

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 कैमरा, 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, प्रिंटेर्स, 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 विन्डोज 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 महत्वण 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 : तत्समण 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 रहेंगी 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 -लेखनण 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।

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Biotechnology– I (General Microbiology & Biotechnology)

COURSE OBJECTIVE:-

This course focuses on the general principles of microbiology and bacterial and virus cell structure and function.

Syllabus:

UNIT-I Unity of microbial world, scope of microbiology, Microbiology and human health, beneficial and harmful microbes. development of microbiology (contributions and pioneers).

UNIT-II Diversity of microbial world: principle of classification, classification of viruses, Bacteria (including Cyanobacteria) Fungi. Structure, Functional organization and economic importance of bacteria (Gram +^{ve} and Gram -^{ve}) and viruses (Plants and Animals).

UNIT-III Methods of studying microorganism: Origin of microbes, microscopy, pure culture techniques, Sterilization, Aseptic techniques, isolation of pure culture, conditions and media for growth of microorganisms in the laboratory.

UNIT-IV Nucleic Acid: DNA: Structure, types and replication, RNA: Structure, and types and Function, Structure of gene old and new concept.

UNIT-V Structure of gene, genetic code, transfer of genetic information; trascription, translation, protein synthesis, ribosomes. Regulation of gene expression in prokaryotes and eukaryotes

COURSE OUTCOMES:-

Describe diversity of microorganisms, bacterial cell structure and function, microbial growth and metabolism, and the ways to control their growth by physical and chemical means.

PRACTICAL:-

- Preparation of solid/ liquid culture media
- Sterilization techniques.
- Isolation of single colonies on solid media
- Enumeration of Bacterial numbers by serial dilution and plating.
- Simple and differential staining.
- Measurement of microorganism (micrometry) and Camera Lucida drawings of isolated organism.
- Gram –^{ve} and Gram +^{ve} Bacteria test.

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 behaviour, 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 van der 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

Records: 8 marks

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Zoology-I (Invertebrates & Cell Biology)

COURSE OBJECTIVE:-

This paper is aimed to introducing the students for the salient features of all Invertebrates, cell organization and cell division.

Syllabus:

- UNIT- I** Classification of Non Chordates upto classes according to Parker and Heswell.(7th Edition)
1. Classification of lower Invertebrates.
2. Classification of higher invertebrates.
3. Protozoa – Type study of Plasmodium.
4. Porifera – Type study of Sycon.
- UNIT- II**
1. Coelenterata – Type study of Obelia.
2. Helminthes – Type study of Liver Fluke.
3. Annelida – Type study of Earthworm, Metamerism, Trochophore Larva.
- UNIT- III**
1. Arthropoda – Type study of Prawn.
2. Mollusca – Type study of Pila.
3. Echinodermata – External Features of Star Fish and Echinoderm Larvae.
- UNIT- IV**
1. The cell – History of Cell Biology, Cell theory, Prokaryotic and Eukaryotic cell.
2. Microscopy : Compound and Electron Microscopy.
- UNIT – V**
1. Nuclear Organization of cell.
2. Extra nuclear organization of cell.
3. Cell reproduction – Amitosis, mitosis, meiosis.

COURSE OUTCOME:-

The student have a knowledge of Classification and life cycle of invertebrates and cell division.

PRACTICALS:-

The Practical's work will be based on theory syllabus and the candidates will be required to show knowledge of the following –

1. Study of Museum Specimens, slides relevant to the type study in theory
2. Mounting (Temporary)
 - a. Mouth parts of insects
 - b. Statocyst of Prawn
 - c. Ctenidium and Osphradium of Pila
 - d. Scales of Teleost fish
 - e. Mounting Material
3. Major Dissection
 - a. Earthworm: Digestive system, nervous system and reproductive system.
 - b. Cockroach : Digestive system, Nervous system, .
 - c. Prawn : Nervous System, Appendages.
4. Minor Dissection
 - a. Hastate plate and appendages of Prawn.
 - b. Salivary glands of Cockroach.
 - c. Radula of Pila.
5. Cell Biology
 - a. Study of Prokaryotic and eukaryotic cell.

- b. Study of DNA and RNA models.
- c. Squash preparation of chromosomes from onion root tip.
- d. study of meiosis in grasshopper testis.

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

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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Biotechnology– II (Biotechnology and Immunology)

COURSE OBJECTIVE:-

Biochemistry is the study to understand the molecular basis of life and its role in the disease process. Immunology is the study of body defends itself against disease and helps us understand how the immune system is tricked into attacking its own tissue.

Syllabus:

- UNIT - 1** Structure and properties of mono and disaccharides, amino acids and peptides, bases; purines and pyrimidens, sugars; ribose, deoxyribose and nucleoside and nucleotide; general account of lipids.
- UNIT – 2** Concept of macromolecules; Structural and functional organization of polysaccharides (starch, glycogen, cellulose, mucopolysaccharides), proteins.
- UNIT – 3** Enzymes; historical account, classification, Co-enzymes and their role. Enzyme action, Enzyme kinetic. Km, Vm and Enzyme inhibition. Allosteric Enzymes and isoenzymes. Extracellular enzymes and their role.
- UNIT - 4** Metabolism; General concept of metabolisms (anabolism, catabolism and amphibolism). Glycolysis TCA Cycle and HMP Shunt. Anaerobic catabolism of glucose; alpha, beta and gamma oxidation of fatty acids.
- UNIT – 5** Concept of immunity, innate and acquired immunity. Brief account of cells and organs of immune system. Antigen and Antigencity. Antibody structure and function. Antigen-Antibody reaction.

COURSE OUTCOMES:-

Biochemistry is a specialised application of chemistry to biological samples. Immunology is the study of a patient's immune system.. Immunology testing is less automated than Biochemistry and results usually take about a week before they are available.

PRACTICAL:-

- General and specific qualitative test tor carbohydrates
- General and specific qualitative test for amino acids
- General and specific qualitative test for lipids
- Estimation of Protein
- Estimation of blood glucose
- Assay of the activity of amylases
- Identification and Enumeration of White Blood Cells
- Identification of human blood groups.
- To perform Total Leukocyte Count of the given blood sample.
- To perform DOT ELISA.
- To perform immunoelectrophoresis.

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 electro negativity : 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 KMnO_4 , 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.

