

Basic Computer & Information Technology-I

COURSE OBJECTIVE:-

To educate students to analyze, design, integrate & manage information systems using information technology.

Syllabus :

- UNIT – I** Introduction to computer organization History of development of Computer system concepts. Characteristics, Capability and limitations. Generation of computer. Types of PC's Desktop. Laptop, Notebook. Workstation & their Characteristics.
- इकाई – 1** कम्प्यूटर ऑर्गनाइजेशन का परिचय कम्प्यूटर का इतिहास, कम्प्यूटर सिस्टम विचारधारा, विशेषताएं, योग्यता एवं सीमाएं, कम्प्यूटर की पीढ़ियां, पी.सी. के प्रकार, डेस्कटॉप के प्रकार, लेपटॉप के प्रकार, नोटबुक, वर्क स्टेशन आदि की विशेषताएं।
- UNIT – II** Introduction to computer organization Basic components of a computer system Control Unit, ALU, Input / Output function and Characteristics, memory RAM, ROM, EPROM, PROM.
- इकाई – 2** कम्प्यूटर ऑर्गनाइजेशन का परिचय कम्प्यूटर सिस्टम के आधार उपकरण, कंट्रोल युनिट, ए.एल.यू. इनपुट/आउटपुट फंक्शन और विशेषताएं, मेमोरी रेम, रोम, इपी रोम, पी रोम, और अन्य प्रकार की मेमोरी।
- UNIT – III** Input & output devices Input Devices : Keyboard, Mouse, Trackball. Joystick, Digitizing tablet, Scanners, Digital Camera, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light pen, Touch Screen. Output Devices: Monitors Characteristics and types of monitor, Video Standard VGA, SVGA, XGA, LCD Screen etc. Printer, Daisy wheel, Dot Matrix, Inkjet, Laser, Line Printer. Plotter, Sound Card and Speakers.
- इकाई – 3** इनपुट तथा आउटपुट डिवाइसेस **इनपुट डिवाइस:** कीबोर्ड, माउस, ट्रैकबॉल, जॉयस्टिक, डिजिटाइजिंग टेबलेट, स्कैनर्स, डिजिटल केमरा, एमआईसीआर, ओसीआर, ओएमआर, बार कोड रीडर, आवाज को पहचानने वाला, लाइटपेन, टच स्क्रीन।
इनपुट डिवाइस: मॉनीटर की विशेषताएं एवं मॉनीटर के प्रकार, वीडियो स्टैंडर्ड VGA, SVGA, XGA, LCD स्क्रीन आदि, प्रिंटर, डेजी व्हील, डॉट मैट्रिक्स, इंकजेट, लेजर, लाइन प्रिंटर, प्लॉटर, साउंड कार्ड्स एवं स्पीकर्स।
- UNIT – IV** Storage Devices Storage fundamental primary Vs Secondary. Various Storage Devices magnetic Tape. Cartridge Tape, Data Drives, Hard Drives, Floppy Disks, CD, VCD, CD-R, CD-RW, Zip Drive, DVD, DVD-RW.
- इकाई – 4** स्टोरेज डिवाइसेस स्टोरेज फंडामेंटल्स प्रथमरी विरुद्ध भिन्न स्टोरेज डिवाइसेस मैग्नेटिक टेप, कार्ट्रिज टेप, डाटा ड्राइव्स, हार्ड डिस्क ड्राइव्स फ्लोपी डिस्कस, सी.डी., वी.सी.डी., सी.डी.-आर. सी.डी.-आर. डब्ल्यू, जीप ड्राइव, डी.वी.डी., डी.वी.डी., – आर. डब्ल्यू।
- UNIT – V** Operating System Introduction to operating systems, its functioning and types. Basic commands of dos & Windows operating System.

इकाई – 5 ऑपरेटिंग सिस्टम का परिचय ऑपरेटिंग सिस्टम का परिचय, उसके लक्षण एवं प्रकार, डॉस एवं विन्डोस का मूल कमांड।

डॉस बेसिक्स–

फिजीकल स्ट्रक्चर ऑफ डिस्क, ड्राइव नेम, फेट, फाईल एवं डायरेक्ट्री स्ट्रक्चर एवं नेमिंग नियम, बूटिंग प्रक्रिया, डॉस सिस्टम फाईल्स।

डॉस कमांडसस–

- आंतरिक कमाण्डस DIR, MD, CD, RD, Copy, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE आदि।
- बाह्य कमाण्डस CHKDSK, SCOPE, PRINT, DISKCOPY, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, MODE, ATTRIB HELP, SYS आदि।

PRACTICALS:-

DOS:

- DOS commands: Internal & External Commands.
- Special batch file: Autoexec, Bar Hard disk setup.

Windows 98:

- Destop setting: New folder, rename bin operation, briefcase, and function. Control panel utility.
- Display properties: Screen saver, background settings.

MS Word:

- Creating file; save, save as HTML, Save as Text, Template, RTF Format.
- Page setup utility: Margin settings, paper size setting, paper source, layout.
- Editing: Cut, past special, undo, redo, find, replace, go to etc.
- View file: page layout, Normal Outline, master document, ruler header, footer, footline, full screen.
- Insert: break, page number, symbol, date & time, auto text, caption file, object, hyperlink, picture etc.
- Format: font, paragraph, bullets & numbering, border & shading, change case, columns.
- Table: Draw label, insert table, cell handling, table auto format, sort formula.

COURSE OUTCOME:-

Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

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हिन्दी आधार/पाठ्यक्रम- हिन्दी भाषा और संरचना – 1

पाठ्यक्रम के उद्देश्य:

1. विद्यार्थियों में राष्ट्र प्रेम की भावना का विकास करना।
2. हिन्दी के समृद्ध साहित्य को नयी पीढ़ी तक पहुँचाना।
3. पत्र-लेखन, सार लेखन, भाव पल्लवन एवं साक्षात्कार के कौशल का विकास करना।
4. डायरी, संस्मरण, लेखन, पारिभाषिक, शब्दावली, तत्सम, तद्भव, देशज, विदेशी शब्दों इत्यादि के ज्ञान का परिमार्जन करना।

पाठ्यक्रम

इकाई-1

भारत वंदना (काव्य)	सूर्यकांत त्रिपाठी निराला
जाग तुझको दूर जाना	सुश्री महादेवी वर्मा
स्वतंत्रता पुकारती (काव्य)	जयशंकर प्रसाद
हम अनिकेतन (काव्य)	बालकृष्ण शर्मा नवीन
भाषा की महत्ता और उसके विविध रूप	
भाषा-कौशल	

इकाई-2

करुणा (निबंध)	आचार्य रामचन्द्र शुक्ल
समन्वय की प्रक्रिया (निबंध)	रामधारी सिंह दिनकर
बिच्छी बुआ (कहानी)	डॉ. लक्ष्मण विष्ट बटरोही
अनुवाद	परिभाषा प्रकारण महत्वए विशेषताएं
हिन्दी की शब्द-संपदा	
परिभाषिक शब्दावली	

इकाई-3

विलायत पहुंच ही गया (आत्मकथांश)	महात्मा गांधी
अफसर) व्यंग्य (शरद जोशी
तीर्थयात्रा (कहानी)	डॉ. मिथिलेश कुमार मिश्र
मकड़ी का जाला (व्यंग्य)	डॉ. रामप्रकाश सक्सेना
वाक्य- संरचना : तत्समए तद्भव देशज विदेशी	

इकाई-4

अप्प दीपो भव (वक्तृत्व कला)	स्वामी श्रद्धानंद
भारत का सामाजिक व्यक्तित्व (प्रस्तावना)	जवाहरलाल नेहरू
पत्र मैसूर के महाराजा को (पत्र-लेखन)	स्वामी विवेकानंद
बनी रहेगी किताबें (आलेख)	डॉ. सुनीता रानी घोष
पत्र-लेखन: महत्व और उसके विविध रूप	
सड़क पर दौड़ते ईहा मृग (निबंध)	डॉ. श्यामसुन्दर दुबे

इकाई-5

योग की शक्ति (डायरी)	डॉ. हरिवंश राय बच्चन
कोश के अखाड़े में कोई पहलवान नहीं उतरता (साक्षात्कार) –	भाषाविद् डॉ. हरिदेव
	बाहरी से प्रो. त्रिभुवननाथ शुक्ल

नीग्रो सैनिक से भेंट (यात्रा-संस्मरण)

डॉ. देवेन्द्र सत्यार्थी

यदि बा न होती तो शायद गांधी को यह ऊँचाई न मिलती (साक्षात्कार) कथाकार.

गिरिराज किशोर से सत्येन्द्र शर्मा

सार -लेखनए भाव-पल्लवन साक्षात्कार और कौशल

अपेक्षित परिणाम:

1. विद्यार्थी भारत भूमि से प्रेम व स्नेह के भावों को बढ़ा सकेंगे।
2. विद्यार्थियों की हिन्दी की शब्द संपदा में वृद्धि होगी।
3. पत्र-लेखन ,सार लेखन, भाव पल्लवन साक्षात्कार के कौशल का विकास होगा।
4. डायरी एवं संस्मरण लेखन विद्या का परिमार्जन होगा।
5. हिन्दी के समृद्ध साहित्य कोश से लाभान्वित होंगे।

Physics-I (Mechanics, Oscillations and Properties of Matter)

COURSE OBJECTIVE:-

1. To understand applications of Newton's Laws of Classical System.
2. Understands the concepts of elasticity and viscosity
3. Understands the damped and driven oscillators
4. Gains and appreciations of surface phenomena.

Syllabus:

- UNIT – I** Mechanics Laws of motion, centripetal acceleration, Coriolis force and its applications. Kepler's laws. Gravitational law and field,. Gauss &Poisson's Equation of Gravitational self-energy System of. particles,, centre, of mass, equation of motion, conservation of linear and angular, momentum, conservation of energy, single stage and multistage rockets, elastic and inelastic collisions.
- UNIT – II** Oscillations differential equation and its solution, kinetic and potential energy, simple harmonic oscillations and its examples, spring and mass system, Vibrations of a magnet, moments of inertia and their products, principal moments and axes, Euler's equations simple and compound pendulum torsional pendulum, Helmholtz resonator, LC circuit.
- UNIT – III** Superposition Of Harmonic Motion Superposition of two simple harmonic motions of the same frequency along the same line, interference, superposition of two mutually perpendicular simple harmonic vibrations of the same frequency, Lissajous figures, damped harmonic oscillators, power dissipation, quality factor and their examples, driven harmonic oscillator;
- UNIT – IV** Properties of matter Elasticity, Hook's Law, elastic constants for an isotropic solid beams supported at both the ends, cantilever, torsion of a cylinder bending moments and shearing forces. Kinematics of moving fluids, equations of continuity Euler's equation, Bernoulli's theorem, viscous fluids, streamline and turbulent flow, Poiseuille's law, Capillary tube flow, Reynolds number, Stokes law Surface tension and surface energy. surface wetting.
- UNIT - V** Motion of charged Particles in Electric and Magnetic Fields E as an accelerating field, electron gun, case of discharge tube, linear accelerator. E as deflecting field- CRO, sensitivity of CRO. Transverse B field; 180° deflection, mass spectrograph. principles of cyclotron. discovery of isotopes, elements of mass spectrographs, principle of magnetic focusing (lenses).

COURSE OUTCOMES:-

1. To study the fundamentals of mechanics and oscillations
2. Gate the knowledge about forces help the student in their daily life
3. The information will teach the students about the rolling concepts

PRACTICAL:-

To determine the acceleration due to gravity (g) at a place with the help of Bar pendulum.

