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**SCHOOL OF SCIENCES**

**SYLLABUS I& II Year**

**B. Sc. (Chemistry, Botany and Zoology)**

**SEMESTER SYSTEM**

**(Session 2015-16)**

**Program Aims and Objectives:**

The B.Sc. (Biology) program of Suresh Gyan Vihar University, Jaipur is designed keeping in view the latest trends in the field of Chemistry, Botany & Zoology. The students are given an overview of the various subjects of all the three disciplines during the tenure of their program. The various papers that are put to study during the program include study of plants, animals and physical, organic and inorganic chemistry in details. Therefore after completion of the biology program, the students are well versed with the entire area of all the three disciplines and their application in the current scenario.

**Undergraduate Programmes**

Undergraduates majoring in Biological Sciences will develop a broad base of general knowledge, focused primarily in the biological sciences, and capped with in-depth knowledge specific to their particular major program.

Biological Sciences majors will also obtain broad knowledge in mathematics, Biological sciences, and natural sciences, coupled with analytical, oral and compositional skills, to promote good citizenship and the capacity for life-long learning.

Our students are expected to demonstrate a breadth of knowledge across the sub-disciplines that comprise Biological Sciences. The curriculum for biology majors meets the needs of students with three post-graduation ambitions: graduate school, professional school, or work in industry or government without further training.

**Learning Objectives**

As Biological Sciences is an integrative discipline, students are required to demonstrate appropriate proficiency in Chemistry, Mathematics and Physics in order to apply this knowledge to the study of Biology(Botany/Zoology).

Students will acquire a breadth of knowledge in Biology (genetics, physiology, anatomy, ecology, evolution, cell- or biochemistry, and microbiology).

Students will acquire a broad knowledge in mathematics, biological sciences, and natural sciences, coupled with analytical, oral and compositional skills, to promote good citizenship and the capacity for life-long learning.

Students will develop and apply oral and written skills, problem-solving skills in developing experimental design and analysis, and participate in individualized hands-on field and laboratory exercises.

Students will be prepared with a sufficient depth of knowledge in their specific major program to assure their admission to graduate or professional school or be prepared for entry-level employment.

The study of biology can have a multitude of aims and objectives. Largely, it is studied to allow a person to enter a specific field of employment. Other aims for studying biology are intellectual, ethical and pragmatic: to increase knowledge about all aspects of organisms, to encourage greater benevolence in the relationship between humans and the natural environment and to implement biological factors into various technologies or management techniques.

**Understanding Living Systems and Critical Thinking:**

The study of biology aims to increase understanding of living systems and to allow you to consider the systems in relationship to the self and other organisms in the natural environment. The goal is to be able to test theories developed about living things by utilizing the scientific method and then to apply the new information in a beneficial way.

Field Biology, Health Care and Education

Biology has many applications, both in the natural environment and the environment of health and education. Studying biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous

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**Teaching and Examination Scheme**

**To commence from the Academic year:**

**Department : School of Science Year: 2015-16 Program : B.Sc. Biology Semester: I**

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| **S.No.** | **Course Code** | **Course Name** | **Credit** | **Contact Hrs/Wk.** | | | **Exam Hours** | **Weightage (in%)** | |
| **L** | **T** | **P** | **CIE** | **ESE** |
|  |  | **(A)University Core:** |  |  |  |  |  |  |  |
| 1 | EN 101 | * **English Language 1** | 2 | 2 | 0 | 0 | 3 | 40 | 60 |
| 2 | PC 101 | * **Proficiency in co-curricular activities** | 2 | 0 | 0 | 0 | 0 | 100 | 0 |
| 3 | CP 101 | * **Elementary Computer** | 3 | 3 | 0 | 0 | 3 | 40 | 60 |
|  |  | **(B) Program Core:** |  |  |  |  |  |  |  |
| 4a  4b | BY 111 | **Botany-I**  **Systematics and Plant Diversity** | 4 | 4 | 0 | 0 | 3 | 40 | 60 |
| BY 161 | **Botany-I**  **Systematics and Plant Diversity Lab** | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| 5a  5b | CY 111 | **Fundamental of Chemistry-I** | 4 | 3 | 1 | 0 | 3 | 40 | 60 |
| CY 161 | **Fundamental of Chemistry-I Lab** | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| 6a  6b | ZY 111 | **Zoology-I**  **Systematics and Animal Diversity** | 4 | 4 | 0 | 0 | 3 | 40 | 60 |
| ZY 161 | **Zoology-I**  **Systematics and Animal Diversity Lab** | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| 7a | EN 111 | **English Language Lab 1** | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
| 8 | EN 161 | **Elementary computer Lab** | 1 | 0 | 0 | 2 | 2 | 60 | 40 |
|  |  | **(C)Program Elective:** |  |  |  |  |  |  |  |
|  |  | **(D)Open Elective:** |  |  |  |  |  |  |  |
|  |  | **Total** | 24 | 16 | 1 | 10 |  | | |

L – Lecture CIE – Continuous Internal Evaluation

T – Tutorial ESE – End Semester Examination

P – Practical

**Signature of Concerned Teacher Signature of Convener-BoS**\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Teaching and Examination Scheme**

**To commence from the Academic year:**

**Department : School of Science Year: 2015-16 Program : B.Sc. Biology Semester: II**

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| **S.No.** | **Course Code** | **Course Name** | **Credit** | **Contact Hrs/Wk.** | | | **Exam Hours** | **Weightage (in%)** | |
| **L** | **T** | **P** | **CIE** | **ESE** |
|  |  | **(A)University Core:** |  |  |  |  |  |  |  |
| 1 | EM 101 | * **Employability Skills** | 1 | 1 | 0 | 0 | 0 | 100 | 00 |
| 2 | PC 102 | * **Proficiency in co-curricular activities** | 2 | 0 | 0 | 0 | 0 | 100 | 00 |
| 3 | ES 101 | * **Environmental Studies** | 2 | 2 | 0 | 0 | 3 | 40 | 60 |
| 4 | EN 102 | **English language II** | 3 | 3 | 0 | 0 | 3 | 40 | 60 |
|  |  | **(B) Program Core:** |  |  |  |  |  |  |  |
| 5 | BY-112 | * **Botany-II**   **Microbiology and Plant Pathology** | 4 | 4 | 0 | 0 | 3 | 40 | 60 |
| 6 | BY 162 | * **Botany-II**   **Microbiology and Plant Pathology Lab** | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
| 7 | CY-112 | * **Fundamentals of Chemistry II** | 4 | 3 | 1 | 0 | 3 | 40 | 60 |
| 8 | CY 162 | * **Fundamentals of Chemistry II Lab** | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
| 9 | ZY-112 | * **Zoology-II**   **Cell Biology and Biochemistry** | 4 | 4 | 0 | 0 | 3 | 40 | 60 |
| 10 | ZY 162 | * **Zoology-II**   **Cell Biology and Biochemistry Lab** | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
| 11 | EN 162 | * **English Language 2 lab** | 1 | 0 | 0 | 2 | 3 | 60 | 40 |
|  |  | **(C)Program Elective:** |  |  |  |  |  |  |  |
|  |  | **(D)Open Elective:** |  |  |  |  |  |  |  |
|  |  | **Total** | 25 | 17 | 1 | 08 |  | | |

