromatic/non-aromatic compounds. Different substitution reactions of aromatic compounds.
3	Module 1: Atomic structure and chemical bonding Bohr model, spectrum of hydrogen atom, quantum numbers; Wave-particle duality, de Broglie hypothesis; Uncertainty principle; Qualitative quantum mechanical picture of hydrogen atom, shapes of s, p and d orbitals; Electronic configurations of elements (up to atomic number 36); Aufbau principle; Pauli's exclusion principle and Hund's rule; Orbital overlap and covalent bond; Hybridization involving s, p and d orbitals only; Orbital energy diagrams for homonuclear diatomic species; Hydrogen bond; Polarity in molecules, dipole moment (qualitative aspects only); VSEPR model and shapes of molecules (linear, angular, triangular, square planar, pyramidal, square pyramidal, trigonal bipyramidal, tetrahedral and octahedral).	6	Very basic concept of quantum mechanics. Idea of orbitals. Electronic configuration of atoms and molecules. Structure function relationship of inorganic compounds.
	Module 2: Isolation/preparation and properties of the following non-metals Boron, silicon, nitrogen, phosphorus, oxygen, sulphur and halogens; Properties of allotropes of carbon (only diamond and graphite), phosphorus and sulphur.	3	Synthesis and properties of certain non-metals.
	Module 3: Transition elements (3d series) Definition, general characteristics, oxidation states and their stabilities, color (excluding the details of electronic transitions) and calculation of spin-only magnetic moment; Coordination compounds: nomenclature of mononuclear coordination compounds, cis-trans, and ionization isomerism, hybridization and geometries of mononuclear coordination compounds (linear, tetrahedral, square planar and octahedral).	4	Basic concepts of transition metal elements and their compounds. Structure-function relationship of transition metal compounds.

Text Books:

- Shriver Atkin's Inorganic Chemistry by P. Atkins, T. Overton, J. Rourke, M. Weller, M. Armstrong, 5th Edn, Oxford University Press, 2009
- A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co.
- Inorganic Chemistry by C.E. Housecroft, A.G. Sharpe, 4th Edn, Pearson Education, 2017
- Introduction to Spectroscopy by PAVIA, LAMPMAN, KRIZ, VYVYAN, Cengage Learning India Private Limited; 5 edition.
- Advanced Physical Chemistry by B.R. Puri, L.R. Sharma & M.S. Pathani, Milestone Publisher.
- Organic Chemistry, J. Clayden, N. Greeves, S. Warren, P. Wothers, Oxford University Press, 2000.

Reference Books:

- Atkins' Physical Chemistry, P. Atkins and J. de Paula, 8th edition, Oxford University Press, 2006.
- Principles of polymerization, George G. Odian, 4th Edn, John Wiley & Sons Inc., Publication, 2004.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	HSP001	English -1	3	1	0	11

Course Objective
The students are expected to learn basic English Grammar, Vocabulary, and Reading Comprehension.
Learning Outcomes
At the end of the course the students will be able to: • Use English grammar effectively in their writing and oral communication. • Use grammar items particularly different parts of speech, sentence structure, Tenses, phrases, clauses and sentences in their communication. • Learn Vocabulary building and better usage. • Develop reading skills and comprehension.

Unit No.	Topics to be Covered	Lecture Hours	Tutorial Hours	Learning Outcome
1.	Introduction to English Grammar Language and Grammar, Grammar and its Usage, Summary of General Principles of Grammar	3	1	To aid students with the basic understanding of grammar
2.	Parts of Speech: Noun, Pronoun, Adjective, Adverbs and Verb- Its classification Modal and Semi Modals, Article and Preposition	9	3	To revisit and revise parts of speech and its sub-types
3.	Sentence structure and Construction Subject and Predicate and Type of Sentence; Subject – Verb Agreement; Phrases & Clauses	7	2	To aid a better grasp of sentence structure, construction, etc.
4.	Speech and Voice: Speech (Direct, Indirect), Voice (Active, Passive)	6	2	To aid a better grasp of voice transformation
5.	Tense – Present, Past and Future - Types, Variation, Occasion of Use	7	2	To revisit the basic tenses and to aid a better grasp of secondary tenses
6.	Vocabulary Building Suffixes and Prefixes, root Word	3	1	To build vocabulary
7.	Reading Comprehension Reading Comprehension and Answering Subjective and Objective Question	3	2	To develop reading comprehension

Text Books:

1. Eastwood, John. (1994). *Oxford Guide to English Grammar*. Oxford: OUP.
2. Collins. (2011). *Easy Learning English Vocabulary*. Glasgow: HarperCollins Publishers.
3. Grellet, Franfoise. (1981). *Developing Reading Skills: A practical guide to reading comprehension exercises*. Cambridge: CUP.