1. (Compound Pendulum).
2. To determine the acceleration due to gravity (g) at a place with the help of Kater's reversible pendulum.
3. To determine the modulus of rigidity of given wire by Torsional Pendulum.
4. To determine the moment of inertia of a flywheel about its own axis of rotation.
5. To determine the moment of inertia of given body by using inertia table.
6. To determine the moment of inertia of given body by using inertia table with lamp and scale arrangement.
7. To study and prove the perpendicular axis theorem of moment of inertia by using inertia table.
 $I_z = I_x + I_y$
8. To determine the surface tension of a liquid by the capillary rise method.
9. To determine the co-efficient of viscosity of glycerine or castor oil by falling sphere method.
10. To determine the density of liquid by using steel balls and Teflon spheres.
11. To determine the fall time of different size spheres of same material.
12. To determine the Young's Modulus of elasticity of the given sample material by bending. (Bending of Beam)
13. To study and verify the truth table of Basic, Universal & Compound Logic Gates.

Note:-

- ❖ **One experiment will be asked in the semester practical examination.**

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Chemistry –I (Physical Inorganic & Organic Chemistry)

Syllabus:

- UNIT - I** A. Mathematical Concepts : Logarithmic relations, curves stretching, linear graphs and calculation of slopes, Differentiation of functions like Kx , ex , xn , $\sin x$, $\log x$; maxima and minima, partial differentiation and reciprocity relations. Integration of some useful/relevant functions; permutations and combinations. Factorials, Probability. B. Gaseous States : Deviation from ideal behavior, van der Waals equation of state. Critical phenomenon : PV isotherms of ideal gases, continuity of states, the isotherms of van der Waals equations, relationship between critical constants and vander Waals constants, the law of corresponding states, reduced equation of states. C. Molecular Velocities : Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision numbers, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).
- UNIT - II** A. Liquid State : Intermolecular forces, structure of liquids (a qualitative description) Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. B. Colloidal State : Definition of colloids, classification of colloids. Solids in liquids (sols): properties- kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in liquids (emulsions) : types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids. C. Solid State : Definition of space lattice, Unit cell, Laws of crystallography - (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Laws of symmetry, Symmetry elements in crystals. Diffraction : X-ray diffraction by crystals, Derivation of Bragg's equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).
- UNIT - III** Chemical Kinetics : Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light and catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction - differential method, method of integration, method of half life period and isolation method. Experimental methods of chemical kinetics - conductometric, potentiometric, optical methods- polarimetry and spectrophotometry. Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis) Expression for the rate constant based on equilibrium constant and thermodynamic aspects.
- UNIT - IV** A. Structure and Bonding : Hybridizations, Bond lengths and bond angles, bond energy : Localized and delocalized chemical bond, van-der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding. B. Mechanism of Organic reactions : Curved arrow notations, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking.

C. Types of Reagents : Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates- carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.

UNIT - V

Stereochemistry : Concept of isomerism, types of isomerism, optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centres, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, mesocompounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configurations, sequence rule, D & L , R & S systems of nomenclature. E and Z system of Nomenclature geometrical isomerism in alicyclic compounds. Conformation, conformational analysis of ethane and n-butane. Conformations of cyclohexanes, axial and equatorial bonds, Newman projection and Sawhorse formulae, Fischer and Flying wedge formulae. B. Alkanes and Cycloalkanes : IUPAC nomenclature, classification, isomerism in alkanes, sources and methods of preparation (with special reference to Wurtz, Kolbe, Corey-House reactions and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes Cycloalkanes : nomenclature, methods of preparations, chemical reactions. Baeyer's strain theory and its limitations. ring strain in cyclopropane and cyclobutanes. Theory of strainless rings.

PRACTICAL:-

Physical Chemistry

A. (Any one experiment will be asked in examination form the following carrying 12 Marks)

1. Calibration of thermometer
2. Determination of melting point
3. Determination of boiling point
4. Determination of mixed melting point
5. Preparation of solutions of various concentrations, NaOH, HCl, H₂SO₄.

B. (Any one experiment will be asked in examination form the following carrying 12 Marks)

1. To determine the velocity constant (specific reaction rate) of hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To study the effect of acid strength on the hydrolysis of an ester.
3. To compare the strength of HCl and H₂SO₄ by studying the kinetics of hydrolysis of ester.
4. To study kinetically the reaction rate of decomposition of iodide by H₂O₂.
5. Determination of surface tension / percentage composition of given organic mixture using surface tension method.
6. Determination of viscosity / percentage composition of given organic mixture using viscosity method.

Organic chemistry

(Any one experiment will be asked in examination form the following carrying 12 Marks)

1. Distillation
2. Crystallization
3. Decolourisation and crystallization using charcoal
4. Sublimation

Viva: 6 marks

Mathematics – I (Algebra, Trigonometry & Geometry)

COURSE OBJECTIVES:-

- Apply the concepts of matrices in solving a system of linear equations.
- Be familiar with the theory of equations.
- Expand trigonometric functions and also find the summation of T-series.
- To have knowledge about Cone and Cylinder with conicoides.
Be familiar with group theory, ring, integral domain, field and make their fundamental strong

Syllabus:

- UNIT – 1** Rank of a matrix. Eigen values, eigen vectors.Characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of marix. Application of matrix to a system of linear (both homogenous and non - homogenous) equations. Theorems on consistency and inconsistency of a system of linear equations. Solving the linear equations with three unknowns. Relation between the roots and coefficients of a general polynomial equation in one variable. Transformation of equations, Descarte’s rule of signs.
- UNIT – 2** De Moivre’s theorem and its application. Direct and inverse circular and hyperbolic functions, Expansion of trignometrical function. Gregory’s Series, Summation of Series,
- UNIT – 3** Definition and basic properties of group. Order of an element of a group. Subgroups, algebra of subgroups. Cyclic groups and their simple properties. Coset decomposition and related theorems. Lagrange’s theorem and its consequences, Normal sub groups, quotient groups.
- UNIT- 4** Homomorphism and isomorphism of groups, kernel of Homomorphism and fundamental theorem of Homomorphism of groups Permutation groups (even and odd permutations) Alternating groups A_n , Cayley’s theorem. Introduction to rings, subrings, integral domains and fields, simple properties and examples.
- UNIT – 5** General equation of second degree. Tracing of conics. Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone. Equation of Cylinder and its properties. Right circular cylinder, enveloping cylinder and their properties Central conicoids, Paraboloids. Plane sections of Conicoids.

COURSE OUTCOMES:-

- Understanding the ideas of matrices and ability to solve system of linear equations.
- The student will be able to acquire sound knowledge of matrices and techniques in solving equations with the help of theory of equations
- Fluency in solving equations.
- Understanding the concepts of algebra, trigonometry and geometry

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English FC I

English Language and Indian Culture

COURSE OBJECTIVES:-

- To Study the basic concept and Language Skills of English Language.
- Comprehensive study of different kinds of vocabulary in English Language.
- To Study the different era in every story and moods in poems.

Syllabus:

UNIT – I

1. Amalkanti: Nirendranath Chakrabarti
2. Sita: Toru Dutt
3. Tryst with Destiny: Jawaharlala Nehru
4. Delhi in 1857: Mirza Ghalib
5. Preface to the Mahabharata: C. Rajagopalachari
6. Where the Mind is Without Fear: Rabindranath Tagore
7. A Song of Kabir: Translated by Tagore
8. Satyagraha: M.K. Gandhi
9. Toasted English: R.K. Narayan
10. The Portrait of a Lady: Khushwant Singh
11. Discovering Babasaheb: Ashok Mahadevan

UNIT – II Comprehension

UNIT – III Composition and Paragraph Writing (Based on expansion of an idea).

UNIT – IV Basic Language Skills : Vocabulary – Synonyms, Antonyms, Word Formation, Prefixes and Suffixes, Words likely to be confused and Misused, Words similar in Meaning or Form, Distinction between Similar Expressions, Speech Skill.

UNIT – V Basic Language Skills : Grammar and usage – The Tense Forms, Propositions, Determiners and Countable/Uncountable Nouns, Verb, Articles, Adverbs.

COURSE OUTCOMES:-

1. Students will be able to understand the basic concept and Language Skills of English Language.
2. Students will be able to understand the different use of vocabulary in their sentences.
3. Students will be able to understand the varieties of stories on different issues and on different format.

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Fundamentals of Entrepreneurship

COURSE OBJECTIVE:-

Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Syllabus:

UNIT – I Entrepreneurship-Definition, Characteristics and importance, Types and functions of an entrepreneur, merits of a good entrepreneur motivational factors of entrepreneurship.

UNIT – II Motivation to achieve targets and establishment of ideas. Setting targets and facing challenges. Resolving problems and creativity. Sequenced planning and guiding capacity, Development of self confidence. Communication skills, Capacity to influence, leadership.

UNIT – III Project Report- Evaluation of selected process. Detailed project report - Preparation of main part of project report pointing out necessary and viability.
Selecting the form of Organization: Meaning and characteristics of sole Proprietorship, Partnership and cooperative committees, elements affecting selection of a form of an organization.
Economic management -Role of banks and financial institutions banking, financial plans, working capital-evaluation and management, Cost and Price determination, Calculation of Profits, keeping of accounts.

UNIT – IV Production management - Methods of purchase. Management of movable assets/goods. Quality management. Employee management. Packing.
Marketing management Sales and the art of selling. Understanding the market and market policy. Consumer management. Time management.

UNIT - V Role of regulatory institutions - district industry centre, pollution control board, food and drug administration, special study of electricity development and municipal corporation.
Role of development organizations, khadi & village Commission/ Board, State Finance Corporation, scheduled banks, MP Women's Economics Development Corporation.
Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban environment scheme, Rani Durgavati Self-Employment scheme, Pt. Deendayal Self-employment scheme.
Various grant schemes - Cost-of-Capital grant, interest grant, exemption from entry tax, project report, reimbursement grant, etc.
Special incentives for women entrepreneurs, prospects & possibilities.
Schemes of Tribal Finance Development Corporation, schemes of Antyavasai Corporation, schemes of Backward Class and Minorities Finance Development Corporation.
Special incentives for women entrepreneurs, prospects & possibilities.
Schemes of Tribal Finance Development Corporation, schemes of Antyavasai Corporation, schemes of Backward Class and Minorities Finance Development Corporation.

COURSE OUTCOME:-

Understanding basic concepts in the area of entrepreneurship, understanding the stages of the entrepreneurial process, adopting of the key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

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Physics-II (Mathematical Background, Electrostatics and Steady)

COURSE OBJECTIVE:-

1. The main objective of this subject is introducing the basic concepts of Electrostatics to student and help in developing problem solving skills.
2. Student will study basic ideology of Scalar and Vector product, double and triple integral.
3. Introducing the basic concepts of electrostatics to student and help in developing problem solving skills.

Syllabus:

- UNIT - I** Mathematical Background Scalars and vectors, dot and cross products, triple vector product, flux of a vector field, Gauss's divergence theorem. Green's theorem and Stoke's theorem. Functions of two and three variables, partial derivatives, definition of a double and triple integral, evaluation of double and triple integrals as repeated integrals, change of variables of integration, Jacobian applications.
- UNIT - II** Electrostatics Coulombs law in vacuum expressed in vector forms, calculations of E for simple distributions of charge at rest, dipole and quadrupole fields. torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application. Capacitors, electrostatic field energy,. Dielectrics, parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, and displacement vector D, molecular interpretation of Claussius-Mossotti equation.
- UNIT - III** Electric Currents Steady current, current density J, non-steady currents and continuity equation, Kirchhoff 's laws and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits. AC circuits, complex numbers and their applications solving AC circuits Problems, complex impedance and reactance, series and parallel resonance., Q factor, power consumed by an A.C. circuit, power factor,
- UNIT – IV** Magneto-statics Force on a moving charge: Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio, Biot and Savart's Law, Ampere's Law, $\vec{\nabla} \times \mathbf{B} = \mu_0 \mathbf{J}$, $\vec{\nabla} \cdot \mathbf{B} = 0$; Field due to a magnetic dipole magnetization current magnetization vector, Half order field, magnetic permeability (linear cases).
- UNIT - V** Time Varying Fields Electromagnetic induction, Faraday's Laws, electromotive force $e = \int \mathbf{E} \cdot d\mathbf{l}$, integral and differential forms of Faraday's laws. self and mutual inductance9.transformers,. Maxwell's displacement current, Derivations of Maxwell's equations, electromagnetic field energy density., Poynting's vector. The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, polarization by reflection and total internal reflection. Faraday effect, reflection and refraction by the ionosphere.