L – Lecture CIE – Continuous Internal Evaluation

T – Tutorial ESE – End Semester Examination

P – Practical

**Signature of Concerned Teacher Signature of Convener-BoS**\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **EN 101** | **ENGLISH LANGUAGE 1** | | |
| **Prerequisite** | Nil | | |
| **Learning objective** | The learning objective of course are: 1.To develop a professional orientation | | |
| **Salient features** | 1. Conduct themselves with professionalism in organizations, 2. To face interview with confidence. 3. To improve the soft skills | | |
| **Utility** | A degree in forestry opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, forestry technicians and forestry workers. | | |
| **Unit-I** | **GRAMMAR** | | |
| Sentences, Prepositions, Subject-verb agreement, Correct Usage- Tenses, Active & Passive, Modals, Direct and indirect Speech, Idioms, Determiners | | | |
| **Unit- II** | **Vocabulary Building** | | |
| Introduction, Synonyms, Antonyms, Homophones, Homonyms, Words Often Confused, One Word Substitution, Affixes, Select Vocabulary of about 300-500 new words | | | |
| **Unit-III** | **Verbal Communication** | | |
| Definition, Working with customers, developing professional telephone skills & improving informal communication | | | |
| **Unit-IV** | | **Professional Writing** | |
| Writing Official/ Business/ Formal letters; Writing Application and CV; Writing for Official Meetings  Report Writing- Size of the Report, Kinds of Reports, How to write Reports, Format for reporting  Technical Proposals: Parts, Types, Writing of Proposal, Significance. | | | |
| **Unit-V** | | **COMPOSITION** | |
| Paragraph Writing- Parts of a paragraph, Writing a good paragraph, Characteristics of a good paragraph; Developing Outlines, Note- making, Review Writing | | | |
| **Reference books** | | | 1. Communicative Grammar and Composition by Rajesh K. Lidiya,2008 Oxford Uni. Press, New Delhi   2. Communicative Grammar and Composition, by Rajesh K. Lidiya,2013 OUP, New Delhi  3. Effective Technical Communication by M. Ashraf Rizvi 2005 ,Tata McGrew Hill New Delhi  4. Technical Communication by Meenakshi Raman &Sangeeta Sharma ,2008 OUP New Delhi  5. Business Communication by Meenakshi Raman & Prakash singh, OUP, New Delhi  6. A Practical Course for developing Writing Skills In English by J.K. Gangal PHI Learning Pvt. Ltd. New Delhi  7. Oxford Companion to English Literature U P  8. A glossary of literary terms -M H Abrams |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **CP 101** | | **Elementary Computer** | |
| **Prerequisite** | | Nil | |
| **Learning objective** | | This course aims to:  – give a general understanding of how a computer works   * Aware about operating system, various Computer Languages and number system * Give a general understanding of Internet, information technology, e-commerce and Networks | |
| **Salient features** | | The students will able to   * Understand what is computer and how is it works. * Understand what number system, operating system, computer language is.   Understanding the Role of Information Technology | |
| **Utility** | | A B. Tech degree in biotechnology opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, biotechnology technicians and life science laboratory. | |
| **Unit-I** | | **Introduction** | |
| Types of computers and generations .Basic architecture of computers and its building blocks .Input-Output devices, Memories, Overview, definition and function of operating system, need of operating System, | | | |
| **Unit- II** | | **Classification of Computer Languages** | |
| Machine, assembly and high level languages .Brief idea of operating systemAssembler, compiler and interpreter  Number Systems :Binary, octal, decimal and hexadecimal representation of numbers.Integers and floating point numbers.Representation of characters, ASCII and EBCDIC codes.Binary Arithmetic: addition, subtraction, complements | | | |
| **Unit-III** | **An overview of information technology** | | |
| An overview of information technology, difference between data and information, quality, of information, Information system.  Introduction to internet: www, web browser, search engine, email, open source software’s, Search Engine optimization | | | |
| **Unit-IV** | | | **Introduction to e-commerce** |
| Introduction to e-commerce and its advantage, Types of E-Commerce, B2B, B2M, M2B, M2M, Electronic payment system, E-governance,  Introduction to Information Security, cryptography, digital signature and smart card technology, | | | |
| **Unit-V** | | | **Introduction to LAN, WAN, MAN** |
| Transmission mediaData transmission type: Introduction to OSI reference model, Analog and digital signals,, Network topologies, client-server architecture, ISDN, Broad Band | | | |
| **Reference books** | | | * 1. Computer Fundamentals: Architecture and Organization, by B Ram, New Age International Publisher   2. Computer Fundamentals: Architecture and Organization, by B Ram, New Age International Publisher   3. Information Technology and the Networked Economy, Second Edition ByMcKeown, Patrick G.   4. Internet & Intranet Engineering, Tata McGraw Hill company.   5. Information Technology by AjitPoonia.   6. Information Technology by D.P. Sharma |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **CY111** | | **Fundamentals of Chemistry - I** | |
| **Prerequisite** | | All students are expected to have a general knowledge of organic and inorganic chemistry principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the atomic structure, To gain knowledge about electron displacement effects, To have understanding about chemical reaction mechanisms. | |
| **Salient features** | | The student will be able to conceptualize about hybridization, Able to analysephysical effect in organic chemistry. | |
| **Utility** | | A degree in Biology and chemistry allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous | |
| **Unit-I** | | **Atomic Structure** | |
| Atomic Structure: Recapitulation of: Bohr’s theory de-Broglie’s relation, Heisenberg Uncertainty principle. Need of a new approach to Atomic structure. Time independent Schrodinger equation (H Ψ = EΨ). Significance of Ψ and Ψ 2 , Schrodinger equation for hydrogen atom. Transformation of Cartesian coordinates (x,y,z) into polar coordinates (r,θ,φ). Radial and angular parts of the hydogenicavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals. (Only graphical epresentation), Radial and angular nodes and their significance. Radial distribution functions (1s and 2s atomic orbitals). Significance of quantum numbers, orbital angular momentum and quantum numbers mr and ms. Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Electronic configurations of the atoms. Concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations. | | | |
| **Unit- II** | | **Chemical Bonding and Molecular Structure** | |
| Chemical Bonding and Molecular Structure Ionic Bonding : Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Born-Lande equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan’s rules, bond moment, dipole moment and percentage ionic character. Covalent bonding :VB Approach : Concept of hybridization and VSEPR theory . Resonance and resonance energy : study of some inorganic and organic compounds. Molecular Orbital Approach : LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combination of atomic orbitals, non- bonding combination of orbitals ,MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and NO+ | | | |
| **Unit-III** | **Fundamentals of Organic Chemistry** | | |
| Fundamentals of Organic Chemistry :Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules : Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Huckel’s rule | | | |
| **Unit-IV** | | | **Stereochemistry** |
| Stereochemistry :Conformations w.r.t. ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newman, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; nantiomerism, Diastereomerism and Meso compounds) . Threo and erythro; D and L; cis - trans omenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems). | | | |
| **Unit-V** | | | **Aliphatic Hydrocarbons** |
| Aliphatic Hydrocarbons-Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Alkanes: (Upto 5 Carbons) Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe’s synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff’s rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine). Add | | | |
| **Reference books** | | | 1. J. D. Lee : A new Concise Inorganic Chemistry, E L. B. S.  2. James E. Huheey, Ellen Keiter and Richard Keiter : Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Publication.  3. I. L. Finar : Organic Chemistry (Vol. I & II), E. L. B. S.  4. R. T. Morrison & R. N. Boyd : Organic Chemistry, Prentice Hall.  5. ArunBahl and B. S. Bahl : Advanced Organic Chemistry, S. Chand  6. Peter Sykes : A Guide Book to Mechanism in Organic Chemistry, Orient Longman. |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **BY111** | | **BOTANY 1: SYSTEMATICS AND PLANT DIVERSITY** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology and taxonomic principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the plant taxonomy, To gain knowledge about microorganism, To have understanding about gymnosperm and angiosperm, Able to analyse life cycle pattern. | |
| **Salient features** | | The student will be able to conceptualize about identification of algae, fungi and bryophytes, Able to analyse economic importance of gymnosperm and angiosperms. | |
| **Utility** | | A degree in Biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous | |
| **Unit-I** | | **Plant Taxonomy** | |
| Plant Taxonomy.Principles of classification, nomenclature; comparative study of different classification systems, viz. Linnaeus, Bentham & Hooker, Engler&Prantl, Hutchinson, and Cronquist. Herbarium techniques and important BotanicGardens. | | | |
| **Unit- II** | | **Algae** | |
| Algae- General characters, classification (upto classes) and economic importance;  important features and life-history (excluding development) of Volvox, Oedogonium (Chlorophyceae), Vaucheria (Xanthophyceae), Ectocrpus (Phaeophyceae) and Polysiphonia (Rhodophyceae). | | | |