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Zoology-II (Vertebrates & Developmental Biology)

COURSE OBJECTIVE:-

This paper is aimed to introducing the students for the salient features of all Vertebrates, and developmental biology

Syllabus:

- UNIT – I**
1. Origin of Chordates. Classification of phylum Chordata upto orders according to Parker and Haswell (Latest edition).
 2. Hemichordata – External features and affinities of Balanoglossus.
- UNIT – II**
1. Urochordata – Type study of Herdmania (excluding Development). Cephalochordata – Type study of Amphioxus. Affinities of Amphioxus.
- UNIT – III**
1. Comparison between Petromyzon and Myxine.
 2. Comparative account of limb bones and girdles of vertebrates (Amphibia, Reptiles, Birds and Mammals).
- UNIT – IV**
1. Parthenogenesis.
 2. Gametogenesis.
 3. Fertilization, Patterns of cleavage
- UNIT – V**
1. Frog and chick embryology upto the formation of three germinal layers.
 - 2 Fate map construction in frog & chick Gastrulation in frog and chick upto the formation of germinal layers.
 3. Concept of competence, determination and differentiation.
 4. Extra embryonic membranes in chick.
 5. Concept of regeneration

COURSE OUTCOME:-

The student have a knowledge of Classification and life cycle of Vertebrates, gametogenesis and formation of three germinal layers

PRACTICALS:-

- 1.The practical work will be based on theory syllabus and the candidates will be required to show knowledge of the following :
- 2 Study of museum specimens and slides relevant to theory paper.
- 3 Osteology
 - a. Girdles and limb bones of : Frog, Varanus, Fowl and Rabbit
- 4 Cell Biology:Study of DNA and RNA Models.
 - a. Preparations of Polytene chromosome in chironomous larva
 - b. Squash preparation of chromosome from Onion root tip.
 - c. Study of Meiosis in Grasshopper testis.
- 4 Embryology : Study of different developmental stages of frog and chick – whole mounts and sections.

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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 एव 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 संसाधन रू 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 रू,कहानीद्ध प्रेमचंद
4. मातृ भूमिगुप्त मैथिलीशरण रू,कविताद्ध
5. साहित्यकार का दायित्व डॉ. भारती प्रेम ष

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।

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 इंफॉर्मेशन, 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: पॉवरपॉइंट का परिचय-1

फीचर्स एंड विभिन्न वर्जन्स

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

- पॉवरपॉइंट के भिन्न व्यूस के साथ काम करना एवं पॉवरपॉइंट 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 पॉवरपॉइंट 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:

इवोल्यूशन, प्रोटोकॉल, विचारधारा, इंटरनेट, डायल अप कनेक्टिविटी, डीज्डलाइन, वीएसटी, ब्रॉडबैंड, यू.आर. एल्स., डोमेननेम्स, पोसटल्स, ई-मेल, पॉप एवं वेब बेस्डई-मेल, बेसिक्स ऑफ 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.

COURSE CODE: 3CBCA502

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.



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Biotechnology-III – (Molecular Biology)

COURSE OBJECTIVE:-

The field overlaps with other areas of biology and chemistry, particularly genetics and biochemistry.

Molecular biology chiefly concerns itself with understanding the interactions between the various systems of a cell, including the interrelationship of DNA, RNA and protein synthesis and learning how these interactions are regulated.

Syllabus:

UNIT - I History of molecular biology, model systems, concepts of molecular biology, early history of genetic engineering, genetic engineering concepts, ethical issue.

UNIT – II Mutations: spontaneous and induced, base pair change, frame shift, deletion, inversion, random duplication, insertion, useful phenotypes (auxotroph, conditional lethal, resistance). Reversion vs. suppression, Ames's test.

UNIT - III DNA as genetic material; basic mechanism of replication, enzymes involved in replication, Enzymes involved in transcription translation, regulation of gene expression-transcription, translation and control of gene expression in microbes.

UNIT – IV Genetic recombination; requirements, molecular basic, genetic analysis of recombination in bacteria, Biology of plasmids. Bacteriophage, lytic vs lysogenic phages, single stranded DNA phages.

UNIT – V Plasmid and phage vectors, restriction and ligation of vector and passenger DNA, transformation of host cells. selection vs screening of recombinant colonies, analysis recombinant clones, DNA sequencing.

COURSE OUTCOMES:-

Molecular Biology gives depth knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms.

PRACTICAL:-

- Exercise on paper and gel electrophoresis
- Characterization of genetic markers of known bacterial strain
- Isolation of DNA from bacteria
- Isolation of Plasmid DNA
- Simple cloning using plasmid DNA as vector and transformation of competent *E. coli*
- Electrophoresis of Protein /DN
- Estimation of DNA from Plant cells
- Preparation of Polytene chromosome from *Chironomous* larva/*Drosophila* larva
- Demonstration of mammalian sex chromatin.
- Preparations of temporary mount and study the different stages of Mitosis (Onion root tip).
- Demonstration of Southern Blot Technique.
- Perform electrophoresis of restricted DNA.
- Demonstration DNA amplification by PCR.
- Study of semi conservative replication of DNA through micrographs/schematic representations.
- Hybridization and detection of gene of interest)

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 Riemer-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 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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Zoology-III (Genetic)

COURSE OBJECTIVE:-

This paper is aimed to introducing the students for Genetics and applied Genetics.

Syllabus:

- UNIT - I:** Heredity & Variation, Gene and Genetic Material
1. Chromosome: The Physical basis of heredity and transmitters of heredity.
 2. Types of chromosomes: Lampbrush, salivary gland and Beta Chromosomes.
 3. Nucleocytoplasmic interactions : Ultra structure of nucleus, nucleolus, Role of nucleus and nucleolus in nucleocytoplasmic interactions including Synthesis & Export of RNA, transport of Proteins
 4. Heredity and Variation : Sources of variation, Genotype, phenotype and environmental variations (elementary idea), Mendel's laws of heredity, Kinds of variations, Genetic basis of variation.
 - 5 (a) Chemistry of Gene ; Nucleic Acids and their structure.
(b)Concept of DNA replication.
(c)Nucleosome (Solenoid model).
(d)Split genes, overlapping genes and Pseudo genes.
(e)Genetic Code.
- UNIT - II:** Cytoplasmic Inheritance, Gene Expression and Regulation
1. Cytoplasmic inheritance: Maternal effect on limnea (Shell Coiling), Kappa particles in Paramecium.
 2. Transcription in Prokaryotes and Eukaryotes
 3. Translation in Eukaryotes
 4. Gene Expression: Regulation of protein synthesis, transcription in Prokaryotes and Eukaryotes.
 - 5: Gene Expression: Operon model
- UNIT - III:** Linkage and Chromosomal Aberrations
1. Gene Linkage: Kinds and Theories of linkage, significance of linkage.
 2. Gene linkage, Mechanism of genetic recombination.
 3. Sex Chromosomes System: Sex differentiation, chromosome theory of sex determination.
 4. Sex linked inheritance (Haemophilia, Colour blindness)
 5. Structural changes in chromosomes.
 6. Numerical changes in chromosomes.
- UNIT - VI:** Mutation and Applied Genetics
1. Types of Mutation.
 2. Causes of mutation.
 3. Mutagens- classification, Types & effects.
 4. Gene therapy.
 5. DNA finger printing.
- UNIT - V:** Human Genetics & Genetic Engineering
1. Human chromosomes, Elementary idea of Human Genome Project
 2. Common genetic diseases in man (Autosomal syndromes, sex chromosome syndromes, diseases due to mutation-Sickle cell anaemia, Albinism & Alkaptonuria.
 3. Multiple factors and blood groups.
 4. Twins- physical traits, mental traits.

COURSE CODE: 3SBZO305

5. Techniques used in recombinant DNA technology. Construction of Chimeric DNA, Elementary idea of plasmids & vectors.
6. Gene cloning and Polymerase Chain Reaction (PCR) ,Gel Electrophoresis, Northern & Southern Blotting.

COURSE OUTCOME:-

The student have a knowledge of Gene, genetic code ,diseases and treatment.

PRACTICAL:-

1. Identification of spots related to theory.
2. Squash preparation of onion root tip / Chironomous larva salivary gland/grass hopper testis.
3. Study of instruments techniques related to applied genetics – PCR, Gel electrophoresis, DNA fingerprinting etc.
4. Problems based on genetics.

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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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Biotechnology– IV (Industrial Biotechnology)

COURSE OBJECTIVE:-

The objective is to develop biotechnology approaches that will yield 'green' industrial processes that are cost effective and sustainable.

Syllabus:

- UNIT – I** Industrially important microbes and their products, screening, strain development strategies.
- UNIT – II** Dairy Industry Fermented foods cheese production, use of enzymes in food industry, processing of milk and dairy products (Pasteurized milk, sterilized milk, cream and butter), enzymes in fruit juice and brewing industries (Fruit Juice and Wines, Beer), single cell protein.
- UNIT – III** Bioreactors – Structure and types. Fermentation media, media sterilization, Types of fermentation (Batch and Continuous) and downstream processing.
- UNIT - IV** Alcohol And Acid Production
Industrial production of alcoholic beverages vinegar, Ethanol, organic acids, Amino acids and Antibiotics
- UNIT – V** Tannery technology – Tanning – types of tanning – chrome tanning and vegetable tanning. Tanning Process (pre tanning, tanning, post tanning and finishing). Treatment of tannery effluents by microbes.

COURSE OUTCOMES:-

Industrial biotechnology is one of the most promising new approaches to pollution prevention, resource conservation, and cost reduction. It is often referred to as the third wave in biotechnology. If developed to its full potential, industrial biotechnology may have a larger impact on the world than health care and agricultural biotechnology.

PRACTICAL:-

- Demonstration for production of Penicillin
- Cultivation of edible mushrooms
- Production and estimation of alkaline protease.
- Study Isolation of industrially important microorganisms .
- Production of Citric acid, Lactic acid, alcohol.
- Production of bread and yoghurt
- Study of Bioreactor and its essential parts
- Microscopic observation of industrially important microorganisms using Light microscopy.
- Culturing and Characterization of microorganisms used in Dairy industry
- Study of microbial fermentations for the production and estimation (qualitative and quantitative) of:
 - (a) Enzyme: Amylase
 - (b) Amino acid: Glutamic acid
 - (c) Organic acid: Citric acid
 - (d) Alcohol: Ethanol
 - (e) Antibiotic: Penicillin
- A visit to any educational institute/industry to see an industrial fermenter, and other

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, LiAlH_4 and NaBH_4 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-Phthalimide 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

Transition temperature

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

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 phenol water system.

2. To construct the phase diagram of two component (e.g., diphenyl amine benzophenone) by cooling curve method.

Thermochemistry 12 Marks

COURSE CODE: 3SBCH404

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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Zoology-IV (Animal Physiology)

COURSE OBJECTIVE:-

This paper is aimed to introducing the students for animal physiology viz digestion ,respiration ,excretion, nervous and endocrine function

Syllabus:

UNIT - I

Nutrition, Metabolism

1. Physiology of digestion in mammals
2. Protein Metabolism-Deamination, decarboxylation.Transamination of amino acids, and Ornithine cycle.
3. Carbohydrate metabolism- Glycogenesis, Glycogenolysis, glycolysis, The Citric acid cycle, Gluconeogenesis.
4. Lipid Metabolism-Beta oxidation of fatty acids.

UNIT - II

Respiration

1. Organs of respiration in mammals
2. Mechanism of respiration in mammals.
3. Physiology of respiration (transport of gases, chloride shift).
4. Properties and function of respiratory pigments.

UNIT - III

Regulatory Mechanisms and Enzymes

1. Osmoregulation.
2. Physiology of Excretion- urea and urine formation in mammals.
3. Thermoregulation.
4. Definition and nomenclature of enzymes, classification of enzymes.
5. Mechanism of enzyme action.

UNIT - IV

Neuromuscular Co- ordination.

1. Structure and properties of nervous tissue.
2. Physiology of nerve impulse conduction.
3. Types of muscles and their properties.
4. Theory of muscle contraction and its biochemistry.

UNIT - V

Endocrine system.

1. Structure and functions of Pituitary Gland.
2. Structure and functions of Thyroid Gland.
3. Structure and functions of Adrenal Gland.
4. Structure and functions of Parathyroid, Thymus and Islets of langerhan's.