Reference Books:

1. Hewings, Martin. (1999). *Advance Grammar in Use*. Cambridge: CUP.
2. Murphy, Raymond. 2004). *English Grammar in Use*. Cambridge: CUP.
3. Alexander, L. G. (1990). *Longman English Grammar Preactice*. Longman.
4. Collins, Steven. (2006). *Practical Everyday English*. Montserrat Publishing.
5. Engelhardt, Diane. (2013). *Advanced English Reading and Comprehension*. McGraw-Hill Education.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	PHP002	Physics Lab - I	0	0	2	2

Sl No.	Name of the experiments
1.	Determination of Least count of Vernier caliper and Screw gauge
2.	Determination of Least count Spherometer & Traveling microscope
3.	Measurement of density of wire using screw gauge
4.	Experiments on measurement of refractive indices of solids and liquids using traveling microscope
5.	Determination of Joule's equivalent of heat by Joule's Calorimeter
6.	Determination of Radius of curvature using spherometer
7.	Experiments on Deflection Magnetometer

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	CYP002	Chemistry Lab - I	0	0	2	2

Sl No.	List of Experiments (Syllabus)
1	Safety and General information.
2	Preparation of N/10 Na_2CO_3 and N/10 HCl.
3	Standardization of HCl by standard Na_2CO_3 solution.
4	Determination of temporary hardness of water.
5	Determination of permanent hardness of water.
6	Determination of Fe in Fe salts.
7	Test for ethyl alcohol.
8	Test for formaldehyde.
9	Test for acetone.
10	Test for phenols.
11	Test for carboxylic acids.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	MCP002	Mathematics II	3	1	0	11

Course Objective
To provide elementary introduction to vector geometry and probability
Learning Outcomes
Application oriented real life system such as engineering mechanics, control systems, workshop practice to know the geometrical shapes and associated properties along with chance phenomenon of objects to measure the accuracy using probabilistic models such as surface roughness, skewness tc.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Vector equations of line and plane, Geometrical applications of vectors, Product of two, three and four vectors, Applications, Differentiation of vectors.	8	Basic properties of vector geometry and its associate properties
2	Gradient of a scalar point function, divergence and curl of vector point functions.	8	Vector operators both in Cartesian and polar frame and its properties
3	Direction ratio, direction cosines and projections, planes, straight lines, shortest distance between two lines.	8	Vectors associated with trigonometric functions and equations in plane
4	Frequency distribution and Measures of central tendency and dispersion, Coefficient of dispersion. Law of addition and multiplication.	8	.How probability functions arises and its properties and functions
5	Probability mass and density functions, Determination of mean, variance and probabilities based on p.m.f and p.d.f.s.	7	Moments of probability and its applicability for functions.

Text Books:

1. P.L. Meyer: Introductory Probability and Statistical Applications, Addison Wesley second Indian Edition, 2003.

Reference Title:

1. Sheldon Ross: A First Course in Probability, Elsevier Indian Reprint, 2015.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	PHP003	Physics - II	3	1	0	11

Course Objective

The students are expected to learn about the fundamentals of physics subject with a special focus on Electricity and Magnetism and Modern Physics, Waves, Thermodynamics and Optics