| **Unit-III** | **Fungi** | | |
| Fungi- General characters, classification (upto classes) and economic importance; important features and life-history of Phytophthora (Mastigomycotina), Mucor (Zygomycotina), Penicillium (Ascomycotina), Puccinia, Agaricus (Basidiomycotina), Colletotrichum (Deuteromycotina); General account of Lichens. | | | |
| **Unit-IV** | | | **Bryophytes and Pteridophytes** |
| Bryophytes and Pteridophytes. Important Characteristics and Classification up to classes. Habit, Habitat and life cycle patterns.Ecological and Economic importance of Marchantia (Hepaticopsida), Anthoceros (Anthocerotopsida), Funaria (Bryopsida), Rhynia (Psilopsida), Selaginella (Lycopsida), Equisetum (Sphenopsida) and Pteris (Pteropsida). | | | |
| **Unit-V** | | | **Gymnosperms and Angiosperms** |
| Gymnosperms and Angiosperms- Important Characteristics and Classification up to classes,Life cycle patterns (Saprophyte and gametophyte). Ecological and Economic importance of Cycas and Pinus | | | |
| **Reference books** | | | 1. Rastogi V.B. Organic Evolution. Rastogi Publication.  2. Clifton A., Introduction of Bacteria, McGrawHill Co. Ltd. New York 1985.  3. Kaushik P. Microbiology, Emkay Publication, 2001.  4. Pelczer, Chan and Kruig. Microbiology. McGraw Hill Co., London, 1995.  5. De Robertis& De Robertis Cell and Molecular Biology.Lippincott Williams and Wilkins.  6. P.K. Gupta, Cell and Molecular Biology.Rastogi Publication.  7. C.B. Powar – Cell Biology,Himalaya Publishing House.  8. V.B. Rastogi – Cell Biology.Rastogi Publications.  9. Dube, H.C. Fungi, Rastogi Publication, Merrut, 1989.  10. Vashishtha P.C. Gymnosperm, S. Chand Company.  11. Singh Pandey Jain, A text Book of Botany, Rastogi Publication. |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **ZY111** | | **ZOOLOGY I- SYSTEMATICS AND ANIMAL DIVERSITY** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the multicellular animal, To gain knowledge about reproduction in non-chordates, To have understanding about hemichordate. | |
| **Salient features** | | The student will be able to conceptualize about concept of five kingdom, Able to analyse economic importance of chordates. | |
| **Utility** | | A degree in Biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous | |
| **Unit-I** | | **Criteria for classification of multicellular animals** | |
| Criteria for classification of multicellular animals. Taxonomy and classification: General principles of taxonomy - Binomial nomenclature, -Trinomial nomenclature, Rules of nomenclature, Concept of Five kingdom, concept of protozoa, metazoan and levels of organization. Basis of Classification: symmetry, coelom, segmentation and embryology. | | | |
| **Unit- II** | | **Non–Chordates** | |
| Non–Chordates: General characters and Outline Classification upto class, Economic importance. Protozoans - Entamoebahistolytica. Poriferans - Skeleton and canal system of sponges.Coelenterates - Coral and coral reefs.Platyhelminths - Parasitic adaptations. Aschelminthes - Nematodiasis. | | | |
| **Unit-III** | **Non–Chordates** | | |
| Non–Chordates: General characters and Outline Classification up to class, Economic importance. Annelids –Vermiculture. Arthropods - Larval forms. Molluscs - Pearl culture. Echinoderms - Water vascular system | | | |
| **Unit-IV** | | | **Hemichordata** |
| Hemichordata :Classification (up to class) and Habit, habitat, distribution and General characters. Protochordates: Urochordates, Cephalochordates**.** Cyclostomes | | | |
| **Unit-V** | | | **Chordates** |
| Chordates: General characters and Outline Classification up to order, Economic importance of, Fishes, Amphibian, Reptiles, Birds and Mammals. | | | |
| **Reference books** | | | 1. R .L.Kotpal :Modern text book of biology – Invertebrate –(Rastogi Publication, Meerut). 2. Jordan, E. L. : Invertebrate Zoology ( S. Chand Co. New Delhi.). 3. Dhami and Dhami : Invertebrate Zoology ( S. Chand & Co. New Delhi). 4. Shrivastava, : Economic Zoology. ( CommercialPub.brue,N.Delhi). 5. Vishwapremi K.K., : Economic Zoology (AkashdeepPub.House,New Delhi). 6. V.P.Agrawal and L. D.Chaturvedi: A text book of Invertebrate Zoology –(Jagmander Book Agency, New Delhi). 7. R.L.Kotpal :Modern text book of biology –Vertebrate –(Rastogi Publication, Meerut). 8. Young, J.Z. : Life of Vertebrate.(E L B S) 1983.Oxford. 9. Dalela, R.C. : A text book of Chordate Zoology, (Jai Prakash Nath publications, Meerut.). 10. Newman, H.H. : The phylum Chordate, (Satish Book Enterprise, Agra). 11. Jordon, E.L. :Vertebate Zoology, ( S.Chand and Co., New Delhi.). |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **ES101** | | **ENVIRONMENTAL STUDIES** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology and environment principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the Environment, To gain knowledge about surroundings, To have understanding about nature of environment, Able to analyse climate change factors. | |
| **Salient features** | | The student will be able to conceptualize about all aspects of organisms, to encourage greater benevolence in the relationship between humans and the natural environment and to implement biological factors into various technologies or management techniques. | |
| **Utility** | | A degree in Biology opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, forestry technicians and forestry workers. | |
| **Unit-I** | | **Man & Environment** | |
| Man & Environment: Definition of Environment & its various components. Ecosystem concepts. Dependence of Man on nature for its various needs. Human population growth & its impacts on environment. Environment & human health. Environmental concerns including climate change, Global warming, Acid Rain, Ozone layer Depletion etc. Environmental ethics. Traditional ways of utilizing various components of environment. Sustainable developments. | | | |
| **Unit- II** | | **Natural Resources** | |
| Natural Resources: Forest resources, Mining, Dams & their effects on forests & tribal people. Water resources-over utilization of water, floods, droughts and conflicts over water resources. Mineral Resources- Use of various minerals for Human welfare & environmental effects of mining. Food resources -World food problem. Impacts of changing Agriculture practices on Environment. Energy Resources-Renewable and non renewable energy Resources & exploration of alternative energy sources. Land Resources- land degradation, soil erosion, desertification and soil contamination. | | | |
| **Unit-III** | **Ecosystems** | | |
| Ecosystems: Structure & function, energy flow, food chains, food webs, Ecological pyramids. Basics of forest grasslands, desert & aquatic ecosystem (Ponds, Streams, Lakes, Rivers, Oceans & Estuaries) | | | |
| **Unit-IV** | | | **Biological Diversity** |
| Biological Diversity: Genetic, species & ecosystem diversity, Values of Biodiversity, Global, National & Local Biodiversity. Hot-spots of Biodiversity, threat to biodiversity. Endangered & endemic species of India. Conservation of biodiversity in situ & ex-situ | | | |
| **Unit-V** | | | **Environment pollution** |
| Environment pollution: Causes, effects & control of- Air pollution, Water pollution, Soil pollution, Noise Pollution, Thermal pollution & Nuclear Hazards. Solid wastes & their Management. Disaster Management-Flood, Drought, Earthquake, Landslides etc. | | | |
| **Reference books** | | | 1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.  2. BharuchaErach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad –  3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.  4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).  5. Cunningham WP, Cooper TH, Gorhani E & Hepworth MT, 2001. Environmental Encyclopaedia, JaicoPublishing House, Mumbai |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **EN 102** | **English language 2** | |
| **Prerequisite** | Nil | |
| **Learning objective** | The learning objective of course are: 1.To develop a professional orientation | |
| **Salient features** | 1. Conduct themselves with professionalism in organizations, 2. To face interview with confidence. 3. To improve the soft skills | |
| **Utility** | A degree in forestry opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, forestry technicians and forestry workers. | |
| **Unit-I** | **Commercial Correspondence** | |
| 1. Style and Construction 2. Significant Commercial terms and Phrases 3. Letter of Inquiry 4. Letter of Quotation 5. Letter of Order 6. Letter of Execution of Order 7. Letter of Complaint 8. Letter of Collection 9. Circular Letter   Application for Agency | | |
| **Unit- II** | **Official Correspondence:** | |
| Official Letter. Semi-Official Letter. Memorandum  Journalistic Competitions on Commercial Topics:   1. Editorial Note on a Commercial Topic 2. Letter to the Editor on Economic and Commercial Topics 3. Script Writing for the Media 4. Journalistic Report Writing, Press Release 5. Writing Advertisement Copy 6. Writing for Internet   Precise Writing | | |
| **Unit-III** | **Theme Writing** | |
| (Report writing/Academic and Journalistic writing) | | |
| **Unit-IV** | | **Paragraph Writing and Essay writing** |
|  | | |
| **Unit-V** | | **Advanced Comprehension** |
|  | | |
| **Reference books** | | 1. Modern English –N. Krishnaswamy, Macmillan publication 2. Oxford Guide to Writing and Speaking – John Selly Oxford University press 3. Communicative Grammar and Composition by Rajesh K. Lidiya,2008 Oxford Uni. Press,   New Delhi  4. Communicative Grammar and Composition, by Rajesh K. Lidiya,2013 OUP, New Delhi  5. Effective Technical Communication by M. Ashraf Rizvi 2005 ,Tata McGrew Hill New Delhi  6. Technical Communication by Meenakshi Raman &Sangeeta Sharma ,2008 OUP New Delhi  7. Business Communication by Meenakshi Raman & Prakash singh, OUP, New Delhi  8. A Practical Course for developing Writing Skills In English by J.K. Gangal PHI Learning Pvt. Ltd. New Delhi. |
| **Mode of Examination** | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | |  |
| **Approved by academic council on:** | |  |