COURSE OUTCOMES:-

The student have a knowledge of physiological diseases and treatment

PRACTICAL:-

1. Detection of protein, carbohydrate and lipid.
2. Study of Human salivary enzyme activity in relation to pH.
3. Detection of nitrogenous waste products – Ammonia & Urea
4. Use of Kymograph
5. Exercise on Haematology – Counting of RBC /WBC and Blood grouping in blood samples.
6. Estimation of Haemoglobin in blood samples.
7. Histological study of various endocrine glands –T. S. of Thyroid, T. S. of Pituitary gland , T. S. of Adrenal gland , T. S. of Testis, T. S. of Ovary.

COURSE CODE: 3SBZO405

8. Histological study of Alimentary canal & various digestive organs – T.S of Stomach , T.S of Intestine , T.S of Pancreas, and T. S. of liver.
9. Histological study of Visceral organs - T.S of Lungs, L.S. of Kidney
10. Histological study of Muscles – Striated, Unstriated & Cardiac muscle.

PRACTICAL:-

1. Spotting
2. Biochemical test
3. Physiological experiment
4. Exercise on enzyme activity
5. Viva
6. Practical record/collection

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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

Biotechnology-V (Instrumentation Biotechnology and Complex)

COURSE OBJECTIVE:-

To ensure quality control in bioinformatics research through a scientific user committee, documentation, data traceability and reliability, CECILL licences, indicator measurement.

Syllabus:

- UNIT – 1** Chromatography; adsorption partition, column, gas, ion-exchange, gel Filtration and affinity Chromatography, HPLC, FPLC.
- UNIT - 2** Electrophoresis techniques types and their application; Electrophoresis of proteins and nucleic acids.
- UNIT – 3** Centrifugation and ultracentrifugation, Colorimetry, Microscopy- light, phase-contrast, fluorescence, dark field, electron microscopy.
- UNIT - 4** Introduction to Bioinformatics. Genomics - information flow in biology, DNA sequence data. Nature of Biological data. Major Bioinformatics Resources: NCBI, EBI and ExPASY.
- UNIT - 5** Introduction to computer fundamental, Organization.Evolution, Generation of computers (I, II, III,IV, V). Classification of computers (mainframes, minicomputers, microcomputers, special purpose). M S Office.

COURSE OUTCOME:-

knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics existing software effectively to extract information from large databases and to use this information in computer modeling

PRACTICAL:

- Exercise on colorimeter/spectrophotometer/pH meter.
- Exercise on paper, thin layer, column chromatography
- Exercise on paper and gel electrophoresis
- Exercise on tissue culture techniques.
- Absorbance curve for dyes.
- Exercise on lab instruments
- Testing of Beer's law
- Slide preparation
- To perform spreadsheet application
- Cell separation by Centrifugation
- Defined projects will be done by the students and evaluated by the instructor.
- Document Preparation
- Presentation Software
- Familiarizing with the Operating System, Control Panel, Networking Configuration, Firewall setting
- Spreadsheet Handling, Working with worksheets, Creating a spreadsheet, entering and formatting information, basic functions and formulas, creating charts, tables and graphs.

Discipline Specific Elective-II
Biotechnology-V (Environmental Biotechnology)

COURSE OBJECTIVE:-

One of the main objectives of environmental biotechnology is the conservation of resources via the recycling of waste materials.

Syllabus:

- UNIT – I**
1. Environment: Basic concepts and issues.
 2. Environmental pollution: Type of pollution,
 3. Air pollution and its control through Biotechnology.
- UNIT – II**
1. Water pollution and its control: waste water treatment – physical, chemical, biological processes.
 2. Microbiology of waste water treatments, aerobic process; Activated sludge, oxidation ditches, trickling filter, rotating discs, rotating drums, oxidation ponds.
 3. Anaerobic process: Anaerobic digestion, anaerobic filters,
- UNIT – III**
1. Treatment schemes for waste water of dairy, distillery, tannery, sugar, antibiotic industries.
Bioremediation.
 2. Xenobiotics in Environment- Ecological considerations, oil pollution, surfactants, pesticides.
- UNIT – IV**
1. Global Environment problems: Ozone depletion, UV-B, green house-effect and rain, their impact and biotechnological approaches for management.
 2. IPR.
- UNIT – V**
1. Biodegradation of cellulose lignins and hydrocarbons (superbug).
 2. Composting, treatment of solid wastes.
 3. Bioaccumulation of metals and detoxification
- Outcome- Environmental biotechnology is a system of scientific and engineering knowledge related to the use of microorganisms and their products in the prevention of environmental pollution through biotreatment of solid, liquid, and gaseous wastes, bioremediation of polluted environments and biomonitoring of environment and treatment processes.

PRACTICAL:-

1. To determine the Total dissolved solids of water (TDS).
2. Determination of Dissolved oxygen (DO) of water.
3. Determination of chemical oxygen demand (COD) of water.
4. Determination of Biological oxygen demand (COD) of water.
5. To Screen the antagonism between Trichoderma sp. And Curvularia sp.
6. Determination of effect of fungicide on the growth of fungi (Trichoderma sp.).
7. Effect of fungicide on the antagonism between Trichoderma sp. And Curvularia sp.
8. To determine the Most Probable Number (MPN) of a given water sample

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Discipline Specific Elective-III
Biotechnology-V (Genetics & Genetic Engineering)

COURSE OBJECTIVE:-

To impart basic knowledge and genetics techniques of various aspects of biotechnology.
Biotechnology is the research oriented subject

Syllabus:

- UNIT – I** Origin of life: Classical experiments and current concepts. Evolution of biological macromolecules, Evolution of early forms, Mendelian genetics: Mendel's Law, Chromosomal basis of heredity, Chromosomal analysis, allelic variation, dominance, linkage and crossing over.
- UNIT-II** Microbial genetics: genetics: genetics cross and analysis with special reference to E. Coli (conjugation, general and specialized transduction), Bacteriophage lambda (lytic/lysogenic). Genetic mapping in eukaryotes: Drosophila; maize and Human examples. Sex determination, genetic disorder and chromosomal abnormalities.
- UNIT - III** Cloning, History of cloning, Isolation and Quantification of DNA vehicles, Plasmids, Bacteriophage, Phagemid & Cosmids. Selection and Screening of Recombinants, Vectors of plants and animals, Expression Vectors, Gene Cloning and expression of foreign gene in bacteria.
- UNIT- IV** Construction of genomic and DNA libraries. Production of transgenic microbes, Animals & plants and their application in Biotechnology. Gene Cloning in medicine, Production of protein from cloned genes.
- UNIT- V** Over expression conditions, production of inclusion bodies, solubilization, insoluble proteins, purification protocol, Determination of purity and activity of over expressed proteins.