COURSE OUTCOMES:-

1. To study the basics of Mathematical Background and to introduce concepts of Electrostatics and magnetics.

PRACTICAL:-

1. To plot graphs showing the variation of magnetic field with distance along the axis of circular coil carrying current and to estimate the radius of the coil.
2. To Determine the Dielectric Constant of different materials.
3. To determine the impedance, phase angle & power factor of R, L & C are connecting in series with the help of LCR Impedance circuit.
4. To determine the resistance per unit length of the Carrey-Foster's bridge wire.
5. To study and verify the Coulomb's law.
6. To determine the radius of a current carrying coil by using current carrying coil measurement unit.
7. To determine the magnetic field with the variation of distance along the axis of current carrying coil.

8. Experiment with Ballistic Galvanometer:

- 8.1 To determine the ballistic constant by steady deflection method by using ballistic galvanometer.
- 8.2 To determine the charge sensitivity of a moving coil ballistic galvanometer using a known capacitor.
- 8.3 To study the comparison of the capacitance of two condensers by using ballistic galvanometer.
- 8.4 To determine the logarithmic decrement for a ballistic galvanometer.

9. Electrostatics Measurement Lab:

- 9.1 To study the charge induction in electrostatics.
- 9.2 To study the charge conduction in electrostatics.
- 9.3 To study the pith ball pendulum with the help of Electroscope.
- 9.4 To study the relative charges of different rods with the help of Digital Display in millivolt.
- 9.5 To study the electrostatic charge with the help of Charge Demonstration Tube.
- 9.6 To study the electrostatics charge by the combination of different rods & clothes.

Note:-

- ❖ **One experiment will be asked in the semester practical examination.**

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Chemistry –II (Physical Inorganic & Organic Chemistry)

Syllabus:

- UNIT - I**
- A.** Atomic Structure : Idea of de Broglie's matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of n and l , quantum numbers, radial and angular wave functions and probability distribution curves, effective nuclear charge.
- B.** Periodic Properties : Atomic and ionic radii, ionization energy, electron affinity and electronegativity : definition, method of determination, trends in periodic table and applications.
- C.** Chemical Bonding : Covalent bond- valence bond theory and its limitations, directional characteristic of covalent bond. Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH_3 , SF_4 , ClF_3 , ICl_2 - and H_2O .
- UNIT - II**
- A.** Molecular Orbital theory for homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and the bond energy, % ionic character from dipole moment and electronegativity difference. Weak interactions, hydrogen bonding, van der Waals forces.
- B.** Ionic Solids : Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, Lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions. Fajan's rule, Metallic bond, free electron, Valence bond and Band theories.
- C.** Noble Gases : Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.
- UNIT - III**
- A.** s-Block Elements : Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.
- B.** p-Block Elements : Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. Hydrides of boron-diborane and higher boranes. Borazine, borohydrides. Fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens.
- UNIT – IV**
- A.** Arenes and Aromaticity : Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain structure of benzene, molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure. MO picture. Aromaticity the Huckel rule, aromatic ions. Aromatic electrophilic substitution, general pattern of the mechanism, role of s and p complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents. orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction. Methods of formation and chemical reactions of alkylbenzenes and biphenyl.
- B.** Alkenes : Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regio-selectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes, mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with

KMnO₄, polymerization of alkenes, Substitution at the allylic and vinylic positions of alkenes, Industrial applications of ethylene and propene.

UNIT – V

A. Cycloalkenes, Dienes and alkynes : Methods of formation, conformation and chemical reactions of cycloalkenes, nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions - 1,2 and 1,4 additions, Diels-Alder reaction. Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroborationoxidation and polymerization.

B. Alkyl and Aryl Halides : Nomenclature and classes of alkyl halides, methods of formation, chemical reactions; mechanisms of nucleophilic substitution reaction of alkyl halides, SN₂ and SN₁ reactions with energy profile diagrams.

Polyhalogen compounds: chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition reactions mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides versus allyl, vinyl and aryl halides. Synthesis and uses of DDT, BHC and Freon.

PRACTICAL:-

Max. Marks 50

Duration of practicals during the entire semester: 90 hours

Duration of practical during the semester examination: 4 hours

Inorganic chemistry

Inorganic mixture analysis 12 Marks

Macro/Semi-micro Analysis- Cation analysis, separation and identification of ions from group I-VI, anion analysis

Separation of cations by paper chromatography. 4 marks

Preparation of ferrous alum. 8 marks

Organic Chemistry: (12 marks)

1. Detection of elements (N, S and halogens) 2 elements, 4 marks

2. Functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and aniline) in simple organic compounds.

2 functional groups: 8 marks

Viva: 6 marks

Records: 8 marks

Course Outcome:-Upon successful completion of this course, students will understand theories of chemical bonding and determine the molecular geometry of molecules using VSEPR theory. Understand the general and physical properties of matter.

MATHEMATICS – II (Calculus, Differential Equations & Vector Calculus)

COURSE OBJECTIVES:-

- To solve problem using expansion of functions.
- Familiar with curve tracing.
- Apply integral calculus in solving problems.
- To make the student acquire sound knowledge of techniques in solving differential equations.
- Familiar with physical interpretation of divergence and curl of a vector.

Syllabus:

- UNIT – I** Concept of Partial differentiation, Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions, Asymptotes and Curvature, Tests for concavity and convexity, Points of inflexion. Multiple points. Tracing of curves in cartesian and polar co-ordinates
- UNIT – II** Integration of irrational algebraic functions and transcendental functions. Reduction formulae. Definite Integrals. Quadrature, Rectification, Volumes and Surfaces of solids of revolution of curves.
- UNIT – III** Linear equations and equations reducible to the linear form, Exact differential equation First order higher degree equations for x , y , p , Clairaut's form and singular solutions. Linear differential equations with constant coefficients.
- UNIT – IV** Homogenous linear ordinary differential equations, linear differential equations of second order. Transformation of the equation by changing the dependent variable and the independent Variable, Method of variation of parameters, Ordinary simultaneous differential equations.
- UNIT – V** Vector differentiation. Gradient, Divergence and Curl. Vector integration, Theorem of Gauss (without proof) and problems based on it. Theorem of Green (without proof) and problems based on it. Stoke's theorem (without proof) and problems based on it.

COURSE OUTCOMES:-

- Understanding the ideas and concept of calculus and facility in solving standard examples.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Fluency in solving differential equations and facility in solving standard examples.
- Understanding the ideas of vector calculus and facility in solving standard examples.

हिन्दी भाषा संवेदना एवं संचार साधन – 2

पाठ्यक्रम के उद्देश्य—

- विद्यार्थियों को भारतीय संवेदना, संस्कृति, वैश्विक चेतना से परिचित कराना।
- धर्म, दर्शन, न्याय, नीति, साहित्य की प्राचीन व नवीन मान्यताओं से परिचित करवाना।
- संचार संसाधनों से परिचित करवाना।
- सिनेमा, रंगमंच, संगीत, चित्रकला इत्यादि से परिचित करवाना।

पाठ्यक्रम:

इकाई -1

1. भारतीय संस्कृति
2. भारतीय समाज व्यवस्था
3. सभ्यता एवं संस्कार
4. वैश्विक चेतना
5. समन्वयीकरण भारतीय एवं अंतर्राष्ट्रीय संदर्भ में

इकाई -2

1. धर्म
2. न्याय
3. दर्शन
4. नीति
5. साहित्य

इकाई -3

1. संचार साधन : संपर्क के नए क्षितिज
2. समाचार पत्र
3. भारतीय प्रेस परिषद्
4. रेडियो
5. दूरदर्शन

इकाई -4

1. सिनेमा
2. रंगमंच
3. संगीत
4. चित्र, मूर्ति, स्थापत्य कला
5. शिल्प कला

इकाई -5

1. कम्प्यूटर
2. दूरभाष सौगात विज्ञान की
3. मंत्र :(कहानी) प्रेमचंद
4. मातृ भूमिगुप्त मैथिलीशरण :(कविता)
5. साहित्यकार का दायित्व डॉ. भारती प्रेम .

अपेक्षित परिणाम:

1. विद्यार्थी आधुनिक संचार संसाधनों के प्रयोग में कुशल हो सकेंगे।
2. भारत की धर्म, दर्शन, नीति, संस्कृति, सभ्यता, संस्कारों इत्यादि के प्रति ज्ञान प्राप्त कर कुशल एवं संवेदनशील नागरिक बन सकेंगे।

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Basic Computer & Information Technology-II

COURSE OBJECTIVE:-

To educate students to analyze , design , integrate & manage information systems using information technology.

Syllabus:

UNIT – I Word Processing: Word

- MS Word: features, Creating, Saving and Operating Multi document windows, Editing Text selecting, Inserting, deleting moving text.
- Previewing documents, Printing document to file page. Reduce the number of pages by one.
- Formatting Documents: paragraph formats, aligning Text and Paragraph, Borders and shading, Headers and Footers, Multiple Columns.

इकाई-1 वर्डप्रोसेसिंग

- वर्डप्रोसेसिंग का परिचय
- एम. एस वर्ड: फीचर्स, क्रीएटिंग, सेविंग एवं ओपनिंग, मल्टी डॉक्यूमेंट विंडोस, एडिटिंग टेक्स्ट सिलेक्टिंग, इंसर्टिंग, डिलीटिंग टेक्स्ट।
- प्रीव्यूविंग डॉक्यूमेंट्स, प्रिंटिंगडॉक्यूमेंट फ्रॉम दि स्टेण्डर्ड टूलबार, प्रिंट डॉक्यूमेंट फ्रॉम दि स्टेण्डर्ड टूलबार, डॉक्यूमेंट को मीनू द्वारा प्रिंट करना, प्रिकिंग ए डॉक्यूमेंट इन ए फाइल पेज, पेजों को कम करना।
- फॉरमेटिंग डॉक्यूमेंट्स: पैराग्राफ फारमेट, अलाइनिंग टेक्स्ट एंड पैराग्राफ, बार्डर एवं हेडर्स एवं फुटर्स, मल्टीपल कॉलम्स।

UNIT – II Introduction to Excel& Worksheet

- Worksheet basic.
- Creating worksheet, entering data into worksheet, heading information, data text, dates, alphanumeric, values, saving & quitting worksheet.
- Opening and moving around in an existing worksheet.
- Toolbars and Menus, keyboard shortcuts.
- Working with single and multiple workbook coping, renaming, moving, adding and deleting. coping entries and moving between workbooks.
- Working with formulas & cell referencing.
- Autosum.
- Coping formulas
- Absolute & Relative addressing.