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| **CP 101** | | **Elementary Computer** | |
| **Prerequisite** | | Nil | |
| **Learning objective** | | This course aims to:  – give a general understanding of how a computer works   * Aware about operating system, various Computer Languages and number system * Give a general understanding of Internet, information technology, e-commerce and Networks | |
| **Salient features** | | The students will able to   * Understand what is computer and how is it works. * Understand what number system, operating system, computer language is.   Understanding the Role of Information Technology | |
| **Utility** | | A B. Tech degree in biotechnology opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, biotechnology technicians and life science laboratory. | |
| **Unit-I** | | **Introduction** | |
| Types of computers and generations .Basic architecture of computers and its building blocks .Input-Output devices, Memories, Overview, definition and function of operating system, need of operating System, | | | |
| **Unit- II** | | **Classification of Computer Languages** | |
| Machine, assembly and high level languages .Brief idea of operating systemAssembler, compiler and interpreter  Number Systems :Binary, octal, decimal and hexadecimal representation of numbers.Integers and floating point numbers.Representation of characters, ASCII and EBCDIC codes.Binary Arithmetic: addition, subtraction, complements | | | |
| **Unit-III** | **An overview of information technology** | | |
| An overview of information technology, difference between data and information, quality, of information, Information system.  Introduction to internet: www, web browser, search engine, email, open source software’s, Search Engine optimization | | | |
| **Unit-IV** | | | **Introduction to e-commerce** |
| Introduction to e-commerce and its advantage, Types of E-Commerce, B2B, B2M, M2B, M2M, Electronic payment system, E-governance,  Introduction to Information Security, cryptography, digital signature and smart card technology, | | | |
| **Unit-V** | | | **Introduction to LAN, WAN, MAN** |
| Transmission mediaData transmission type: Introduction to OSI reference model, Analog and digital signals,, Network topologies, client-server architecture, ISDN, Broad Band | | | |
| **Reference books** | | | * 1. Computer Fundamentals: Architecture and Organization, by B Ram, New Age International Publisher   2. Computer Fundamentals: Architecture and Organization, by B Ram, New Age International Publisher   3. Information Technology and the Networked Economy, Second Edition ByMcKeown, Patrick G.   4. Internet & Intranet Engineering, Tata McGraw Hill company.   5. Information Technology by AjitPoonia.   6. Information Technology by D.P. Sharma |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **CY 112** | | **Fundamentals of Chemistry - II** | |
| **Prerequisite** | | All students are expected to have a general knowledge of organic, inorganic and physical chemistry. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the thermodyanamics, To gain knowledge about chemical equilibrium, To have understanding about ionic equilibrium, Able to analyse reaction mechanisms. | |
| **Salient features** | | The student will be able to conceptualize about nucleophilic substitution reaction, Able to analyse hydrolysis of salt. | |
| **Utility** | | A degree in Biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous. | |
| **Unit-I** | | **Chemical Thermodynamics** | |
| Chemical Thermodynamics: What is thermodynamics? State of a system, state variables, intensive and extensive variables, concept of heat and work, thermodynamic equilibrium, thermodynamic properties, various types of systems and processes. First Law of thermodynamics. Calculation of work (w), heat (q), changes in internal energy (∆U) and enthalpy (∆H) for expansion or compression of ideal gases under isothermal and adiabatic conditions for both reversible and irreversible processes. Calculation of w, q, ∆U and ∆H for processes involving changes in physical states. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. | | | |
| **Unit- II** | | **Chemical Equilibrium** | |
| Chemical Equilibrium: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ∆G and ∆Gѳ, Le Chatelier’s principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases. | | | |
| **Unit-III** | **Ionic Equilibria** | | |
| Ionic Equilibria:Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect, Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. | | | |
| **Unit-IV** | | | **Aromatic hydrocarbons** |
| Aromatic hydrocarbons: Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions : (Case benzene) : Electrophilic substitution: nitration, halogenation and sulphonation. FrieCraft’s reaction (alkylation and acylation). (Upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (Upto 4 carbons on benzene). Unit 5. Alkyl and Aryl Halides Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN2, SN1 and SNi) reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile &iso-nitrile formation. Williamson’s ether synthesis: Elimination vs substitution. | | | |
| **Unit-V** | | | **Alcohols, Phenols and Ethers** |
| Alcohols, Phenols and Ethers (Upto 5 Carbons) Alcohols: Preparation: Preparation of 1 3 alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acid. dichromate, con. HNO3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement. Phenols: (Phenol case) Preparation: Cumenehydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer - Tiemann Reaction, Gattermann-Koch Reaction, | | | |
| **Reference books** | | | 1 Barrow, G. M. Physical Chemistry Tata McGraw-Hill (2007).  2. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).  3. Mahan, B. H. University Chemistry 3rd Ed. Narosa (1998).  4. I. L. Finar : Organic Chemistry (Vol. I & II), E. L. B. S.  5. R. T. Morrison & R. N. Boyd : Organic Chemistry, Prentice Hall.  6. ArunBahl and B. S. Bahl : Advanced Organic Chemistry, S. Chand  7. Peter Sykes : A Guide Book to Mechanism in Organic Chemistry, Orient Longman. |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **BY 112** | | **BOTANY II MICROBIOLOGY AND PLANT PATHOLOGY** | |
| **Prerequisite** | | All students are expected to have a general knowledge of cell andbiology. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the microbiology, To gain knowledge about genetic recombination, To have understanding about economic importance of microorganism, Able to analyse timber management. | |
| **Salient features** | | The student will be able to conceptualize structure and function of cell, Able to analysesymptoms of microbial diseases. | |
| **Utility** | | A degree in Biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous. | |
| **Unit-I** | | **History and scope of Microbiology** | |
| History and scope of Microbiology. Position of microorganisms in the living world; morphological, metabolic and molecular criteria for the classification of bacteria | | | |
| **Unit- II** | | **Prokaryotic cell structure** | |
| Prokaryotic cell structure. Bacterial cell structures: capsule and slime, flagella, cell wall, cell membrane, chromosome, plasmid and endospore | | | |
| **Unit-III** | **Bacteriophages and genetic recombination** | | |
| Bacteriophages and genetic recombination .Structure ofBacteriophagesbelonging to 'T' series. Lysogenic and lytic cycles. A brief account of genetic recombination in bacteria (transformation, conjugation and transduction) | | | |
| **Unit-IV** | | | **Economic importance of microorganisms** |
| Economic importance of microorganisms. Role of microorganisms in cycling of carbon and nitrogen.Microorganisms and the production of alcoholic beverages, antibiotics and single cell protein | | | |
| **Unit-V** | | | **Plant pathology** |
| Plant pathology. General symptoms of viral, bacterial and fungal diseases of plants.  The study of the following plant diseases: Tobacco mosaic, citrus canker, late blight of potato, powdery mildew of pea, loose smut of wheat, covered smut of barley and wilt of pigeon pea | | | |
| **Reference books** | | | 1. Pelczar, M.J. (2001) Microbiology, 5thedition, Tata Mc Graw-Hill Co, New Delhi. 2. Presscott, L. Harley, J. and Klein, D. (2005) Microbiology, 6 thedition, Tata Mc Graw-Hill Co. New Delhi. |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **ZY 112** | | **ZOOLOGY II CELL BIOLOGY AND BIOCHEMISTRY** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology and basic principles in science. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the cell biology, To gain knowledge about biomolecules, To have understanding about cell reproduction. | |
| **Salient features** | | The student will be able to conceptualize about tools and technique use in biology, Able to analyseclassification of proteins. | |
| **Utility** | | A degree in Biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Educators rely on biology to teach the study of life to future generations. Field biologists use biology to understand relationship between living organisms and to notice what’s beneficial and what is imbalanced and dangerous. | |
| **Unit-I** | | **Introduction to cell** | |
| Introduction to cell: Morphology, size, shape and characteristics of Prokaryotic, Eukaryotic, Plant and animal cells; cell-theory. Cell membrane: Characteristics of cell membrane molecules, fluid mosaic model of Singer and Nicolson, concept of unit membrane. Cell membrane transport: Passive (diffusion and osmosis facilitated (mediated) and active transport. | | | |
| **Unit- II** | | **Tools and techniques used in cell study** | |
| Tools and techniques used in cell study; ultrastructures and functions of different cell organelles of eukaryotes and prokaryotes (cell wall, plasmamembrane, nucleus, mitochondria, chloroplast, ribosome, peroxisomes, golgi bodies, etc.). | | | |
| **Unit-III** | **Cell reproduction** | | |
| Cell reproduction**,** Basic features of cell cycle, Mitosis, mitotic spindle and chromosome movement, Process and phases of meiosis and its significance , Cell divisions: cell cycles, mitosis phases. | | | |
| **Unit-IV** | | | **Protein classification** |
| Protein classification and biological significance, Amino acids, zwitterion, properties of peptide bond, General properties, Major classes and classification of enzymes, Mechanism of enzyme action | | | |
| **Unit-V** | | | **Carbohydrates** |
| Carbohydrates and lipid Classification, biological significance, Structure and physiochemical Properties of Monosaccharides, Oligosaccharides (disaccharides) and polysaccharides, Lipids, Wax, Glycerol and Triacyl Glycerol. | | | |
| **Reference books** | | | 1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6thEdition. John Wiley & Sons. Inc. 2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8thedition. Lippincott Williams and Wilkins, Philadelphia. 3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5 thedition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA. 4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7thedition. Pearson Benjamin Cummings Publishing, San Francisco. 5. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists. 6. Elliot (2009) Biochemistry and Molecular Biology. Oxford Publishers. 7. Nelson, D.L., Cox, M.M. (2004) Lehninger Principles of Biochemistry, 4thEdition, WH Freeman and Company, New York, USA |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