PRACTICAL:-

- Study of plant chromosome (Root tip).
- Study of animal chromosome (Chironomous larvae)
- Study of human chromosome (Slide)
- Estimation of DNA by the diphenylamine reaction.
- Estimation of RNA by the mean of orcinol reaction.
- Isolation and DNA from microbial, plant/animal.
- Isolation of RNA from Yeast.
- Isolation of chromosome DNA from bacteria.
- Isolation of plasmid DNA from bacteria.
- Isolation of nucleic acid (DNA/RNA) from biological material by perchloric acid method.
- Extraction in saline, buffer and solvent.
- Effect of UV radiation on microbial cell
- Demonstration of repair mechanism *in* microbes.
- Bacteriophage and determination of latent period of infection
- Isolation of total RNA from Plant tissue by SDS phenol method.

COURSE OUTCOMES:-

- Origin of life: Classical experiments and current concepts. Microbial genetics:. Gene Cloning and expression of foreign gene in bacteria.
- Production of transgenic microbes, Animals & plants and their application in Biotechnology. Gene Cloning in medicine, Production of protein from cloned genes.

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Discipline Specific Elective-I

Chemistry-V (Physical Inorganic and Organic Chemistry)

Syllabus:

Physical Chemistry

UNIT - I 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, antiarthritis 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

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

Syllabus:

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.

UNIT - 1 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 - 2 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 - 3 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 - 4 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 - 5 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-III Chemistry-V (Green Chemistry)

COURSE OBJECTIVE:

Study of basic concept of Green Chemistry, Microwave and Ultrasound assisted green synthesis, Green catalysis and its application.

Syllabus:

- UNIT-I Green Chemistry:** Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required examples of sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).
- UNIT-II Selection of solvent:** i) Aqueous phase reactions ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis Super critical CO₂: Preparation, properties and applications, (decaffeination, dry cleaning)
- UNIT-III Microwave and Ultrasound assisted green synthesis:** Apparatus required, examples of MAOS (synthesis of fused anthro quinones, Leuckart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldol condensation-Cannizzaro reaction, Diels- Alder reactions-Strecker's synthesis
- UNIT-IV Green catalysis:** Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis- biocatalysis: Enzymes, microbes Phase transfer catalysis (micellar/surfactant)
- UNIT V** Examples of green synthesis / reactions and some real world cases: 1. Green synthesis of the following compounds: adipic acid, catechol, disodium imino diacetate (alternative Strecker's synthesis) 2. Microwave assisted reaction in water – Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols – microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction. 3. Ultrasound assisted reactions – sonochemical Simmons –Smith reaction (ultrasonic alternative to iodine)

COURSE OUTCOMES:

Know about the reaction of Green catalysis, Microwave and Ultrasound assisted green synthesis and its modern application Green Chemistry.

REFERENCE BOOKS:

1. Green Chemistry Theory and Practice. P.T. Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Green Chemistry: Introductory Text, M.Lancaster
6. Principles and practice of heterogeneous catalysis, Thomas J.M., Thomas M.J., John Wiley
7. Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava, Narosa Publications

**GREEN CHEMISTRY
CHEMISTRY PRACTICAL - DSE LAB:**

1. Safer starting materials

The Vitamin C clock reaction using Vitamin C tablets, tincture of iodine, hydrogen peroxide and liquid laundry starch.

- Effect of concentration on clock reaction
- Effect of temperature on clock reaction. (if possible)

2. Using renewable resources

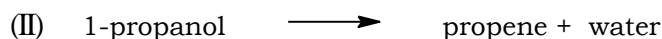
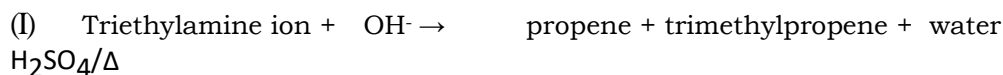
Preparation of biodiesel from vegetable oil.

3. Avoiding waste

Principle of atom economy.

Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.

Preparation of propene by two methods can be studied



The other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.

4. Use of enzymes as catalysts

Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide

Alternative Green solvents

5. Diels Alder reaction in water

Reaction between furan and maleic acid in water and at room temperature rather than in benzene and reflux.

6. Extraction of D-limonene from orange peel using liquid CO₂ prepared from dryice.
7. Mechanochemical solvent free synthesis of azomethines
8. Co-crystal controlled solid state synthesis (C²S³) of N-organophthalimide using phthalic anhydride and 3-aminobenzoic acid.

Alternative sources of energy

9. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).
10. Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Reference Books:

- Anastas, P.T & Warner, J.C. *Green Chemistry: Theory and Practice*, Oxford University Press (1998).
- Kirchoff, M. & Ryan, M.A. *Greener approaches to undergraduate chemistry experiment*. American Chemical Society, Washington DC (2002).
- Ryan, M.A. *Introduction to Green Chemistry*, Tinnensand; (Ed), American Chemical Society, Washington DC (2002).
- Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. I.K. *Green Chemistry Experiment: A monograph International Publishing House Pvt Ltd. New Delhi. Bangalore* CISBN 978-93-81141-55-7 (2013).

Discipline Specific Elective-I
Zoology –V (Applied Zoology)

COURSE OBJECTIVE:-

This paper is aimed to introducing the students for Aquaculture, Economic Entomology ,toxicology and lab techniques .