इकाई-2: एक्सेल एवं वर्कशीट का परिचय

- एक्सेल एंड वर्कशीट
- वर्कशीट का आधार, वर्कशीट बनाना, वर्कशीट में डाटा एंटर करना, हेडिंग इंफॉरमेशन, डाटा टेक्स्ट डेट, अल्फा न्यूमेरिक, वेल्यूज, सेविंग और वर्कशीट छोड़ना।

- पहले बनी हुई वर्कशीट को खोलना तथा चलाना।
- टूलबार मीनू और कीबोर्ड के शॉर्टकट।
- एक एवं अनेक वर्कशीट पर काम करना, कॉपी, रिनेमिंग, मूविंग, एडिंग एंड डिलीटिंग, एन्टीज को कॉपी तथा विभिन्न वर्कशीट में ले जाना।
- फॉर्मूला एवं सेल रिफ्रेसिंग के साथ काम करना।
- ऑटो सम फॉर्मूला को कॉपी करना, एक्सल्यूट एंड रिलेटिव एड्रेसिंग।

UNIT – III INTRODUCTION TO POWER POINT

- Features and various versions.
- Creating presentation using Slide master and template in various colour scheme.
- Working with slides make new slide move, copy, delete, duplicate, lay outing of slide, zoom in or out of a slide.
- Editing and formatting text: Alignment, editing, inserting, deleting, selecting, formatting of text, find and replace text.

इकाई-3: पॉवरपाइंट का परिचय-1

फीचर्स एंड विभिन्न वर्जन्स

प्रजेन्टेशन तैयार करना स्लाइड मास्टर एवं टेम्प्लेट इन वेरियस कलर स्कीम।

- पॉवरपाइंट के भिन्न व्यूस के साथ काम करना एवं पॉवरपाइंट के मेन्यू।
- स्लाइड्स के साथ काम करना, नये स्लाइड तैयार करना एवं मूव करना, कॉपी करना, डिलीट करना, डुपलीकेट स्लाइड तैयार करना, ले-आउटिंग करना, जूम इन और आउट करना।
- एडिटिंग एवं फॉरमेटिंग टेक्स्ट: अलाइनमेंट, एडिटिंग, इनसर्टिंग, डिलीटिंग, सिलेक्टिंग, फॉरमेटिंग ऑफ टेक्स्ट, फाईन्ड एवं रिप्लेस टेक्स्ट।

UNIT – IV POWER POINT – II

- Bullets , footer, paragraph formatting, spell checking.
- Printing presentation Print slides, notes, handouts and outlines.
- Inserting objects Drawing and Inserting objects using Clip Arts picture and charts.
- Slide sorter, slide transition effect and animation effects.
- Presenting the show making stand alone presentation, Pack and go wizards.

इकाई-4 पॉवरपाइंट का परिचय-2

- बुलेट्स, फुटर, पैराग्राफ फॉरमेटिंग, स्पेल चेकिंग।
- प्रिंटिंग प्रजेन्टेशन, प्रिंट स्लाइड्स, नोट्स, हेण्डआउट एवं आउट लाईन्स।
- इंसर्टिंग आब्जेक्ट, ड्राइंग एवं इंसर्टिंग ऑब्जेक्ट्स क्लिपआर्ट पिक्चर्स एवं चार्ट्स का प्रयोग करना।
- स्लाइड्स सोर्टर, स्लाइड ट्रांजिशन के प्रभाव एवं अन्य ऐनिमेशन प्रभाव।
- प्रेजेंटिंग शो मेकिंग स्टैंड अलोन प्रजेन्टेशन, पके एवं गोविजार्ड।

UNIT – V INTRODUCTION OF INTERNET

Evolution, Protocol, concept, Internet, Dial-up connectivity, leased line, VSAT, Broad band, URLs, Domain names, Portals. E-mail, Pop & web based Email. Basic of sending and

receiving Emails, Email & Internet Ethics, Computer virus, Antivirus software wage, Web Browsers.

इकाई-5: इंटरनेट का परिचय:

इवोल्यशन, प्रोटोकॉल, विचारधारा, इंटरनेट, डायल अप कनेक्टिविटी, डीज्डलाइन, वीएसटी, ब्रोडबैंड, यू.आर. एल्स., डोमेननेम्स, पोसटल्स, ई-मेल, पॉप एवं वेब बेस्डई-मेल, बेसिक्स ऑफ़ सेडिंग एवं रिसीविंग इमेल्स, ई-मेल एवं इंटरनेट एथिक्स, कम्प्यूटर वायरस, एंटी वायरस सॉफ्टवेयर, वेब ब्राउसर।

PRACTICALS:

MS- Power Point:

Creating new slide, formatting slide layout, slide show & sorter, Inserting new slide, slide no., date, time, chart, formatting slide, tool operation.

List of suggested practical work:

- Under standing of a dial up connection through modern.
- Configuring a computer for an e-mail and using outlook Express or Netscape Messenger.
- Registration an e-mail address.
- Understanding of e-mail drafting.
- Understanding of address book maintenance for e-mail.
- Understanding of different mail program tools.
- Send and receive functions of e-mail.

Note- Minimum laboratory timing of six hours in a week.

COURSE OUTCOME:-

Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

Physics-III (Kinetic Theory of Gases, Thermo-dynamics and Statistical Mechanics)

COURSE OBJECTIVES:-

1. To express the basic assumption of the kinetic theory of gases.
2. Students learn the different laws of Thermodynamics.
3. To learn Thermodynamically function and their relations.

Syllabus:

- UNIT – I** Kinetic Theory of Gases: Ideal Gas Kinetic model, deduction of Boyle's law, interpretation of temperature, estimation of rms speeds of molecules. Brownian motion, estimation of the Avogadro number. Law of Equipartition of energy, specific heat of monatomic gas, extension to di- and tri- atomic gases, behavior at low temperatures. Adiabatic expansion of an ideal gas, applications to atmospheric physics. Real Gas: Van der Waals gas, Equation of state, nature of Vander Waals forces, comparison with experimental P-V curves. The critical constants; gas and vapour. Joule expansion of ideal gas and Vander Waals gas, Joule coefficient, estimates of J-T cooling. Liquefaction of gases: Boyle temperature and inversion temperature. Principle of regenerative cooling, liquefaction of hydrogen and helium. Refrigeration cycle, meaning of efficiency.
- UNIT – II** Thermodynamics The laws of thermodynamics: The Zeroth law, first law of thermodynamics, internal energy as a state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics, Entropy,. The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero; third law of thermodynamics. Thermodynamic relationships: Thermodynamic variables: Maxwell's general relationships, application to Joule – Thomson cooling and adiabatic cooling in a general system, Clausius-Clapeyron Latent heat equation. Cooling due to adiabatic demagnetization, Production and measurement of very low temperatures.
- UNIT – III** Statistical Physics The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, probability distribution and its narrowing with increase in number of particles. The expressions for average properties. Constraints, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states. Some universal laws: The μ space representation, division of μ space into energy states and into phase cells of arbitrary size, applications to one-dimensional harmonic oscillator and free particles. Equilibrium between two systems in thermal contact, bridge with macroscopic physics. Probability and entropy, Boltzmann entropy relation. Statistical interpretation of second law of thermodynamics. Boltzmann canonical distribution law and its applications; Rigorous form of equipartition of energy.
- UNIT - IV** Maxwellian distribution of speeds in an ideal gas Distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Black Body Radiation :Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Spectral distribution of Black Body radiation. Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment. Interpretation of behaviour of specific heats of gases at low temperature.

UNIT - V Quantum Statistics Transition to quantum statistics; “h” as a natural constant and its implications, cases of particle in a one dimensional box and one-dimensional harmonic oscillator. Indistinguishability of particles and its consequences, Bose- Einstein and Fermi-Dirac conditions; applications to liquid helium, Free electrons in a metal, and photons in blackbody chamber. Fermi level and Fermi energy. Transport Phenomena : Transport phenomena in gases; Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

COURSE OUTCOMES:-

1. understand the concept of Thermodynamics and their laws.
2. Describe the Thermodynamics function and their relations.
3. Student learn about the concepts of Quantum Statics.

PRACTICAL:-

1. To determine the mechanical equivalent of heat of the water (J) by using Callendar & Barne’s method.
2. To study and verify the Stefan's law by electrical method.
3. To study the temperature dependence of total radiation and hence, to verify the Stefan's law.
4. To determine the grid voltage plate current characteristics of a Triode valve (6C5) and then to find the triode constants.
5. To determine the plate current I_P for different plate voltage V_P when grid voltage V_G remains fixed.
6. To study and plot the plate characteristics for different values of grid voltage V_G .
7. To study and plot the transfer characteristic for different values of plate voltage V_P .
8. To determine the Coefficient of Thermal Conductivity of bad conductors of given material by Lee’s Disc method.
9. Study of Brownian motion.

Note:-

- ❖ One experiment will be asked in the semester practical examination.

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Chemistry –III (Physical, Inorganic & Organic Chemistry)**Syllabus:****Physical Chemistry**

- UNIT – I** Thermodynamics-I Definition of thermodynamic terms: System, surrounding, Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.
 First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law: Joule Thomson coefficient and inversion temperature.
 Calculation of w , q , dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Thermochemistry: Standard state, standard enthalpy of formation: Hess's Law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermochemical data, temperature dependence of enthalpy, Kirchoff's equation.
 Second Law of Thermodynamics- Need for the law, different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.
- UNIT – II** Thermodynamics-II (a) Concept of entropy: Entropy as a state function, entropy as a function of P&T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function(A) as a thermodynamic quantities, A and G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.
 (b) Chemical equilibrium Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chateliers's principle. Reaction isotherm and reaction isochore: Clapeyron equation and Clausius- Clapeyron equation, applications.
 (c) Buffers: Mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts.
 (d) Corrosion: types, theories and methods of combating it.

Inorganic Chemistry

- UNIT – III** Chemistry of elements of I transition series: Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds such as carbides, oxides and sulphides. Complexes illustrating relative stability of their oxidation states, coordination number and geometry chemistry of elements of II and III transition series: General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry
- UNIT – IV** (a) Coordination Compounds: Werner's coordination theory and its experimental verification, EAN Concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, VBT of transition metal complexes.
 (b) Oxidation and Reduction: Use of redox potential data, analysis of redox cycle, redox stability in H₂O: Frost, Latimer and Pourbaix diagram. Principles involved in the extraction of elements.

Organic Chemistry

- UNIT – V**
- (a) Electromagnetic Spectrum: Absorption Spectra; UV absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation.
Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. IR absorption spectroscopy; molecular vibrations, Hook's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.
- (b) Alcohols: Classification and nomenclature. Monohydric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reactions of alcohols. Dihydric alcohols: nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)₄ and HIO₄] and pinacole-pinacolone rearrangement. Trihydric alcohols-nomenclature and methods of formation, chemical reactions of glycerol
- (c) Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols: resonance stabilization of phenoxide ion. Reactions of phenols: electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Riemeier-Tiemann reaction
- (d) Ethers and Epoxides Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions: cleavage and auto oxidation. Ziesel's method. Synthesis of epoxides. Acid and base-catalysed ring opening of epoxides, orientation of epoxide ring opening, reaction of Grignard and organolithium reagents with epoxides.

PRACTICAL:-

Time: 6 hours

Inorganic Chemistry 18 marks

Calibration of the fractional weights, pipettes and burettes. Preparation of standard solutions. Dilution of 0.1 M to 0.001 M solutions.

Quantitative analysis -Volumetric analysis.

(a) Determination of acetic acid in commercial vinegar using NaOH.

(b) Determination of alkali content- antacid tablet using HCl.

(c) Estimation of calcium content in chalk as calcium oxalate by permanganometry.

(d) Estimation of hardness of water by EDTA

Gravimetric analysis:

Barium as barium sulphate

Organic Chemistry Laboratory Techniques 18 marks

A. Thin layer chromatography

Determination of R_f values and identification of organic compounds.

(a) Separation of green leaf pigments (spinach leaves may be used).

(b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:6).