 

**SYLLABUS**

**B. Sc. Biology PROGRAMME 2ndYEAR**

**School of Sciences**

**EDITION2015**

# SCHOOL OF SCIENCES

**B. Sc. Biology 2nd year**

**Teaching&ExaminationScheme**

**Edition2015**

#### B.Sc. BiologyCourse2ndyear Semester: III

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| **S.**  **No.** | **Course code** | **Course Name** | **Credits** | **ContactHrs/Wk.** | | | | **ExamHrs.** | **Weightage(in%)** | |
| **L** | **T/S** | | **P** | **CE** | **ESE** |
|  |  | 1. **University Core** |  |  |  |  | |  |  |  |
| 1. | PCA 103 | Proficiency in Co-curricular Activities | 2 | 0 | 0 | 0 | | 0 | 100 | 0 |
| 2. | EM 203 | Employability Skills | 1 | 1 | 0 | 0 | | 0 | 100 | 0 |
|  |  | 1. **Programme Core** |  |  |  |  | |  |  |  |
|  |  | **Theory** |  |  |  |  | |  |  |  |
| 3. | BY 113 | Botany III- Diversity of Microbes and Cryptogams (Thallophyta) | 4 | 4 | 0 | 0 | | 3 | 40 | 60 |
| 4. | CY-211 | Chemistry –III (Inorganic-I ) | 4 | 3 | 1 | 0 | | 3 | 40 | 60 |
| 5. | CY-213 | Chemistry –IV (Organic-I ) | 4 | 3 | 1 | 0 | | 3 | 40 | 60 |
| 6. | ZY 113 | Zoology III- Genetics and Biotechnology | 4 | 4 | 0 | 0 | | 3 | 40 | 60 |
|  |  | **Practical**  B.Practical&Sessional: |  |  |  |  | |  |  |  |
| 7. | BY 163 | Botany III- Diversity of Microbes and Cryptogams (Thallophyta) Lab | 2 | 0 | 0 | 3 | | 3 | 60 | 40 |
| 8. | CY-261 | Chemistry- III Lab | 2 | 0 | 0 | 3 | | 3 | 60 | 40 |
| 9. | ZY 163 | Zoology III- Genetics and Biotechnology Lab | 2 | 0 | 0 | 3 | | 3 | 60 | 40 |
|  |  | **University Elective** | **-** |  |  |  | |  |  |  |
|  |  | **Program Elective** | **-** |  |  |  | |  |  |  |
|  |  | **Total** | **25** | **15** | **2** | **9** | |  |  |  |