Syllabus:

- UNIT - I** Aquaculture
- Definition and scope of aquaculture.
 - Prawn culture –(Culture of fresh water prawn, Methods of prawn fishing, preservation and processing of prawns)
 - Pearl culture and Pearl Industry.
 - By products of fishing industry.
 - Frog culture, Breeding and selection.
- UNIT - II** Pisciculture
- General account of Edible fresh water fishes.
 - Carp culture: Management of ponds, Preservation and processing of fishes.
 - Maintenance of Aquarium
 - Plankton and their role in Fisheries.
 - Elementary knowledge of polyculture.
- UNIT - III** Economic Entomology
- Sericulture: Species of silkworm, life history of Bombyx mori, Sericulture Industry in India.
 - Apiculture –life cycle and species Methods of bee keeping, Products of bees, enemies of bees.
 - Lac culture: Lifecycle, Host Plant cultivation.
 - Common Pest: Stored Grains Sitophilus oryzae and Tribolium Castanaeum, Vegetable pest Piers brassicae and Dacus cucurbitae..
 - Biological control of insect pests.
- UNIT - IV** Toxicology
- Toxicology: Basic concepts,
 - Heavy metal toxicity- Pb, Cd, Hg.
 - Toxicity testing, LC 50, LD 50, acute and chronic toxicity.
 - Pesticide and their toxicological effect.
 - Occupational health hazards and their control
- UNIT - V** Lab Techniques
- pH- Definition, Study of pH- meter, determination of pH.
 - Chromatography: Principles & Types of chromatography (Paper Chromatography).
 - Types of microtome and their uses.
 - General ideas of some common fixatives, stains and reagents.
 - Museum keeping, preservation and skeleton preparation, taxidermy(Bird)

COURSE OUTCOMES:-

The student have a knowledge of different culture Skill to develop own Business, lab Techniques and self employment.

PRACTICAL:-

1. Study of museum specimen of fresh water edible fishes.
2. Study of pH of Water and soil.
3. Study of Chromatography (Paper Chromatography).
4. Study of working instrument : Microtome.
5. Study of different techniques for Museum Keeping..
6. Maintenance of aquarium.
7. Study of pests-
Stored grain pests- Sitophilus Oryzae & Tribolium castanaeum.
Vegetable pests- Pieris brassicae & Dacus cucurbitae
8. Study of Plankton – Euglena, Paramecium, Cyclops, Mysis, Daphnia

PRACTICAL:-

1. Exercise based on pH determination
2. Exercise based on simple chromatography
3. Comments on instruments based on theory paper (any one) Exercise based on museum keeping techniques
4. Spotting
5. Viva
6. Practical record/collection

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Discipline Specific Elective-II
Zoology-V (Zoology Wild Life Conservation)

COURSE OBJECTIVE:-

This paper is aimed to introduce wildlife conservation ,endangered species ,santuries biosphere reserve Project Tiger and. Gir Lion..

Syllabus:

UNIT – I

1. Wild Life of India.
2. Types of Wild Life.
3. Value of Wild Life.
4. Positive negative of Wild Life.

UNIT – II

1. Wild Life protection act.
2. Conservation of wild Life in India.
3. Endangered species in India.

UNIT – III

1. Wild Life conservation.
2. National park in India.
3. Santuries in C.G & M.P.

UNIT – IV

1. Project Tiger.
2. National animal and their conservation.
3. Project Gir Lion.

UNIT – V

1. Wild Life in M.P & C.G with references to mammals.
2. Biosphere reserves.
3. Bird santuries in India.

COURSE OUTCOME:-

The student have a knowledge of different biosphere reserve, santuries ,wildlife conservation Skill to develop employment in Zoo.

PRACTICAL:-

1. Wild life : Endangered and threatened species.
2. National animal and their conservation
3. Achanakmar Project Tiger.
4. Zoo Visit Kannan Pendari
5. Crocodile Project, National park in India.
6. Bird santuries in India.
7. Butterfly identification, Santuries ,Biospher Reserve

Discipline Specific Elective-III
Zoology-V (Industrial Biology)

COURSE OBJECTIVE:-

This paper is aimed to introduce micro-organism used in Fermentation. Vitamin, Enzyme Antibiotics, Alcohol, dairy products and other pathogenic treatment.

Syllabus:

UNIT – I

1. Vitamin.- Commercial production of vitamin.
2. Fermentation techniques
3. Microorganism used in alcohol.

UNIT – II

1. Antibiotics their importance
2. Antibiotics and their Producing companies.
3. Chemical nature of Penicillin.

UNIT – III

1. Biofertilizers
2. Vermi composting
3. Enzymes and their properties.
4. Industrial uses of enzymes.

UNIT – IV

1. Microbiology of domestic water and sewage.
2. Microbiology of milk and milk products.
3. Industrial microbiology.

UNIT – V

1. Brief introduction to pathogenic Nemetodes.
2. Brief account, Life history and Pathogenicity of *Entamoeba*, *Trypanozoma*, *Giardia*.
3. Vector insects

COURSE OUTCOME:-

The student have a knowledge of different micro-organism used for drug, alcohol vitamine, antibiotics, enzyme, dairy production Skill to develop own Business, marketing and self employment.

PRACTICAL:-

1. Study of Micro-organism from soil.
2. Study of *Entamoeba*, *Trypanozoma*, *Giardia*.
3. Study of Microorganism used in alcohol.
4. Study of Microbiology of domestic water and sewage.
5. Study of Biofertilizers, Vermi composting
6. Study of Vector insect

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Discipline Specific Elective-I Biotechnology (Applied Biotechnology)

COURSE OBJECTIVE:-

To trained the students for industrial need and pursue further education.
To include entrepreneurship among the student so as to start their own ventures in the field of biotechnology.

Syllabus:

- UNIT – I** Introduction to plant tissue culture, Nutritional requirements, In vitro culture, Single cell culture, Somaclonal variations, Anther culture, Ovule culture. somatic . embryogenesis, Organogenesis
- UNIT - II.** Somatic hybridization, Genetic manipulation of plants using *Agrobacterium-tumefaciens*. The engineering of recombinant plastids in higher plants. Isolated Microspore. Embryogenesis in cereals.
- UNIT – III** Energy transfer in ecosystem, Renewable and non-renewable resources, Role of biotechnology in pollution, Type and management of pollution, Waste water treatment, xenobiotics, Bioremediation, green house effect, Ozone depletion, Bioleaching, biofertilizers, Biopesticides, Modern fuels, Biogas, Microbial H₂ production.
- UNIT - IV** Production of some important bioproducts, Antibiotic and beverages. Microbial role in food processes, operation and production, new protein post harvest technology and process of food preservation milk procession operations.
- UNIT – V** Medical application of rDNA technology, Human disorders associated with defects in protein/enzyme biosynthesis, DNA probes and their application in diagnosis of genetic and other disorders. Plant DNA finger printing.