Learning Outcomes

1. To learn the fundamental laws in Electrostatics and magnetostatics.
2. To understand the origin of electrical current and magnetism
3. To learn about the electromagnetic induction and physics of alternating current
4. To learn about the atomic structure and nuclear physics.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Electrostatics & Current Electricity: Coulomb's law; Electric field and potential; Electric dipole and dipole moment; Potential and field due to a dipole in end-on and broadside-on positions; potential energy; Torque. Capacitors-Parallel plate, spherical and cylindrical, Potential energy of capacitors; Combination of capacitors. Kirchhoff's laws; Wheatstone's bridge and its sensitivity; E. M. F and internal resistance of a cell. P. O. box; Metre bridge; Carey – Foster's bridge; Potentiometer. Seebeck, Peltier and Thomson's effect; Thermoelectric equation; Thermocouple.	10	To learn the fundamental laws in Electrostatics and magnetostatics.
2.	Magnetostatics & Magnetism: Magnetic effect of current; Biot-savart's law and the tesla; Magnetic field due a straight conductor, circular coil and solenoid; Toroid – Helmholtz Coil; Line integral and Ampere's circuital law. Lorentz force; Force on current-carrying conductor in a magnetic field; Moving coil galvanometer. Current element concept; Magnetic dipole; Diamagnetism, Paramagnetism and Ferro-magnetism; Tangent Law; Magnetometers.	09	To understand the origin of electrical current and magnetism
3.	Electromagnetic Induction & Alternating current: Faraday's and Lenz's laws; Inductance; Mutual and self-inductions; Torque on a current carrying coil; Generator, Transformer, Electric motor. Alternating currents; peak and average values; AC across pure R, pure L and pure C; Phase lag and phase lead; Reactance; AC across L-R, C-R, and L-C-R Circuit; Impedance and impedance diagrams; Electrical resonance; Choke coil; Power and power factor.	09	To learn about the electromagnetic induction and physics of alternating current
4.	Atomic & Nuclear Physics: Bohr's quantization rule; Hydrogen spectrum; Sommerfield's modifications; Introduction to Vector Atom Model. Natural radioactivity; α , β and γ rays and their properties; Rutherford-Soddy formula; Half-life and mean-life; Successive disintegration; Radioactive Series, Mass defect, binding energy and packing fraction; Mass-energy equivalence. Introduction to Nuclear Reactions, Nuclear fission and fusion - Nuclear Reactor.	11	To learn about the atomic structure and nuclear physics.

Text Books:

1. Halliday & Resnick, Fundamentals of Physics (Extended), Wiley
2. H. C. Verma, Concepts of Physics Vol. 1 & 2, Bharati Bhawan Publishers

Course Type	Course Code	Name of the Course	L	T	P	Credit
PP	CYP003	Chemistry-II	3	1	0	11

Course Objective

Having learned the fundamentals of Physical, Organic and Inorganic Chemistry in CYP101, in this preparatory course student will develop advanced understanding of different chemical reactions and processes. Again, this preparatory course will help them to prepare for the advanced Chemistry courses that they have to take up during their first year of B Tech course.

Learning Outcomes

- Understanding the physical principles that govern the chemical reaction kinetics.
- Understanding of the chemistry behind redox reactions.
- Develop an understanding of the structure and properties of solid-state materials and different surfaces.
- Understanding the different chemical transformations of aliphatic and aromatic compounds.
- Develop an understanding of the role of polymeric materials, carbohydrates. Lipids proteins etc.
- Basic understanding of different forms of radioactivity and their use.
- Develop an understanding of synthesis of metals and alloys from different naturally occurring ores.
- To develop a general idea about chemical tests that is used for identification of metal ions.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Module 1: Electrochemistry Electrochemical cells and cell reactions; Standard electrode potentials; Nernst equation and its relation to DG; Electrochemical series, EMF of galvanic cells; Faraday's laws of electrolysis; Electrolytic conductance, specific, equivalent, and molar conductivity, Kohlrausch's law; Concentration cells.	4	Understanding of electrical cell and electrode potentials. Understanding of basic electrochemical parameters.
	Module2: Chemical kinetics Rates of chemical reactions; Order of reactions; Rate constant; First order reactions; Temperature dependence of rate constant (Arrhenius equation).	3	Getting the basic idea of the rate of reaction, order of reaction. Relationship between rate and temperature.