# SCHOOL OF SCIENCES

**B. Sc. Biology 2nd year**

**Teaching&ExaminationScheme**

**Edition2015**

#### B. Sc. Biology Course2ndyear Semester:IV

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| **S.**  **No.** | **Coursecode** | **CourseName** | **Credits** | **ContactHrs/Wk.** | | | | **ExamHrs.** | **Weightage(in%)** | |
| **L** | **T/S** | | **P** | **CE** | **ESE** |
|  |  | 1. **University Core** |  |  |  |  | |  |  |  |
| 1. | PCA 104 | Proficiency in Co-curricular Activities | 2 | 0 | 0 | 0 | | 0 | 100 | 0 |
| 2. | EM 204 | Employability Skills | 1 | 1 | 0 | 0 | | 0 | 100 | 0 |
|  |  | 1. **Programme Core** |  |  |  |  | |  |  |  |
|  |  | **Theory** |  |  |  |  | |  |  |  |
| 4. | BY 114 | Botany IV- Diversity of Cryptogams (Bryophyta,Pteridophyta and Paleobotany) | 4 | 4 | 0 | 0 | | 3 | 40 | 60 |
| 5. | CY-212 | Chemistry- V (Physical-I) | 4 | 3 | 1 | 0 | | 3 | 40 | 60 |
| 6. | ZY 114 | ZoologyIV-Endocrinology and Ethology | 4 | 4 | 0 | 0 | | 3 | 40 | 60 |
| 7. | ZY 116 | Zoology-V Gamete and Developmental Biology | 4 | 4 | 0 | 0 | | 3 | 40 | 60 |
|  |  | **Practical**  B.Practical&Sessional: |  |  |  |  | |  |  |  |
| 8. | BY 164 | Botany IV- Diversity of Cryptogams (Bryophyta,Pteridophyta and Paleobotany)  Lab | 2 | 0 | 0 | 3 | | 4 | 60 | 40 |
| 9. | CY-262 | Chemistry -IV Lab | 2 | 0 | 0 | 3 | | 3 | 60 | 40 |
| 10. | ZY 164 | ZoologyIV-Endocrinology and Ethology Lab | 2 | 0 | 0 | 3 | | 4 | 60 | 40 |
|  |  | **University Elective** |  |  |  |  | |  |  |  |
|  |  | **Program Elective** |  |  |  |  | |  |  |  |
|  |  | **Total** | **25** | **16** | **1** | **9** | |  |  |  |