COURSE OUTCOME:-

To introduced the plant tissue culture ,Nutritional requirements, In vitro culture, Single cell culture, Somaclonal variations, Anther culture, Ovule culture somatic embryogenesis, Organogenesis.To the study of DNA probes and their application in diagnosis of genetic and other disorders. Plant DNA finger printing

PRACTICAL:-

- Growth of plant tissue into undifferentiated mass of callus.
- Preparation of animal cell culture media.
- Separation and culture of lymphocyte from blood.
- Demonstration of fermentor.
- Preparation of wine.
- Effects of toxicants on microbes.
- Effects of toxicants on animal cell.
- Extraction of citric acid from *Aspergillus*.
- Production of ethanol by yeast.
- Demonstration of PCR.
- Immobilization of yeast cells.

- Immobilization of enzyme.
- Extraction and preparation of lactic acid.
- Extraction and preparation of citric acid.
 - a. Demonstration of Radial immuno diffusion analysis.
 - b. Isolation of microorganism from polluted site/ industrial waste.

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Discipline Specific Elective-II
Biotechnology (Recombinant DNA Technology)

COURSES OBJECTIVE:-

To familiarize the student with emerging field of biotechnology i.e. Recombinant DNA Technology as well as to create understanding and expertise in wet lab techniques in genetic engineering.

Syllabus:

- UNIT - 1** Scope and aim of the Biotechnology, Recombinant DNA Technology: General concept and Application Strategies of recombinant DNA technology in Prokaryotes. Restriction Enzymes: endonuclease (type, Nomenclature, Restriction, Sequence and Cleavage Pattern)- a Modification of cut ends
b. Steps in gene cloning
c. Isolation of the desired gene
d. DNA Library, Genomic Library
- UNIT – 2** Vectors (Animal and Plant vectors)
Bacteriophage Vectors
Introduction of vectors into appropriate host
- UNIT – 3** 1. PCR- Procedure (denaturation Annealing extension)
2. Types of PCR
3. Applications advantages and Limitation of PCR.
- UNIT – 4** Monoclonal Antibodies: Structure, Production, Application
Genome map and Genome Project, Apoptosis.
- UNIT – 5** 1. Stem cell technology
2. Targeted Gene Transfer
3. DNA Fingerprinting
4. Transgenic animals and Plants

COURSE OUTCOME:-

At the end of the course, the students will have sufficient scientific understanding of the subject and have good knowledge of application of Recombinant DNA techniques in Life Sciences Research.

PRACTICAL:-

- Demonstration for isolation of DNA from:
- Bacteria (genomic)
- Bacteria (Plasmid)
- Plants
- Demonstration for Isolation of RNA.
- Demonstration of DNA from Plant Cells.
- Separation of animal genomic DNA by Agarose gel electrophoresis
- Separation of Bacterial proteins by vertical SDS-PAGE electrophoresis
- Transformation
- Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis.
- Ligation of DNA fragments.
- Demonstration of PCR.
- Interpretation of sequencing gel electropherograms.

Discipline Specific Elective-III
Biotechnology (Plant and Animal Tissue culture Techniques and its
Application Biotechnology)

COURSE OBJECTIVE:-

This course focuses on the Laboratory organization & Plant and Animal Tissue Culture Techniques and its application.

Syllabus:

- UNIT – I** Introduction to Techniques - Introductory history, Laboratory organization, Media, Aseptic manipulation. Basic concepts in cell culture - cell culture, Cellular Totipotency, Somatic Embryogenesis.
- UNIT – II** In vitro culture : approaches & methodologies - preparation steps for tissue culture, surface sterilization of plant tissue material, basic procedure for aseptic tissue transfer, incubation of culture.
- UNIT – III** Tissue nutrition : Growth Hormones - Plant cells (Composition of culture media, Growth hormones, Vitamins, Unidentified supplements, selection of media); Animal cells (substrate on which cells grow, Feeder layer on substrate, gas phase for tissue culture, media and supplements).
- UNIT – IV** Tissue culture methodologies - Plant cells (Callus Culture, Cell Suspension Culture, Organ Micro-culture, plant micro-propagation, Somatic Embryogenesis); Animal cells (Source of tissue, primary culture, differentiation of cells, growth kinetics, animal cell lines and their origin and characterization).
- UNIT – V** Cloning & Selection of specific cell types – cloning, somatic cell fusion and HAT selection, Medium suspension fusion, selection of Hybrid clone, production of monoclonal antibodies. Organ Culture - Culture of embryonic organs, whole embryo culture, culture of adult organs.

COURSE OUTCOME:-

Student able to, Plant And Animal tissue culture Laboratory organization & Cloning.

PRACTICAL:

1. Antigen-Antibody reactions – Agglutination (Blood grouping testing).
2. Antibody titration (Ouchterlony Double Diffusion).
3. Antigen-Antibody reactions – Immuno-electrophoresis, Rocket immuno-electrophoresis.
4. Antigen-Antibody reactions – Coomb's test
5. Antigen-Antibody reactions – ELISA.
6. In vitro Culture - Washing & Sterilization, Preparatory steps for tissue culture, surface sterilization of plant material, basic procedures for Aseptic tissue transfer, incubation of culture
7. Preparation of Culture media & Reagents - Media composition, Nutrition, Hormones.
8. Tissue Culture – Callus culture, Cell suspension
9. Organ Micro-culture - Shoot tip, excised root, Leaf culture.
10. Plant micro-propagation – micro-culture of plants.

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Discipline Specific Elective-I

Chemistry-VI (Physical Inorganic and Organic Chemistry)

Syllabus:

Physical Chemistry

- UNIT – I** (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-Mossotti 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.

COURSE CODE: 3SBCH 603

- (d) Amino acids Classification, structure, stereochemistry of amino acids, acid base behaviour, isoelectric point, general methods of preparation and properties of -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. Hexaamminenickel(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-III
Chemistry-VI (Bio-Chemistry)

COURSE OBJECTIVE:

Study of fundamental concept of Vitamin, Carbohydrates Lipids and Amino acids

Syllabus:

UNIT- I The foundations of biochemistry and Vitamins

Cellular and chemical foundations of life . Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms, hypervitaminosis.

UNIT- II Water

Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment.

UNIT-III Carbohydrates and Glycobiology

Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and non-reducing disaccharides. Polysaccharides – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lip polysaccharides). Carbohydrates as informational molecules, working with carbohydrates

UNIT-IV Lipids

Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes. Structural lipids in membranes –glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Plant steroids. Lipids as signals, cofactors and pigments

UNIT-V Amino acids

Structure and classification, physical, chemical and optical properties of amino acids
Nucleic acids Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA. Other functions of nucleotides - source of energy, component of coenzymes, second messengers

COURSE OUTCOMES:

Study of basic concept of biochemistry.