	Module 3: Solid state Classification of solids, crystalline state, seven crystal systems (cell parameters a, b, c, alpha, beta, gamma), close packed structure of solids (cubic), packing in fcc, bcc and hcp lattices; Nearest neighbors, ionic radii, simple ionic compounds, point defects.	3	Understand identification of planes in crystal lattice. Understand the role of defects in defining the properties of solids.
	Module 4 : Surface chemistry Elementary concepts of adsorption (excluding adsorption isotherms); Colloids: types, methods of preparation and general properties; Elementary ideas of emulsions, surfactants and micelles (only definitions and examples).	3	Basic concepts of adsorption and relationship of adsorption with different types of surfaces. Surfaces and amphiphilic molecules.
2	Module 1: Characteristic and reactions of the following organic compounds Alkyl halides: Nucleophilic substitution reactions; rearrangement of alkyl carbocation, Grignard reactions, Alcohols: Dehydration and oxidation, esterification, reaction with sodium and phosphorus halides, conversion of alcohols. Phenols: Acidity of phenol, halogenation, nitration and sulphonation reactions; Reimer-Tieman reaction, Kolbe reaction etc. Ethers: Properties, preparation, and reactions of ether. Aldehydes and Ketones: Oxidation, reduction, oxime and hydrazone reaction; aldol condensation, Perkin reaction; Cannizzaro reaction; haloform reaction and nucleophilic addition reactions (Grignard addition); Carboxylic acids: formation of esters, acid chlorides and amides, ester hydrolysis. Amines: Basicity of substituted anilines and aliphatic amines, preparation from nitro compounds, reaction with nitrous acid, azo coupling reaction of diazonium salts of aromatic amines, Sandmeyer and related reactions of diazonium salts; carbylamine reaction. Haloarenes: nucleophilic aromatic substitution in haloarenes and substituted haloarenes (excluding Benzyne mechanism and Cine substitution).	8	Basic organic transformation of molecules with variety of functional groups. Reaction mechanism of organic transformations.
	Module 2: Carbohydrates Classification of mono- and di-saccharides (glucose and sucrose); Oxidation, reduction, glycoside formation.	2	Sugars and polymers of sugars. Basic structure and reactions.
	Module 3: Amino acids, peptides and polymers: General structure and physical properties of amino acids and peptides. Properties and uses of some important polymers: Natural	3	Structure, synthesis and properties of natural and un-natural polymeric molecules.

	rubber, cellulose, nylon, teflon and PVC.		
3	Module1: Nuclear chemistry Radioactivity: isotopes and isobars; Properties of alpha, beta and gamma rays; Kinetics of radioactive decay (decay series excluded), carbon dating; Stability of nuclei with respect to proton-neutron ratio; Brief discussion on fission and fusion reactions.	4	Properties of radioactive elements, different types of radioactive emissions, use of radioactivity in chemistry and radioactive transformations.
	Module 2: Ores and minerals Commonly occurring ores and minerals of iron, copper, tin, lead, magnesium, aluminium, zinc and silver.	2	Natural source of different metals and their chemical properties.
	Module 3: Extractive metallurgy Chemical principles and reactions only (industrial details excluded); Carbon reduction method (iron and tin); Self reduction method (copper and lead); Electrolytic reduction method (magnesium and aluminum); Cyanide process (silver and gold).	3	Extraction of metals and alloys from different natural sources.
	Module 4: Principles of qualitative analysis Groups I to V (only Ag^+ , Hg^{2+} , Cu^{2+} , Pb^{2+} , Bi^{3+} , Fe^{3+} , Cr^{3+} , Al^{3+} , Ca^{2+} , Ba^{2+} , Zn^{2+} , Mn^{2+} and Mg^{2+}); Nitrate, halides (excluding fluoride), sulphate and sulphide.	4	Chemical reagents and tests for qualitative analysis of cation and anions both individually and in a mixture.

Text Books:

- Shriver Atkin's Inorganic Chemistry by P. Atkins, T. Overton, J. Rourke, M. Weller, M. Armstrong, 5th Edn, Oxford University Press, 2009.
- A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co.
- Inorganic Chemistry by C.E.Housecroft, A.G.Sharpe, 4th Edn, Pearson Education, 2017
- Introduction to Spectroscopy by PAVIA, LAMPMAN, KRIZ, VYVYAN, Cengage Learning India Private Limited; 5 edition.
- Advanced Physical Chemistry by B.R.Puri, L.R.Sharma & M.S.Pathani, Milestone Publisher.
- Organic Chemistry, J. Clayden, N.Greeves, S.Warren, P.Woother, Oxford University Press, 2000.

Reference Books:

- Atkins' Physical Chemistry, P. Atkins and J. de Paula, 8th edition, Oxford University Press, 2006.
- Principles of polymerization, George G. Odian, 4th Edn, John Wiley & Sons.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	HSP002	English -II	3	1	0	11

Course Objective

This is an introductory, a need based and skills-oriented course for students who have limited or no experience in formal communication skills in the academic professional context. The course emphasizes improvement in communication skills, particularly writing skills, conversation skills, presentation skills.