(c) Separation of a mixture of dyes using cyclohexane and ethylacetate (8:5:1.5). B. Paper chromatography: Ascending and Circular Determination of R_f values and identification of organic compounds

(a) Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid, leucine

COURSE CODE: 3SBCH 304

and glutamic acid. Spray reagent ninhydrin.

(b) Separation of a mixture of DL-alanine, glycine and L-leucine using n-butanol: acetic acid: water (4:1:5). Spray reagent ninhydrin.

(c) Separation of monosaccharides- a mixture of D-galactose and D-fructose using n-butanol: acetone: water (4:1:5). Spray reagent-aniline hydrogen phthalate.

COURSE OUTCOME:-

Upon successful completion of this course, students will understand kinetics, equilibrium, LeChatelier's principle, acid and base reactions, pH, buffers, colligative properties, and electrochemical applications in an undergraduate laboratory.

Understand the first law of thermodynamics and the role of energy and enthalpy in chemical reactions and perform thermochemical calculations.

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Mathematics-III (Calculus, Differential Equation and Mechanics)

COURSE OBJECTIVES:-

- The goal of this course is for students to gain proficiency in calculus computations..
- To make the student acquire sound knowledge of sequences, series and their convergence.
- To familiarize the student with Laplace and inverse Laplace transforms as well as applications of Laplace transformation in solving linear differential equations.
- To acquaint the student with mechanics.

Syllabus:

UNIT – I Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion . Series of non-negative terms. Comparison test, Cauchy's integral test, Ratio test. Raabe's test ,logarithmic test. Leibnitz's theorem. Absolute and conditional convergence.

UNIT – II Continuity of functions of one variable , sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives. Limit and continuity of functions of two variables.

UNIT - III Series Solution of Differential Equations-Power series Method, Bessel's Equation Bessel's function and its properties, recurrence and generating relations. Legendre's

UNIT – IV Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals. Shifting theorem . Differentiation and integration of transforms. Inverse Laplace transforms, Convolution theorem. Applications of Laplace transformation in solving linear differential equations with constant coefficients.

UNIT - V Analytical conditions of equilibrium of Coplanar forces. Catenary. Forces in three dimensions. Velocities and accelerations along Radial and transverse direction.

COURSE OUTCOMES:-

- Understanding the ideas of sequences and series and ability to find their convergence.
- Understanding of the ideas of limit and continuity and an ability to calculate with them and apply them for function of one and two variables.
- Understanding of the ideas of differential equation and facility in solving standard examples.
- Understanding the ideas of Laplace and inverse Laplace transforms facility in solving standard examples and apply them.
- Understanding of the ideas of Mechanics and facility in solving simple standard examples.

English FC II

English Language and Scientific Temper

COURSE OBJECTIVES:-

- To Study the basic language skills (speaking, listening, reading, and writing) and grammar.
- Comprehensive study of different kinds of letters and applications.
- To study the different kinds of prose and poetry.

Syllabus:

UNIT – I

1. Tina Morris : Tree
2. Nissim Ezekiel : Night of the Scorpion
3. C.P. Snow : Ramanujan
4. Roger Rosenblatt : The Power of WE
5. George Orwell : What is Science?
6. C.Rajagopalachari : Three Questions
7. Desmond Morris : A short extract from the Naked Ape
8. A.G. Gardiner : On the rule of the road

UNIT – II Comprehension of an unseen passage.

UNIT – III Letter Writing : Formal Letters, Informal letters, Applications.

UNIT – IV Report Writing.

UNIT – V Language Skills
Correction of common errors in sentence structure : usage of pronouns, subject/ verb agreement word order, gender; compound nouns, collective nouns, possessives, articles and prepositions. (advanced)

COURSE OUTCOMES:-

- Student will be able to understand correct use of grammar and language skills.
- Student will be familiar with different prose and poetry.
- Student should be able to write analytically in a variety of formats, including essays, report writing and application.

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Human Values and Ethics

COURSE OBJECTIVES:-

- To help students understand the basic guidelines, content and process of Human value and value crisis in contemporary Indian Society
- To help students understand the meaning of happiness and prosperity for a human being.
- To help students reflect critically on gender violence .To facilitate the students to understand harmony at all the levels of human living, and live accordingly.

Syllabus:

UNIT – I Concept of value and value crisis in contemporary Indian Society.

1. Concept of value
2. Value crisis at- individual level
3. Value crisis at- Cultural level
4. Value crisis at- Societal level
5. The Indian concept of value.
6. Modern Approach to the study of Values.

UNIT – II Moral and Ethical Human values.

1. Bases for Moral Judgment
2. Some Canons of Ethics
3. Ethics of Duty
4. Ethics of Responsibility
5. Factors to be considered in making Ethical Judgments.
6. Continuous Happiness and Prosperity- A look at basic Human Aspirations.

UNIT – III Moral Values in Profession.

1. What is Profession?
2. Professional Ethos
3. Code of Professional Ethics
4. Corporate social Responsibility

UNIT – IV Gender sensitization.

1. Socialization of Women
2. Demographic consequences
3. Domestic Violence
4. Women's work, its politics and economics , fact and fiction ,Unrecognized and unaccounted work

UNIT – V Co- Curricular Activities and value Education.

1. Games and sports
2. Literary and cultural Activities
3. NSS, NCC activates
4. A New Approach to Human Value Freedom, Creativity Love & Wisdom.

COURSE OUTCOMES:-

On completion of this course, the students will be able to:

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Understand the value of harmonious relationship based on trust and respect in their life and profession.
3. Students will develop a sense of appreciation of women in all walks of life .
4. Understand the role of a human being in ensuring harmony in society and nature.

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Physics-IV (Group Waves, Acoustics and Optics)

COURSE OBJECTIVE:-

1. To aware the students about various phenomena of Waves, Acoustics and Optics.
2. Describe the phenomena like Interference, Diffraction.

Syllabus:

- UNIT - I** Waves: Waves in Media Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, gravity waves and ripples. Group velocity and phase velocity, their measurements. Superposition of waves: Linear homogeneous equations and the superposition principle, Standing waves harmonics and the quality of sound , examples. Chladni's figures and vibrations of a drum. Production and detection of ultrasonic and infrasonic waves and applications.
- UNIT – II** Acoustics Noise and Music , The human ear and its responses , limits of human audibility, intensity and loudness, bel and decibel, the musical scales, temperament and musical instrument. Reflection, refraction and diffraction of sound; Acoustic impedance of a medium, percentage reflection and refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging. Applied acoustics: Transducers and their characteristics. Recording and reproduction of sound, various systems, measurements of frequency, waveform, intensity and velocity. The acoustics of halls, reverberation period, Sabine's formula.
- UNIT – III** Geometrical Optics Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications. General theory of image formation: cardinal points of an optical system, general relationships for thick lens and lens combinations,. Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces.
- UNIT – IV** Interference of light; The principle of superposition, twoslit interference, coherence requirement for the sources, thin films, interference by a film with two non-parallel reflecting surfaces, Newton's rings. Haidinger fringes (Fringes of equal inclination). Michelson interferometer, its application for precision determination of wavelength, Intensity distribution in multiple beam interference, Fabry-Perot interferometer and etalon.
- UNIT – V** Fresnel Diffraction Fresnel half period zones, plates, straight edge, rectilinear propagation. Fraunhofer Diffraction: Diffraction at a slit, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, Rayleigh criterion, resolving power of telescope and microscope. Diffraction & Polarization: Diffraction gratings: Diffraction at N parallel slits, plane diffraction grating, reflection grating and blazed gratings. Concave grating and different mountings. Resolving power of a grating. Double refraction and optical rotation: Refraction in uniaxial crystals. Phase retardation plates.

COURSE OUTCOMES:-

1. Understand the Physics behind various optical phenomena.
2. Understand various natural phenomena which is happening in their surroundings.
3. Explain the relationship in between various optical phenomena.

PRACTICAL:-

1. To determine the frequency of A.C. Mains by using sonometer.
2. To determine the frequency of A.C. Mains by Melde's Experiment in transverse arrangement.
3. To Study and analysis of human ear (on the basis of physical concepts).
4. To determine the wavelength of sodium light by Newton's rings method.
5. To determine the wavelength of prominent lines of mercury light by plane diffraction grating.
6. To determine the refractive index of the material of the prism using spectrometer.
7. To determine the resolving power of the Telescope.
8. To determine the resolving power of the Prism.
9. To determine the resolving power of the Diffraction Grating.
10. To determine the focal length of the combination of two lenses separated by a distance with the help of a nodal slide and to verify the formula –

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{x}{f_1 f_2}$$

11. ULTRASONIC MEASUREMENT LAB

1. To study the characteristic of ultrasound.
2. To determine of the distance by using ultrasonic sensors.
3. To study the object detection by using ultrasonic sensors.
4. To determine the velocity of ultrasonic waves in a non-electrolytic liquid by ultrasonic interferometer.
5. To determine the compressibility of a non-electrolytic liquid by ultrasonic waves.

Note:-

- ❖ **One experiment will be asked in the semester practical examination.**

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Chemistry-IV (Physical Inorganic & Organic Chemistry)

Syllabus:

Physical Chemistry

- UNIT – I** Phase equilibrium Statement and the meaning of the terms: phase component and the degree of freedom, derivation of the Gibbs phase rule. Phase equilibria of one component system: water, CO₂ and S system. Phase equilibria of two component system: solid liquid equilibria, simple eutectic: Bi-Cd, Pb-Ag system, desilverisation of lead.
Solid solutions: compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H₂O) (FeCl₃-H₂O) and (CuSO₄-H₂O) system. Freezing mixtures, acetone-dry ice.
Liquid-liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes: HCl-H₂O and ethanol water systems.
Partial miscible liquids: Phenol-water, trimethylamine-water and nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation, Nernst distribution law: thermodynamic derivation, applications.
- UNIT – II** Electrochemistry Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific conductance and equivalent conductance with dilution.
Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only).
Transport number: Definition and determination by Hittorf method and moving boundary method. Application of conductivity measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of sparingly soluble salt, conductometric titrations.
Types of reversible electrodes: gas-metal ion, metal-metal ion, metal- insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F and single electrode potential, standard hydrogen electrode- reference electrodes-standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells, reversible and irreversible cells. Conventional representation of electrochemical cells.
EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reaction (G , H and K), polarization, over potential and hydrogen over voltage.
Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titration.
Definition of pH and pK, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods.
- UNIT - III** (a) Chemistry of Lanthanides Elements: electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.
(b) Chemistry of Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Similarities between the later actinides and later lanthanides.

(c) Acids and Bases: Arrhenius, Brønsted-Lowry, Lux-Flood, Solvent system and Lewis concepts of acids and bases.

(d) Non-aqueous Solvents: Types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂

Organic Chemistry

UNIT – IV

(a) Aldehydes and ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction.

Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. Meerwein-Ponndorf-Verley (MPV), Clemmensen, Wolf-Kishner, LiAlH₄ and NaBH₄ reductions, Halogenation of enolizable ketones. An introduction of alpha, beta unsaturated aldehydes and ketones

(b) Carboxylic Acids: Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction.

Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents. Methods of formation and chemical reactions of halo acids, hydroxyl acids, malic, tartaric and citric acids.

Carboxylic acid derivatives Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acidic and basic).

UNIT – V

Organic Compounds of Nitrogen Preparation of nitroalkanes and nitroarenes. Chemical reaction of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid.

Halonitroarenes: reactivity, structure and nomenclature. Structure and nomenclature of amines, physical properties and stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Amine salt as phase transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-Phthalamide reaction, Hoffmann bromamide reaction, Reactions of amines, electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid. Synthetic transformation of aryl diazonium salts, azo coupling.