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| **BY 113** | | **Botany III Diversity of Microbes and Cryptogams (Thallophyta)** | |
| **Prerequisite** | | All students are expected to have a general knowledge of Microorganism. | |
| **Learning objective** | | The learning objectives of course are: To create an understanding regarding the Botany, To gain knowledge about classification, To have understanding about microorganisms. | |
| **Salient features** | | The student will be able to understandmicrobial diversity and management, Able to analyseeconomic importance of microorganism. | |
| **Utility** | | A degree in botany opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, and biotechnology. | |
| **Unit-I** | | **Viruses and Bacteria** | |
| Viruses and Bacteria: General account of viruses and mycoplasma, bacteria-structure, nutrition. reproduction and economic importance, General account of Cyanobacteria, economic importance, Nostoc, Oscillatoria | | | |
| **Unit- II** | | **Algae** | |
| Algae : General Characters, classification and economic importance, important features and life history of chlorophyceae : Volvox, Oedogonium, Coleochaete, Chara | | | |
| **Unit-III** | **Classification and economic importance of algae** | | |
| Algae : General Characters, classification and economic importance, important features and life history of Xanthophyceae - Vaucheria, Phaeophyceae-EctocarpusSargassum,Rhodophyceae - Polysiphonia. | | | |
| **Unit-IV** | | | **Fungi** |
| Fungi : General characters, classification and economic importance; important features and life history of Mastigomycotina-Pythium, PhytophthoraOomycotina-Albugo,Ascomycotina- Saccharomyces,Penicillium, Chaetomium, Erysiphae, Peziza. Basidiomycotina-Puccinia, Ustilago and Agaricus, Deuteromycotina-Cercospora, Colletotrichum. | | | |
| **Unit-V** | | | **Lichens** |
| Type studies-Anthocerotopsida-Anthoceros, Bryopsida-Sphagum..Lichens- General characters, habitat, structure, reproduction and economic and ecological importance of lichens. | | | |
| **Reference books** | | | 1. Atherly, A.G., Girton, J.R. and Mc Donald, J.F. 1999 The Science of Genetics, Saunders College Publishing, Fort Worth, U.S.A.  2. Gupta, P.K. 1999 A Text book of cell and Molecular Biology, Rastogi Publications, Meerut, India.  3. Russel, P.J. 1998 Genetics, Saunders College Publishing, Fort Worth, U.S.A.  4. Snustad, D.P. and Simmons, M.J.2000 Principles of Genetics, John Wiley and Sons, Inc., U.S.A.  5. Gupta P.K. 1999. Genetics Rastogi Publications Meerut.  6. Vashistha, B.R. 1989, Algae, S. Chand and Co. Delhi.  7. Vashistha, B.R. 1989, Fungi, S. Chand and Co. Delhi.  8. Pandey S.N. & others. 1995, A Text Book of Botany Vol. I, Vikas Publications Dehli  9. Pandey S.N. & others. 1995, A Text Book of Botany Vol. II, Vikas Publications Dehli |
| **Mode of Examination** | | | Assignment/Quiz/Viva-Voce/student seminar/written examination/PPT |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **CY 211** | | **Chemistry-III Inorganic Chemistry- I** | |
| **Prerequisite** | | All students are expected to have a general knowledge of general chemistry principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the transition element, To gain knowledge about oxidation reduction, To have understanding about nature of organomettalic compound, Able to structure of solid. | |
| **Salient features** | | The student will be able to conceptualize Acid or Base, Able to analyse. Crystal structure of solid. | |
| **Utility** | | A degree in forestry opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, chemist | |
| **Unit-I** | | **Chemistry of Second and Third Transition Series** | |
| Chemistry of Second and Third Transition Series Characteristic properties of d-block elements. Binary compounds (hydrides, carbides and oxides) of the elements of the first transition series and complexes with respect to relative stability of their oxidation states, coordination number and geometry. Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment of Zr/Hf, Nb/Ta, Mo/W in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry | | | |
| **Unit- II** | | **Acid Base** | |
| Acid Base: Acid base concepts, Role of solvent, Relative strengths of acids and bases,Ionization, Law of mass action, Common ion effect, Ionic product of water, pH, Hydrolysis of salts, Henderson Hesselbachequation,Buffer solutions, Neutralization curves, Acid base indicators, Theory of indicators, Choice of indicators, Mixed indicators,Polyprotic system, Polyamine and amino acid systems, Amino acid titration, applications in assay of H3PO4, NaOH, CaCO3 etc. | | | |
| **Unit-III** | **Oxidation Reduction** | | |
| Oxidation Reduction: Concepts of Oxidation and reduction, Redox reactions, Strengths and equivalent weights of oxidizing and reducing agents, Theory of Rredox titrations, Redox indicators, Cell representations, Measurement of electrode potential, Oxidation-reduction curves, Iodimetry and Iodometry, Titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate; titanous chloride and Sodium 2, 6 dichlorophenol indophenol. | | | |
| **Unit-IV** | | | **Organometallic compounds** |
| Organometallic compounds ;Definition Nomenclature ,Preparation properties ,,,application and bonding of alkyl and Aryl compound of Lithium, Aluminium , Mercury and Titanium | | | |
| **Unit-V** | | | **Solid States** |
| Solid States:Definition of space lattice, unit cell; Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices (iii) Law of symmetry, Symmetry elements in crystals. X-ray diffraction by crystals, Derivation of Bragg equation, Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). | | | |
| **Reference books** | | | 1. Basic Inorganic Chemistry F.A. Cotton. G. Wilkinson and P.L. Gaus. Wiley.  2. Concise Inorganic Chemistry, J.D. Lee ELBS.  3. Concepts of Models Inorganic Chemistry B.Douglas. D.McDaniel and J.Alexander, John Wiley.  4. Inorganic Chemistry. D.E. Shriver P.W. Atkins and C.H. Langfor, Oxford.  5. Inorganic Chemistry, W.W. Porterfield Addison Wesley.  6. Inorganic Chemistry, A.G. Sharpe. ELBS.  7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.  8. Group Theory and Its Chemical Applications : P. K. Bhattacharya  9. Inorganic Chemistry: J. E. Huyee, Principles of Structure & Reactivity, 3rd Ed.  10. Selected Topics in Inorganic Chemistry : W. U. Malik, G. D. Tuli and R. Madan  11. Principles of Inorganic chemistry : D. Banerje  12. Modern Aspect of Inorganic Chemistry : H. J. Emeleus and A. G. Sharpe |
| **Mode of Examination** | | |  |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **ZY 113** | | **Zoology III- Genetics and Biotechnology** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology and basic principle of genetics. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding mendelian genetics, To gain knowledge about genetic disorder, To have understanding about molecular genetics, Able to understand environmental biotechnology. | |
| **Salient features** | | The student will be able to conceptualize about sex determination, Able to understand gene cloning principle.. | |
| **Utility** | | A degree in forestry opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, forestry technicians and forestry workers. | |
| **Unit-I** | | **Mendelian Genetics** | |
| Mendelian Genetics: - Mendel’s laws of inheritance. Monohybrid and dihybrid cross. Dominance. Incomplete dominance. Current status of Mendelism. Genetic variation:Variation in chromosome number (Euploidy and Aneuploidy). | | | |
| **Unit- II** | | **Genetic disorders in Human beings** | |
| Genetic disorders in Human beings (Down’s, Turner’s, Klinefelter’s and Edward’s  syndrome) Types of chromosomal mutations. Molecular basis of gene mutation, mutagens, crossing over and linkage. | | | |
| **Unit-III** | **Sex-determination** | | |
| Sex-determination XX-XY. XO-XY and WZ mechanisms. Sex-linked inheritance (X-and Y-linked) Color blindness. Haemophilia.Gene interactions. Supplementary,  complementary, epistasis and inhibitory. Multiple allele-ABO, Rh and MN blood groups and their inheritance, polymorphic genes. | | | |
| **Unit-IV** | | | **Molecular genetics** |
| Molecular genetics: Nucleic acids, structure, function and type of DNA. Structure,  function and types of RNA, genetic code. Transcription, protein synthesis. Gene structure (Recon. muton, cistron) and regulation of gene (lac operon: inducible and repressible system). Bacterial genetic transformation, Transduction and conjugation. Lytic and lysogenic cycle. Elementary idea about eugenics. Elementary idea about genetic engineering. Gene cloning and recombinant DNA technology (Vectors for gene transfers. Plasmids and phages). Restriction enzymes. | | | |
| **Unit-V** | | | **Enviornmental Biotechnology** |
| Introduction. Historical prospective animal cell hybridoma, major areas and future prospects of biotechnology. Medicines and Biotechnology: Microbes in medicine, antibiotics, vaccine, antibodies, antigens.  Enviornmental Biotechnology: use of micro organisms in metal and petroleum recovery pest control. Waste treatment, Processing of industrial waste. Degradation of Xenophobic compounds including pesticides and surfactants. Surfactants and oil pollutants,  Food and Beverage biotechnology, Ferment food dairy products. Food preservation microbial spoilage, alcoholic beverages, Vinegar. Monoclonal antibodies and their applications. | | | |
| **Reference books** | | | 1.Microbial genetics – Friedfelder  2. Principles of gene manipulation – Old and Primrose  3. Genes VII by Lewine  4. Microbiology –Pelczar  5Text book of Microbiology by Tortora  6. Microbiology by Brock |
| **Mode of Examination** | | |  |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **BY 114** | | **Botany-Diversity of Cryptogams (Bryophyta, Pteridophyta and Paleobotany)** | |
| **Prerequisite** | | All students are expected to have a general knowledge of botany principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the classification of bryophyta, To gain knowledge about reproduction in bryophyta, To have understanding about of economic importance of bryophyta, | |
| **Salient features** | | The student will be able to conceptualize about characteristics of pteridophyta, Able to analysefossils. | |
| **Utility** | | A degree in forestry opens doors to job opportunities in science, industry and environmental management, Conservation and Resource Management, Forest Rangers, tree genetics and biotechnology, forestry technicians and forestry workers. | |
| **Unit-I** | | **Bryophyta** | |
| Bryophyta : General characteristics and classification of bryophyta, alternation of generation | | | |
| **Unit- II** | | **economic importance** | |
| Structure, reproduction and economic / importance of Hepaticopsida. Riccia, Marchantia and Porella, Anthoceratopsida-Anthoceros, Bryopsida-Sphagnum, Polytrichum. | | | |
| **Unit-III** | **Pteridophyta** | | |
| The first vascular land plant, types of steles, important characteristies of Psilopsida, Lycopsida, Sphenopsida, and Pteropsida, classification of Pteridophyta. | | | |
| **Unit-IV** | | | **Reproduction in Lycopodium** |
| Structure and reproduction in Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea. | | | |
| **Unit-V** | | | **Types of fossils** |
| Fossilization, Types of fossils, Techniques of fossil study, Geological time scale. General characters of Rhynia, Lepidodendron, Calamites, Cladoxylon in brief. | | | |
| **Reference books** | | | 1. Vashishta B. R. 1983. Botany for Degree student – Bryophyta. S. Chand & Co. NewDelhi. 2. Parihar N. S. 1967. An introduction to embryophyta. Vol. I.Bryophyta. Central book depot, Allahabad. 3. Smith G. N. 1955. Cryptogamic Botany Vol. II – Bryophyta and Pteridophyta. Tata Mc Graw Hill Publishing Co. Ltd. New Delhi. 4. Vashishta, P.C.1972 Botany for Degree Students, Vol IV- Vascular Cryptogams (Pteridophyta), S.Chand& Co. Pvt. Ltd. 5. Vashishta, P.C. 1976 Gymnosperms, S.Chand& Co. Pvt. Ltd. 6. Pandey, B.P.1997. A text book of Bryophyta, Pteridophyta and Gymnosperms. K.Nanth and Co., Meerut |
| **Mode of Examination** | | |  |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