Learning Outcomes

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

- Incorporate general principles of effective composition, applying these principles in the writing in English. Training in basic techniques and hints to produce effective writing in English.
- Perceive the rhetorical principles underlying the writing style and learn conventions of writing in the sciences, such as maintaining objectivity, avoiding jargon but using terminology, using the passive voice appropriately, handling equations, and integrating illustrations into the text.
- Develop the ability to organize, draft, and revise one's own writing in a second language.
- Enhance the participants' awareness of their strengths and limitations in communication skills.
- Help the participants master effective communication skills required of a successful professional.
- Develop a systematic and positive approach to team communication and technical presentations.

Unit No.	Topics to be Covered	Lecture Hours	Tutorial Hours	Learning Outcome
8.	Clause and Joining Sentences: Sentence analysis, Structure: Simple, Complex and Compound Sentences, Joining and Transformation of sentence	5	1	To aid a better grasp of transformation of sentences involving simple, compound and complex sentences
9.	Paragraph Writing and Essay Writing Paragraph: Topic Sentence, Supporting Sentences, Concluding Sentence Basic Structure of Essay, Thesis Sentence, Note Making - Outlining, Organization of Information	7	2	To develop basic writing skill
10.	Rhetorical functions: Writing instructions; Formal & Informal reporting, describing, Defining, Explaining	7	3	To introduce rhetorical functions of writing skills
11.	Professional Writing: Writing Reports, Professional Letters, Memo writing, Resume and Cover Letter	7	3	To develop professional writing skills
12.	Oral Communication Skills Pronunciation practice; Listening Comprehension; Purpose and characteristics of good conversation; Developing conversation skills with a sense of stress, intonation and meaning; Spoken language idioms; Use of question tags	6	2	To develop speaking skill and oral communication
13.	Presentation Skills Characteristics of good presentation; Assessing the audience and its needs; Planning a presentation; Visual aids and their development and use; Rehearsing and delivering; Body language and	7	2	To develop formal presentation skills

	gestures; Handling questions			
TOTAL		39	13	

Text Books:

1. Bailey, Stephen. (2006). *Academic Writing: A Handbook for International Students*. Routledge
2. Zemach, Dorothy E and Lisa A Rumisek. (2005). *Academic Writing: From Paragraph to Essay*. Macmillan.
3. Rizvi, M.A. (2005). *Effective Technical Communication*, New Delhi: Tata Mcgraw Hill.

Reference Books:

1. Emden, Joan van and Lucinda Becker. (2004). *Presentation Skills for Students*. Palgrave Macmillan.
2. Kane, Thomas S. (1988). *The Oxford Essential Guide to Writing*. OUP.
3. Mohan, Krishna and N. P. Singh. (2001). *Speaking English Effectively*, New Delhi: Macmillan India Ltd.
4. Oshima, Alice and Ann Hogue. (2007). *Introduction to Academic Writing*. Pearson Longman.
5. Taylor, Grant. (1999). *English Conversation Practice*. New Delhi: Tata McGraw Hill.

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	PHP004	Physics Lab - II	0	0	2	2

Sl No.	Name of the experiments
1.	Experiments on measurement of acceleration due to gravity
2.	Electrical experiments on Potentiometer & Carey Foster's bridge.
3.	Experiments on Oscillation magnetometer.
4.	Measurement of frequency of A.C. Mains
5.	Verification of Newton's law of cooling
6.	Use of Spectrometer for measuring angle of prism and refractive index
7.	Experiments on Moment of Inertia of regular solids

Course Type	Course Code	Name of Course	L	T	P	Credit
PP	CYP004	Chemistry Lab - II	0	0	2	2

Sl No	List of Experiments (Syllabus)
1	Safety and General information
2	Separation and detection of metal ions in group I (silver, lead and mercury)
3	Estimation of acid radicals (wet method)
4	Action of heat on certain compounds under reducing flame in charcoal block
5	Flame test of known basic radicals
6	Borax bead test
7	Test of Cu^{+2} , Bi^{+3} and Hg^{+2}
8	Special test of Cr^{+3} and Mn^{+2}
9	Test of Fe^{+2} and Fe^{+3}