PRACTICAL:-

Time: 6 hour

Organic Chemistry 12 marks

Qualitative analysis

Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

Physical Chemistry 12 marks

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Transition temperature

1. Determination of transition temperature of given substance by thermometric, dilatometric method (e.g.) ($\text{MnCl}_2 \times 4\text{H}_2\text{O}$ / $\text{SrBr}_2 \times 2\text{H}_2\text{O}$).

Phase equilibrium

1. To study the effect of solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquid (e.g., phenol water system) and to determine the concentration of that soluble in phenolwater system.
2. To construct the phase diagram of two component (e.g., diphenyl aminebenzophenone) by cooling curve method.

Thermochemistry 12 Marks

1. To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/strong base and determine the enthalpy of ionization of the weak acid/ base.

Inorganic chemistry-Quantitative Volumetric Analysis

1. Estimation of ferrous and ferric by dichromate method.
2. Estimation of copper using thiosulphate.

Viva 6 Marks

Sessional 8 Marks

Course outcome :- Upon successful completion of this course students will describe the bonding and properties of transition metal coordination compounds

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Mathematics-IV (Advanced Calculus, Partial Differential Equations, Complex Analysis and Abstract Algebra)

COURSE OBJECTIVES:-

- The goal of this course is for students to gain proficiency in computations of advanced calculus.
- To make the student acquire sound knowledge of techniques in solving partial differential equations.
- To familiarize the student with complex analysis.
- To acquaint the student with Abstract Algebra

Syllabus:

UNIT – I Partial differentiation. Change of variables. Euler's Theorem on homogeneous function, Taylor's theorem for functions of two variables. Jacobians, Envelopes, Evolutes.

UNIT – II Maxima, minima and saddle points of functions of two variables. Beta and Gamma functions. Double and triple integrals. Dirichlet's integrals.

UNIT – III Partial Differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than general methods. Charpit's general method of solution, Partial differential equations of second and higher orders. Homogeneous and non- Homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients.

UNIT – IV Complex numbers as ordered pairs. Geometric representation of Complex numbers, Continuity and differentiability of Complex functions. Analytical function, Cauchy Riemann equation, Harmonic function, Mobius transformations, fixed point, cross ratio.

UNIT – V Group-Automorphisms, inner automorphism. Group of Automorphism, Conjugacy relation and centraliser. Normaliser. Counting principle and the class equation of a finite group. Cauchy's theorem for finite abelian groups and non abelian groups. Ring homomorphism. Ideals and Quotient Rings.

COURSE OUTCOMES:-

- Understanding the ideas of advanced calculus and series and an ability to calculate with them and apply them.
- Understanding of the ideas of partial differential equations and facility in solving standard examples.
- Understanding of the ideas of complex analysis and ability to calculate with them.
- Improved facility in abstract algebra.

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Environmental Studies

COURSE OBJECTIVE:-

Student will be able to become proficient in the natural and physical sciences, as well as to be aware of social and cultural influences upon environmental problems facing society today.

Syllabus:

UNIT – I Scope and importance of environmental studies. Natural resources: Renewable and non-renewable resources, Natural resources and associated problems . Forest, Water, Food, energy and land resources.

UNIT – II Ecosystems: Definition, concept, structure and functions. Producers, consumers and decomposers of an ecosystem. Energy flow in the ecosystem. Types of ecosystems. Biodiversity: Definition, classification, threats to biodiversity and its conservation.

UNIT – III Environmental pollution: Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Causes, effects and management of soil nuclear hazards. Solid waste management : Causes, effects and Control measures of urban industrial waste.

UNIT – IV The Environment Protection Act, The Air Act, The water Act, The Wildlife Protection. Act and Forest Conservation Act. Woman and child welfare, HIV/AIDS and Role of information technology on environment and human health.

UNIT – V Social issues and the environment, unsustainable to sustainable development. Urban problem related to energy, water conservation ,rain water harvesting, watershed management Disaster types and Disaster management, Floods, earthquakes, cyclones and land slides.

COURSE OUTCOME :-

- The Environmental Studies minor supplements other majors to facilitate students' understanding of complex environmental issues from a problem-oriented, interdisciplinary perspective.
- Enable the student to acquire basic ideas about environment and emerging issues about environment problems.
- Aware about the need and importance of Natural Resources.
- Develop knowledge and understanding of the environment and enable the students to contribute towards maintaining and improving the quality of the environment.

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Introduction to Soft Skill & Team Building

COURSE OBJECTIVES:

By the end of the soft skills training program, the students should be able to:

- Develop effective communication skills (spoken and written).
- Develop effective presentation skills.
- Conduct effective business correspondence and prepare business reports which produce results.
- Become self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.
- Develop all-round personalities with a mature outlook to function effectively in different circumstances.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.
- Take part effectively in various selection procedures adopted by the recruiters.

Syllabus:

- UNIT – I** General Introduction of self by students, Importance of the Training sessions, Importance of Presentation Skills, Public Speaking, Basic English Grammar Vocabulary, Kinds of Sentences, Verb, Adverb, Tenses, Preposition, Conjunction, Formation of Sentences, Sentence Making, Translation, Communication Skills Communication meaning, Function, Process, Types of communication, Barriers of communication, Guidelines for effective communication, Purpose of Good communication, Importance of right Pronunciation
- UNIT – II** Listening and Writing Skills Importance of effective listening, Importance of effective writing skills, Conversation Practice, Guidelines for Effective writing, Body Language Gestures, Voice Modulation, Eye Contact, Facial Expression, Posture, Dressing Sense, Attire, Hand, movements, General Etiquette, Mannerism, Smiling Gestures, Confidence building, Exit walk, Behavioral skills Team Management, Time Management, Stress Management, Decision Making, Positive Thinking Attitude, self actualization, Working style
- UNIT – III** Email Skills Email Etiquette, Email Drafting, Creating a Resume/ Resume writing tips Format and Content Resume, Fresher's Resume, Helpful Tips For Resume Writing, Things to avoid in Resume, Group Discussion Introduction “what is GD”, Ability to Influence, Importance of Active Listening, Key Steps to succeed in GD Do's and Don'ts of GD.
- UNIT – IV** Interview Skills/ Tips Groundwork before the Interview, Greeting Etiquettes, Self Introduction, Tips to answer “questions” Do's and Don'ts of Interview, Preparing a day before the interview, Things to remember during the Interview. Telephonic Interview and Video Conferencing Interview Tips Treat the Interview like a face to face Interview, Telephone Etiquette, Flow of Conversation.
- UNIT – V** Corporate Etiquette Professional Attitude at work, Punctuality, Meeting etiquettes, Professional Dressing sense, Cordial Relation with Fellow workers

COURSE OUTCOME:

The teaching methods in the soft skills training include lectures, projects, role plays, quizzes, and various other participatory sessions. The emphasis will be on learning by doing.

Since the method of training is experiential and highly interactive, the students imbibe the skills and attributes in a gradual and subtle way over the duration of the program. The students will not only learn the skills and attributes but also internalize them over a period of time.

Internalization ensures that the skills and attributes become part of the students' nature. Subtle changes are bound to occur in their behavior and outlook, and these will make them more self-assured and confident. Moreover, the behavior changes will be gradual and natural and will not appear artificial or put on. Thus, the changes in them will be genuine and positive.

The Soft Skills training program is a credit course and the evaluation of the students takes place on a continuous basis. Active participation in activities, interest displayed by the students in acquiring the necessary attributes and skills and the commitment shown by them to improve in terms of attitudes are the main criteria for evaluation.

Text Books:

- Business Communication, Universal Pub. Agra – Dr. Ramesh Mangal

Reference Books:

- English Grammar- Wren & Martin
- Putting your best foot forward- Lt. Co. (Dr.) Pramod Deogirikar

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Discipline Specific Elective-I
**Physics-V (Quantum Mechanics, Atomic, Molecular and Nuclear
 Physics)**

COURSE OBJECTIVE:-

1. To introduce student to the concept of special relativity and its application to physical sciences.
2. To express the basic postulates of Quantum Mechanics and Atomic Physics.

Syllabus:

- UNIT - I** Theory of Relativity Reference systems, inertial frames, Galilean Invariance and conservation laws, Michelson-Morley experiment; Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, variation of mass with velocity, mass - energy equivalence, particle with zero rest mass. **Origin of Quantum Theory:** photoelectric effect , Ritz combination principle in spectra. stability of an atom, Planck's radiation law, Einstein's explanation of photoelectric effect..
- UNIT - II** Quantum Mechanics Wave-particle duality and uncertainty principle; de Broglie's hypothesis for matter waves; the concept of wave and group velocities, evidence for diffraction and interference of particles, experimental demonstrations of matter waves. Consequence of de Broglie's concepts; quantization in hydrogen atom; energies of a particle in a box, wave packets, Heisenberg's uncertainty relation for p and x , its extension to energy and time. Consequence of the uncertainty relation; gamma ray microscope, diffraction at a slit, particle in a box, position of an electron in a Bohr's orbit, Schrödinger's equation. Postulates of quantum mechanics; operators, expectation values.
- UNIT - III** Atomic Physics natural occurrence of quantum numbers- n , l and m , the related physical quantities. Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure. screening constants for alkali spectra for s, p, d and f states, selection rules, Singlet and triplet fine structure in alkaline earth spectra. L-S and J-J couplings. **Weak Spectra:** Continuous X-ray spectrum and its dependence on voltage, Duane and Hundt's law. Characteristic X-rays. Moseley's law; doublet structure of X-ray spectra. X-ray absorption spectra.
- UNIT - IV** Molecular Spectra Quantization of vibrational and rotational energies, pure rotational and rotation-vibration spectra Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. **Spectroscopy :** Raman Effect, Stokes and anti-stokes lines, experimental arrangements for Raman Spectroscopy. Spectroscopic techniques: Sources of excitation, prism and grating spectrographs for visible, UV and IR, absorption spectroscopy, double beam instruments, different recording systems.
- UNIT - V** Nuclear Physics Working of nuclear detectors, G-M counter, proportional counter, scintillation counter, cloud chamber, spark chamber and emulsions technique. Structure of nuclei, basic properties (I , μ , Q and binding energy), energy, p - p and n - p scattering and general concepts of nuclear forces. Beta decay, range of alpha particle, Geiger-Nuttall law. Gamow's explanation of alpha decay, beta decay, Nuclear reactions, compound

COURSE CODE: 3SBPH503

nucleus).Shell model, Liquid drop model, Nuclear fission and fusion (concepts), energy production in stars by p-p and carbon - nitrogen cycles (concepts).

COURSE OUTCOMES:-

1. Explain the nature of Quantum Mechanics and Lorentz Transformation equations.
2. Understand the concept of constant relative motion of different bodies in different frames of references.
3. Describe theories explaining the structure of atoms and the origin of the observed spectra.

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Discipline Specific Elective-II
Physics-V (Astro Physics & Atmospheric Science)

COURSE OBJECTIVE:-

1. To gain knowledge of modern techniques, theory and observation results in astrophysics and cosmology.
2. Introduce the physics of planetary atmospheres with special emphasis on the atmosphere of the earth.

Syllabus:

UNIT – I Our Universe Introduction, Constituents of the universe, Atmosphere, Planets, Stars, Solar energy, Asteroids, Meteors or Meteoroids, Comets, Pole Star, Galaxies.

UNIT – II Solar System and Stars Celestial mechanics, Elliptical orbits, Kepler's laws, Earth - Moon system, Tidal forces, Terrestrial Planets, Solar activity, Helioseismology, Binary stars, White dwarfs, Neutron stars, Formation of proto stars, Degenerate remnants of stars, Chandrasekhar Limit, pulsars.