REFERENCE BOOKS:

- 1.Fundamentals of Biochemistry: A. C. Deb
- 2.Biochemistry : U. Satyanarayana ·
- 3.Biochemistry : Lubest Stryer ·
4. Textbook of Biochemistry : Jain & Jain

PRACTICAL:

COURSE OBJECTIVE:

To prepare some inorganic complex compounds. Binary mixture analysis of organic compound containing two solids and prepare derivatives and analysis some methods through physical instruments.

Time: 6 hour M.M: 50

Inorganic Chemistry

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. Hexaamminenickel(II) chloride

Organic Chemistry

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

Physical Instrumentation

(iii) Job's method

(iv) Mole-ratio method.

COURSE OUTCOMES:

It is helpful to get knowledge of preparation of some complex compound, Separation & identification of binary organic mixture, prepare derivatives and know about physical instrumentation techniques

TEXT AND REFERENCE BOOK:

- Experiments & Calculations in engineering chemistry, Dr. S.S. Dara, S.Chand & Company Ltd.
- Practical Chemistry, Dr. M.M.N.Tandon, ShivalAgrawal & Company



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Discipline Specific Elective-I
Zoology – VI (Environmental Biology & Evolution)

COURSE OBJECTIVE:-

This paper is aimed to introduce Ecology ,Origin of life and evolution, Palaeontology and distribution

Syllabus:

- UNIT – I** Concept of Ecology
- Abiotic and Biotic Factors
 - Energy flow in ecosystem
 - Food chain and Food web
 - Biogeochemical cycle: CO₂, N and P
 - Population Concept- Characteristics of population. Factors affecting population growth.
 - Community Concept-Succession, Periodicity ,Indicators
- UNIT – II** Habitat Ecology
- Fresh water habitat – Factors and classification.
 - Marine habitat- Factors and classification
 - Terrestrial habitat – Factors and classification.
 - Ecological divisions of India.
 - Natural resources and their Conservation with special reference to forests
- UNIT – III** Man and Environment
- Wild life conservation (Laws, National Parks and Sanctuaries of MP)
 - Environmental degradation and pollution.
 - Thermal and Noise pollution
 - Radiation Ecology ,Global Warming and Green House Effect
 - Urbanisation and effect of human population on environment.
- UNIT – IV** Origin of life and evolution
- Origin of life- modern concept only
 - Lamarckism, Darwinism.
 - Modern Synthetic theory :Variations Mutations, Isolation & Speciation
 - Adaptations and Mimicry
 - Micro, macro Evolution and Mega evolution.
- UNIT – V** Palaeontology and distribution
- Fossils, Methods of fossilisation, Determination of age of Fossils.
 - Study of Extinct forms: Dinosaurs and Archaeopteryx
 - Zoogeographical distribution of animals
 - Evolution of man.

PRACTICAL:-

1. Study of Fresh water, Marine and Terrestrial Fauna .
2. Water analysis – Oxygen, Chloride.
3. Pond ecosystem.
4. Wild life : Endangered and threatened species.
5. Study of specimen related with Micro , Mega evolution ,Commensalisms Symbiosis , Mimicry , Parasitism and colouration .

Study of various fossils: Living fossil, Limulus, Latimera, dinosaurs, Archaeopteryx,.

Discipline Specific Elective-II
Zoology-VI (Aquaculture)

COURSE OBJECTIVE:-

This paper is aimed to introduce fresh water Prawn, Fish and Pearl Culture.

Syllabus:

- UNIT - I** Aquaculture: history, definition, scope & importance. Abiotic & biotic factors of water necessary for fish life. Ecological characteristics of pond.
- UNIT - II** Fish culture :- Mono, Poly, Fish culture. Fresh water prawn culture, pearl culture. Sewage fed fish culture.
- UNIT - III** Fish breeding in natural conditions. Transport of live fish & seed. Different types of crafts & gears used for fish catching, induced breeding.
- UNIT - IV** Fresh water fish farm: different types of fish ponds. preservation and processing byproducts of fish Industry & their utility.
- UNIT - V** Water pollution and its effects on fisheries and their control. Common fish diseases & their control. Biochemical composition and nutritional value of fish. cultivable species of fishes in india.

COURSE OUTCOME:-

The student have a knowledge of different culture Skill to develop own Business, marketing and self employment.

PRACTICAL:-

1. Study of Fresh water, Marine and Terrestrial Fauna.
2. Water analysis – Oxygen, Chloride.
3. Pond ecosystem.
4. Study of specimen of fresh water fishes.
5. Study of slide preparation from fish scale.

Discipline Specific Elective-III
Zoology-VI (Economic Zoology)

COURSE OBJECTIVE:-

This paper is aimed to introduce Pearl Culture, Lac –Culture , Sericulture and Poultry keeping. Protozoa, rats, mites, insect diseases and control.

Syllabus:

UNIT – 1

1. Protozoa and human diseases
2. House hold insect.
3. Mites and their control.

UNIT – II

1. Toxicology: Basic concepts,
2. Heavy metal toxicity- Pb, Cd, Hg.
3. Toxicity testing, LC 50, LD 50, acute and chronic toxicity.
4. Pesticide and their toxicological effect.
5. Pest of Pulse crops, Vegetables and Paddy

UNIT – III

1. Chemical control of pest.
2. Natural control of pest.
3. Physical control of pest.
4. Biological control of insect pests.

UNIT – IV

1. Economic importance of mammals.
2. Poultry keeping.
3. Rats and their control.

UNIT - V

1. Pearl culture:
2. Sericulture
3. Lac culture.
4. Apiculture
5. Snake venom.

COURSE OUTCOME:-

The student have a knowledge of different culture Skill and diseases and their control to develop own Business, marketing and self employment.

PRACTICAL:-

1. Study of Life cycle of Silk worm
2. Study of Bee culture
3. Study of pests-Stored grain pests- Sitophilus Oryzae & Triboliumcastanaeum.
4. Study of Vegetable pests- Pierisbrassicae & Dacuscucurbitae
5. Study of Plankton – Euglena, Paramoecium, Cyclops, Mysis, Daphnia
6. Study of Protozoa and diseases.

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