UNIT – III Physical Meteorology & Radar Meteorology Atmosphere; atmospheric composition; law of thermodynamics of the atmosphere; adiabatic process; law of black body radiation; solar and terrestrial radiation; albedo; green house effect; heat balance of earth-atmosphere system. Basic meteorology-radar principles; use of weather radar in aviation.

UNIT – IV Dynamic Meteorology & Monsoon Dynamics Fundamental forces; structure of static atmosphere; momentum; thermodynamics of dry atmosphere; vorticity; potential vorticity. Wind; temperature & pressure distribution over India in the lower, middle, and upper atmosphere during pre/ post/and mid-monsoon season; energy cycle of monsoon; dynamics of monsoon; depressions and easterly waves.

UNIT – V Atmospheric Pollution & Instrumentation System Role of meteorology on atmospheric pollution; atmospheric boundary layer; air stability; wind structure; Ekman spiral; turbulence boundary layer scaling; residence time and reaction rates of pollutants; sulphur compounds; nitrogen compounds; organic compounds; aerosol; radioactive particles. Ground based instruments for the measurement of temperature, pressure, humidity, wind and rainfall rate.

COURSE OUTCOMES:-

Students will have understanding of:

1. To understand binary stars as well as our solar system and the associated processes occurring in the Milky Way and other galaxies.
2. To describe the basic structure of an atmosphere and the climate system.
3. The concept of potential temperature and how it relates to static stability.
4. Know the components of the earth radiation balance and understand optical depth and transmission function.
5. Derive a simple model of "green house effect".

PRACTICAL:

1. To determine the value of specific charge e/m of an electron by Thomson's Method.
2. To study and verify the Inverse Square Law by using photo cell.
3. To study and analysis the properties of photo cell.
4. To study of colour thin film of given Sample.
5. To study and analysis of long form of the periodic table
6. To study of the time dilation by the concept of twin paradox.

Experiments with Abbey's Refractometer:

1. To find the Refractive Index of the given liquid sample by using Abbey's Refractometer
2. To determine the polarisability of the given liquid samples at a given temperature.
3. To study the variation of refractive index with:
 - (a) Temperature of liquid sample
 - (b) Wavelength of the light source.

Experiments with GM COUNTER:

1. To draw the plateau characteristics of GM Counter using radioactive source ($_{55}\text{Cs}^{137}$).
2. To study the pulse height with the applied voltage to the GM Tube.
3. To study the absorption of beta and gamma radiation.
4. To study and verify the Inverse Square Law by using GM Counter.
5. To study of GM Counter.
6. To study of design structure of GM Counter.

Experiments with Lissajous Pattern:

1. To study of the Lissajous figures.
2. To determine the unknown frequency calculation by using Lissajous figures.
3. To determine the RLC resonance frequency calculation by using Lissajous figures.
4. To determine the phase difference calculation by using Lissajous figures.

Note:-

- ❖ **One experiment will be asked in the semester practical examination.**

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Discipline Specific Elective-I Chemistry-V (Physical Inorganic & Organic Chemistry)

Syllabus:

- UNIT - I** Physical Chemistry
Spectroscopy – I (a) Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.
(b) Rotational spectrum of diatomic molecules. Energy levels of a rigid rotator (semi classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotator, isotope effect.
(c) Raman spectrum, concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, application of Raman spectrum.
- Spectroscopy - II
(a) UV Spectroscopy : Electronic excitation, elementary idea of instrument used, Applications to structure determination of organic molecules. Woodward-Fieser rule for determining max of , -unsaturated carbonyl compounds.
(b) Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.
- Inorganic Chemistry
- UNIT – II** Bioinorganic Chemistry - I Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin, Biological role of alkali and alkaline earth metal ions with special reference to Ca²⁺. Nitrogen fixation.
Bioinorganic Chemistry - II Role of metal ions in biological process, Na/K pump, metal complexes as therapeutic agents anticancer agents, antiarthritits drugs and chelation therapy.
- UNIT – III** Hard and Soft Acids and Bases (HSAB) Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.
Gravimetric Analysis Principles of gravimetric estimation, supersaturation, co-precipitation, post-precipitation and Ash treatment with respect to the estimation of Ba, Zn and Cu.
Water Analysis Hardness, types of hardness-Temporary, permanent and total hardness, acidity and alkalinity, BOD, COD and DO.
- Organic Chemistry
- UNIT – IV** Carbohydrates - I Classification and nomenclature, monosaccharide, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharide, erythro and threo diastereoisomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters, determination of ring size of monosaccharide, cyclic structure of D(+) glucose, mechanism of mutarotation. Structures of ribose and deoxyribose.

Carbohydrates - II An introduction to glycosidic linkages in di- and poly-saccharides. Reducing and non reducing sugars. Structure determination of maltose, sucrose, starch and cellulose.

UNIT – V Elementary Idea of Fats, Oils and Detergents Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Soapnification value, iodine value, acid value. Soaps and Detergents : Soaps, synthetic detergents, alkyl and aryl sulphonates
Synthetic Dyes: Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.
Nucleic acids Nucleic acid, introduction, constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

PRACTICAL:-

Time: 6 hour

Inorganic Chemistry 12 Marks

Analysis of inorganic mixture containing five radicals with at least one interfering radical (phosphate, borate, oxalate or fluoride).

Organic Chemistry 12 Marks

Preparation:

(i) Acetylation

(ii) Benzoylation

(iii) meta-Dinitrobenzene

(iv) Picric acid

Physical Chemistry 12 Marks

(i) Effluent Analysis

Identification of cations and anions in different water samples.

(ii) Water analysis

To determine the amount of dissolved oxygen in water samples in ppm units.

Viva 06 Marks

Sessional 08 Marks

COURSE OUTCOMES:-

Understand acid/base reactions, their products, and how buffer systems work

Discipline Specific Elective-II
Chemistry-V (Industrial Chemistry)

COURSE OBJECTIVE:-

Study of basic concept of distillation, evaporation, absorption, filtration and drying catalysis Microwave and Ultrasound assisted green synthesis, Green catalysis and its application.

Syllabus:

- UNIT - I** Distillation Introduction, batch and continuous distillation, separation of azeotropes, plate columns and packed columns. **2. Absorption:** Introduction, equipments, packed columns, spray columns, bubble columns, mechanically agitated contactors.
- UNIT - II** Evaporation Introduction, equipments, short tube evaporator, forced circulation evaporators, falling film evaporators, wiped (agitated) film evaporators. **2. Filtration:** Introduction, equipments, plate and frame filter press, Nutch filter, rotary drum filter, sparkler filter, candle filter, Bag filter.
- UNIT - III** Energy Balance Heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, Enthalpy changes. **2. Drying:** Introduction, free moisture, bound moisture, drying curve, equipments– traydryer, rotary dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.
- UNIT - IV** Catalysis Introduction, Types, Basic principles, mechanisms, factors affecting the performance, introduction to phase transfer catalysis, Enzymes catalyzed reactions- rate model, industrially important reactions. **2. Renewable Natural resources:** Cellulose, Starch: - properties, modification, important industrial chemicals derived from them. Alcohols, oxalic acid and Furfura.
- UNIT - V** Utilities in Industry Fuel Types of fuels – advantages and disadvantages. **Boilers:** Types of boilers and their functioning. **Water:** Specifications for Industrial use, various water treatments. **Steam:** Generation and use. **Fluid Flow:** Fans, Blowers, Compressors, vacuum pumps, Ejectors. **Pumps:** Reciprocating pumps, Gear pumps, Centrifugal pumps. **Heat Transfer:** Heat exchangers- shell and tube type, finned tube heat exchangers, plate heat exchangers, refrigeration cycles.

COURSE OUTCOMES:-

Knowlwdge of industrial chemistry and its application.

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Discipline Specific Elective-I
Mathematics-V (Real Analysis, Linear Algebra & Discrete
Mathematics)

COURSE OBJECTIVES:-

- The goal of this course is for students to gain proficiency in computation of real analysis.
- To make the student acquire sound knowledge of linear algebra.
- To familiarize the student with discrete mathematics.

Syllabus:

UNIT - I Riemann integral, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables.

UNIT – II Schwarz and Young's theorem, Implicit function theorem, Fourier series of half and full intervals, Improper integrals and their convergence, Comparison test, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter.

UNIT – III Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis, Finite dimensional vector spaces, Existence theorem for basis, Invariance of the number of elements of a basis set, Dimension, Dimension of sums of vector subspaces.

UNIT - IV Linear transformations and their representation as matrices, The Algebra of linear transformations, The rank- nullity theorem, Eigen values and eigen vectors of a linear transformation, Diagonalisation. Quotient space and its dimension.

UNIT – V Binary Relations, Equivalence Relations, Partitions and Partial Order Relation . Graphs, Multigraphs, Weighted Graphs, Paths and Circuits, Shortest Paths. Trees and their properties.

COURSE OUTCOMES:-

- Understanding the ideas of real analysis and series and an ability to calculate with them.
- Understanding of the ideas of linear algebra and facility in solving standard examples.
- Understanding of the ideas of discrete mathematics. and facility in solving standard examples.

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Discipline Specific Elective-II
Mathematics-V (Ring Theory and Linear Algebra II)

Syllabus:

- UNIT - I** Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products and homomorphisms.
- UNIT – II** Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials
- UNIT - III** Quinn-McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.
- UNIT – IV** Definition, examples and basic properties of graphs, pseudographs, complete graphs, bi-partite graphs, isomorphism of graphs, paths and circuits,
- UNIT – V** Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd-Warshall algorithm.

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Discipline Specific Elective-I
Physics-VI (Solid State Physics, Electronics and Laser)

COURSE OBJECTIVE:-

1. Describe the difference between crystalline and non crystalline materials.
2. Describe the arrangements of atoms and ions in crystalline structure,
3. Explain basic Laser principle Laser behavior properties of Laser radiations, different types of Lasers and Laser applications.

Syllabus:

UNIT - I Overview Crystalline and glassy forms, liquid crystals, glass transition. Crystal structure: Periodicity, lattices and bases, unit cell, Wigner-Seitz cell, lattice types, lattice planes. Common crystal structures. Laue's theory of X-ray diffraction, Bragg's law, Laue patterns. Bonding: Potential between a pair of atoms; Lennard-Jones potential, concept of cohesive energy, covalent, Vander Waal, ionic and metallic crystals Magnetism: Atomic magnetic moment, magnetic susceptibility, Dia, Para and Ferromagnetism, Ferro magnetic domains

UNIT - II Thermal properties Lattice vibrations, simple harmonic oscillator, Concept of phonons, density of modes (1-D). Debye model; Lattice specific heat low temperature limit, extension (conceptual) to 3-D. Band Structure: Electrons in periodic potential; nearly free electron model (qualitative), energy band, energy gap, metals, insulators, semiconductors. Motion of electrons: Free electrons, conduction electrons, electron collisions, mean free path, conductivity and Ohm's law. Fermi energy, Fermi velocity, Fermi-Dirac distribution.

UNIT - III Semiconductors Semiconductors electrons and holes, Fermi Level , Temperature dependence of electron and hole concentrations. Doping: conductivity, mobility, Hall Effect, Hall Coefficient. Semiconductor devices: Metal-semiconductor junction, p-n junction, majority and minority carriers, diode, Zener and tunnel diodes, light emitting diode, transistor, solar cell. Power supply: Diode as a circuit element, load line concept, rectification, ripple factor, Zener diode, voltage stabilization, Transistors : Characteristics of a transistor in CB, CE and CC mode, thermal runaway. FETs: Field effect transistors, JFET volt-ampere curves, biasing JFETMOSFET, biasing MOSFET.

UNIT - IV Amplifiers- I Small signal amplifiers ; General Principle of operation, classification, distortion, RC coupled amplifier, input and output impedance, multistage amplifiers. Amplifier- II: Transformer coupled amplifiers, Noise in electronic circuits. Oscillators Hartley, Colpitt and Wein bridge oscillators.

UNIT – V Laser Laser system: Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients. Spontaneous and induced emissions, conditions for laser action, population inversion. Types of Lasers (gas and solid state), Pulsed lasers and tunable lasers, spatial coherence and directionality, estimates of beam intensity, temporal coherence and spectral energy density.

COURSE OUTCOMES:-

1. Demonstrate an understanding of the crystal lattice and how the main lattice types are described.

Discipline Specific Elective-II
Physics-VI (Nano Technology and Material Science)

COURSE OBJECTIVE:-

1. To give comprehensive exposures to the students regarding various materials, crystalline, non – crystalline materials, crystal structure and their defects the concept of phase and different type of phase diagram.
2. Experimental and computational characterization of nano materials.

Syllabus:

UNIT – I Core Concept of Nanotechnology Nanotechnology, nanotech generation, nano science, nano composites, nano materials, carbon nano tubes, nanohorns, inorganic nanotubes, nanowires.

UNIT – II Impact of Nanotechnology and its Applications Privacy, social denide, communication, risk, social and ethical impacts, Health & environmental impacts, negative impacts. Types of application, nanotechnology for energy.

UNIT – III: Properties of Nanomaterials Optional properties, mechanical properties, magnetic properties, electrical properties etc.

UNIT – IV Classification of Materials Crystalline, Polycrystalline, Amorphous (Introduction and their structure),Elementary idea of polymers (Structure and properties, Methods of polymerization), Glasses: Structure and properties, Type of Glasses, Fracture in glasses, Composite Materials: Introduction, their types and properties, Different types of bonding.

UNIT – V Transport Properties of Solids Electrical conductivity of metals and alloys, Extrinsic & intrinsic semiconductors and amorphous semiconductors, Scattering of electrons by phonons, Impurity, Carrier mobility and its temperature dependence, Mathiessio's rule for resistivity, Temperature dependence of metallic resistivity.

COURSE OUTCOMES:-

Students will have understanding of:

1. Different type of materials and their structure.
2. Structure dependence of various thermal, optical and mechanical properties.
3. Explain the fundamental principles of nano technology and their application to medical science.

PRACTICAL:-

1. To study and verify the De-Morgan's Theorem.
2. To study and prove the Laws of Boolean Algebra.
3. To study and verify the truth table of Compound logic gates.
4. To study and draw the characteristics curve of P-N Junction diode.
5. To study and draw the characteristics curve of Zener diode.
6. To study and draw the characteristics curve of Tunnel diode.
7. To determine the energy band gap of a semiconductor by using P-N Junction diode.
8. To study and draw the characteristics curve of transistor in CB/CC/CE mode.
9. To determine the wavelength of given laser light.
10. To determine the beam divergence of a laser beam.

11. Study of crystal faces & structure by using given model.

Experiment with Malus Law Apparatus:

11.1 Study of polarization of light by reflection and thus verify Brewster's law.

11.2 Study and verify Malus Law using a plain glass plate and a Polaroid.

Experiments with solar cells:

11.3 To study the voltage and current of the solar cells.

11.4 To study the voltage and current of the solar cells in series and parallel combinations.

11.5 To determine the efficiency (η) of the solar cell.

Note:-

- **One experiment will be asked in the semester practical examination.**

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Discipline Specific Elective-I
Chemistry-VI (Physical Inorganic & Organic Chemistry)

Syllabus:

- UNIT – I** Physical Chemistry
 (a) Photochemistry Interaction of radiation with matter, difference between thermal and photochemical process. Law of photochemistry-Grotthus-Draper law, Stark-Einstein law, Beer-Lambert's law. Determination of rate constant of unimolecular reactions. Electronic transitions, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes .
 (b) Physical properties and molecular structures Optical activity, polarization-(Clausius-equation), orientations of dipoles in an electrical field, dipole moment, induced dipole moment, measurement of dipole moment temperature and refractivity method. Dipole moment and structure of molecules, magnetic properties- paramagnetism, diamagnetism and ferromagnetism.
- UNIT – II** (a) Solutions, dilute solutions and colligative properties-I Ideal and non ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solutions- colligative properties. Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurements, determination of molecular weight from osmotic pressure.
 (b) Solutions, dilute solutions and colligative properties-II Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods of determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solute.
Inorganic Chemistry
- UNIT – III** Inorganic polymers Introduction and scope of inorganic polymers, special characteristics, classification, homo and hetero atomic polymers and their applications. Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.
- UNIT - IV** Organometallic chemistry
 (a) Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti.
 (b) A brief account of metal-ethylenic complexes and homogeneous hydrogenation; mononuclear carbonyls and the nature of bonding in metal carbonyls. Transition metal organometallic compounds with bonds to hydrogen and boron.
 (c) Metal nitrosyls: modes of coordination, nature of bonding and probable applications.
Organic Chemistry
- UNIT – V** (a) Organometallic compounds Organomagnesium compounds-the Grignard reagents-formation, structure and synthetic applications, organozinc compounds, formation and chemical reactions, Organolithium compounds-formation and chemical reactions.
 (b) Organic synthesis via enolates Organic synthesis via enolates, acidity of α -hydrogens, alkylation of diethylmalonate and ethylacetoacetate. Synthesis of ethylacetoacetate, the

Claisen condensation, keto-enol tautomerism of ethylacetoacetate. Alkylation of 1, 3-dithianes, alkylation and acylation of enamines.

(c) Organosulphur compounds Nomenclature, structural features, method of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

(d) Amino acids Classification, structure, stereochemistry of amino acids, acid base behaviour, isoelectric point, general methods of preparation and properties of α -amino acids

(e) Proteins and peptides Introduction to peptides linkage, synthesis and end group analysis of peptides, solid phase synthesis, classification, properties and structure of proteins (primary, secondary and tertiary).

PRACTICAL – VI

Inorganic Chemistry 12 Marks

Complex Compound Preparation:

1. Diaquabis(methyl acetoacetato)nickel(II)
2. Diaquabis(ethyl acetoacetato)cobalt(II)
3. Bis(methyl acetoacetato)copper(II) monohydrate
4. Potassium chlorochromate(IV)
5. Tetraamminecopper(II) sulphate monohydrate
6. Mercury(II) tetrathiocyanatocobaltate(II)
7. Hexaaminenickel(II) chloride

Organic Chemistry 12 Marks

Binary mixture analysis containing two solids: Separation, identification and preparation of derivatives.

Physical Instrumentation 12 Marks

(iii) Job's method

(iv) Mole-ratio method.

Viva 06 Marks

Sessional 08 Marks

COURSE OUTCOME:-

Identify and explain the function of carbohydrates, fats, and proteins in living systems. Identify the components of DNA and RNA, the steps of replication, and the basics of genetic engineering.

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Discipline Specific Elective-II
Chemistry-VI (Nano Chemistry)

COURSE OBJECTIVE:-

To understand preparation of nanoparticle, organic nanoparticle and about the role of nanoparticle in environmental protection.

Syllabus:

- UNIT - I** Introduction Nanoscale Science and Technology-Implications for Physics, Chemistry, Biology and Engineering; Classifications of nanostructured materials, nano particles; 3 quantum dots, nanowires, ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties:
- UNIT – II** Preparation methods Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy.
- UNIT – III** Nanoporous materials Zeolites, mesoporous materials, nanomembranes - Carbon nanotubes and graphene - Core shell and hybrid nanocomposites..
- UNIT – IV** Organic Nanoparticles: Introduction, definition, structure, types of NP, analytical methods (Extraction and isolation, Separation, Characterization and Imaging), general method of preparation, properties, detection, and characterization of organic nanoparticles: hydrophobic drugs, protein, peptide, lipid, cyclodextrine, polysaccharides. Nanocochleates, Prospects and Future Challenges.
- UNIT - V** Nanomaterials for Environmental Protection: Nano technology processes – Nano Engineering materials for Pollution Prevention, Green Chemistry, Energy efficient resources and materials, Nano technology products- Nanomaterials (nanostructures) Nanodevices and nanosystems.

COURSE OUTCOME:-

After the completion of course learner is able to understand

- About nanomaterial and its types
- Preparation methods
- Preparation environment
- Organic nanoparticles
- Nanomaterials for Environmental Protection

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Discipline Specific Elective-I

Mathematics-VI (Metric Space, Numerical Analysis & Statistics)

COURSE OBJECTIVES:-

- To introduce the concept of metric space to the students and to make them understand various familiar concept of real analysis with the help of metric space.
- To introduce the concept of compactness and connectedness w.r.t. metric space and to study some useful properties of continuous function.
- To introduce various numerical techniques to the students of solving equation and also introduce the concept of numerical differentiation and integration.

Syllabus:

- UNIT – I** Definition and examples of metric spaces, Neighborhoods, Limit points, Interior points, Open and closed sets, Closure and interior, Boundary points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Dense subsets, Baire Category theorem, Separable, first and second countable spaces.
- UNIT – II** Continuous functions, Extension theorem, Uniform continuity, Compactness, Sequential compactness, Totally bounded spaces, Finite intersection property, Continuous functions and compact sets, Connectedness.
- UNIT – III** Solution of Equations: Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method, Roots of second degree Polynomials, Interpolation, Lagrange's interpolation formula, Divided Differences method, Interpolation formulae using Differences, Newton-Cote's Quadrature Formulae.
- UNIT – IV** Linear Equations: Direct Methods for Solving Systems of Linear Equations (Gauss elimination method, LU Decomposition), Iterative methods (Jacobi, Gauss - Seidel iteration method), Ordinary Differential Equations: Euler's method, Euler's Modified method, Runge-Kutta method, Milne's method, Methods based on Numerical Integration, Methods based on numerical Differentiation.
- UNIT – V** Introduction of Numerical solution of P.D.E., Classification of P.D.E., Solution of Elliptic equation, Solution of Laplace equation, Solution of Poisson's equation, Solution of Elliptic equations by Relaxation method, Solution of one and two dimensional heat equations, Hyperbolic equation, Solution of wave equations.

COURSE OUTCOMES:-

- The concept of metric space would help them to generalize this notion on some other spaces.
- The idea of compactness and connectedness would help them to work on some other useful properties of sets and continuous function.
- The techniques of numerical solution of equation of different kind (algebraic/differential/integral) would help them to find the solution of practical problems.

Discipline Specific Elective-II
Mathematics-VI (Fuzzy Set Theory)

COURSE OBJECTIVES:-

- To introduce the basic types and concepts of fuzzy sets.
- To introduce different operations on fuzzy sets.
- To introduce the concept of fuzzy arithmetic.
- To introduce the concept of fuzzy relation.
- To introduce the concept of fuzzy relation equations.

Syllabus:

- UNIT – I** Basic types and concepts of fuzzy sets, Additional properties of α -cuts, Representations of fuzzy sets, Extension principle for fuzzy sets.
- UNIT – II** Operations on Fuzzy Sets Types of operations, Fuzzy complements, Fuzzy intersections; t-norms, Fuzzy unions; t-co-norms, Combinations of operations.
- UNIT – III** Fuzzy Arithmetic Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on fuzzy numbers.
- UNIT – IV** Fuzzy Relations Crisp and fuzzy relations, Binary fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations.
- UNIT – V** Fuzzy Relation Equations Partition, Solution method, Fuzzy relation equations based on sup-i compositions and inf- w_i compositions.

COURSE OUTCOMES:-

On completion of this course students will be able to:-

- Understand the basic concept of Fuzzy sets.
- Apply the operations on Fuzzy Sets.
- Solve the Fuzzy arithmetic.
- Understand the Fuzzy relations and Fuzzy relation equations.

Chairperson
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(Academic Council)

(Registrar)
Seal