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| **CY 213** | | **Chemistry-IV (organic Chemistry-I)** | |
| **Prerequisite** | | All students are expected to have a general knowledge of basic chemistry principles. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding principle of spectroscopy, To gain knowledge about heterocyclic compound, To have understanding about biomolecules, Able to understand polymer.. | |
| **Salient features** | | The student will be able to conceptualize about NMR spectroscopy, Able to analyse structure of protein. | |
| **Utility** | | A degree in chemistry opens doors to job opportunities in science, industry and environmental management, chemist and biochemist. | |
| **Unit-I** | | **Spectroscopy** | |
| NMR Spectroscopy Nuclear Shielding Deshielding, Organometallic Compound Nomenclature, Methods and Preparation and Applications, Organosulphur Compounds Nomenclature, Methods and Preparation and Applications | | | |
| **Unit- II** | | **Heterocyclic Compounds** | |
| Introduction , MO Picture ,Aromatic Characeteristics of Pyrrole,thiophene,and Pyridine . Mechanism of Nucleophilic substitution | | | |
| **Unit-III** | **Organic Synthesis via Enolates** | | |
| Organic Synthesis via Enolates :Acidity of alpha Hydrogen, Alkylation of diethyl Malonate .Carbohydrates : Classification and Nomenclature , Structure of Ribose and Deoxyribose | | | |
| **Unit-IV** | | | **Biomolecules** |
| Amino Acids Peptides Proteins and Nucleic Acids :Structure and nomenclature of Peptides and Proteins Constituents of Nucleic Acids | | | |
| **Unit-V** | | | **Fats Oils and Detergents** |
| Fats Oils and Detergents, Synthetic Polymers, Synthetic Dyes :Classification | | | |
| **Reference books** | | | 1. I. L. Finar : Organic Chemistry (Vol. I & II), E. L. B. S.  2. R. T. Morrison & R. N. Boyd : Organic Chemistry, Prentice Hall.  3. ArunBahl and B. S. Bahl : Advanced Organic Chemistry, S. Chand  4. Peter Sykes : A Guide Book to Mechanism in Organic Chemistry, Orient Longman. |
| **Mode of Examination** | | |  |
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| **ZY 114** | | **Zoology IV-ENDOCRINOLOGY AND ETHOLOGY** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology and basics of zoology. | |
| **Learning objective** | | The learning objectives of course are: To create an understanding regarding the Endocrinology, To gain knowledge about hormone regulation, To have understanding about the ethology, Able to analyse MRI and CT scan. | |
| **Salient features** | | The student will be able to conceptualize about structure and function of endocrine gland, Able to understand animal behavior. | |
| **Utility** | | A Graduate degree opens doors to job opportunities in science, industry and environmental management, Zoologist and biotechnology. | |
| **Unit-I** | | **Endocrinology** | |
| Introduction, basics and functions. Glands: Exocrine and endocrine; Secretions: Autocrine and paracrine. Hormones: Chemical nature and properties, role in homeostasis. Structure and functions of major endocrine glands: Pituitary, thyorid, parathyroid, adrenal gland, pancreas; their hormones, role and abnormalities due to hyposecretion and hypersecretion. Structure and functions of minor endocrine glands: Thymus, pineal, GIT, kidney, heart; endocrine glands in insects; their hormones and role. | | | |
| **Unit- II** | | **Endocrinology** | |
| Control and regulation of secretion and molecular mechanism. Regulation of hormone secretion; positive and negative feedback control mechanism. Extra cellular and intracellular receptors. Second messengers: Cyclic AMP, PIP2, IP3, DG, G-protein, protein kinase and role of Ca++ as messenger; cell signalling; amplification of signal. Molecular mechanism of insulin action. | | | |
| **Unit-III** | **Endocrinology** | | |
| Role in reproduction. Hormones from testis, ovary and placenta, their structure and functions. Importance of hormones in sexual differentiation in embryo. Hormonal control of menstrual cycle, implantation, pregnancy. Parturition and lactation. Different types of contraceptives, their composition and effects. | | | |
| **Unit-IV** | | | **Ethology** |
| Introduction and basics. Introduction and history of behaviour, approaches and study of animal behaviour (ecological, physiological, evolutionary and neural methods) MRI and CAT scan.Genetic basic of animal behaviour and evolution of ethology.Biological clock; circadian and circannual rhythms.Learning and imprinting, instinct behaviour. | | | |
| **Unit-V** | | | **Ethology** |
| Areas of behavior. Searching of food: Honey bee, rhesus monkey and langoor.Social behaviour and organization : Honey bee, termite, mammals(black-buck and monkeys).Communication, fights and alarm call : Vocal, visual, tactile, olfactoryand acoustic; honey bee language; pheromonal and hormonal basis of aggression, brain hormone relation in sexual behaviour.Migration in fishes and birds. Orientation: Taxes and kinesis. | | | |
| **Reference books** | | | 1. EJW Barrington-General & comparative2. Endoctrinology-Oxford, Claredon Press3. R.H. Williams-Text Book of Endocrinology-W.B. Saunders4. C. R. Martin- Endocrine Physiology-Oxford University Press.5. Molecular CellBiology-J. Darnell, H. Lodish and D. Baltimore-Scientific, American Book USA |
| **Mode of Examination** | | |  |
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| **ZY 116** | | **Zoology-V Gamete and Developmental Biology** | |
| **Prerequisite** | | All students are expected to have a general knowledge of biology and basics of zoology. | |
| **Learning objective** | | The learning objective of course are: To create an understanding regarding the Endocrinology, To gain knowledge about hormone regulation, To have understanding about the ethology, Able to analyse MRI and CT scan. | |
| **Salient features** | | The student will be able to conceptualize about structure and function of endocrine gland, Able to understand animal behavior. | |
| **Utility** | | A Graduate degree opens doors to job opportunities in science, industry and environmental management, Zoologist and biotechnology. | |
| **Unit-I** | | **Developmental Biology-Scope and Early Events** | |
| Developmental Biology-Scope and Early Events:Historical review and types and scope of embryology.Gametogenesis:Formation of egg and spemi..Vitellogenesis | | | |
| **Unit- II** | | **Fertilization** | |
| Fertilization: Activation of ovum, essence of activation: changes in the organization of the egg cytoplasm.Parthenogensis. | | | |
| **Unit-III** | **Developmental Biology-Pattern and Processes** | | |
| Developmental Biology-Pattern and Processes:Cleavage: Deﬁnition, planes and patterns among non-chordatesand chordates\_ significance of cleavage. blastulation andmorulation. Fate maps, morpltogenetic cell movements, signiﬁcance of gastrulation.  Embryonic induction; primary organizer, differentiation and competence. Development of chick up to 96 hours stage. | | | |
| **Unit-IV** | | | **Embryonic adaptations** |
| Embryonic adaptations: i. Extra-embryonic membranes in chiek\_ their development and functions. ii. Placentation in Mammals: Deﬁnition. types. clnssiﬁcntitm on the basis of morphology and histology; ltmctiottsol placenta | | | |
| **Unit-V** | | | **Dimensions in Developmental Biology** |
| Dimensions in Developmental Biology. Regeneration Various types of stem cells and their applications.  Cloning of animals: i. Nuclear transfer technique. ii. l-. Embryo transfer technique.Teratology. Biology of aging | | | |
| **Reference books** | | | 1. Principles of Development. Lewis Wolpert, Oxford universityPress. Oxford. 2. An Introduction to Embryology. Balinsky, B.l. : W.B. Sauders.Philadelphia. 3. Development Biology. Berrill. NJ. McGraw Hill book Company. New York. 4. Principles of Animal Developmental Biology :Goyal S.C. I, Himalaya Publishing Co., Mumbai. 5. Fundamentals of Comparative Embryology :Huettner, A.F.Millan, New York. \_ 6. Elements of Chordate Embryology Jain P.C. Visual Publication.Delhi. 7. Chordate Embryology :Verma. P .S. Agrawal. V.K. and Tyagi,B.S.. S. Cltand and Co. New Delhi. 8. Development Biology. Veer BalaRastogi and M.S. Jayaraj, KedarNathRamnath, Meerut |
| **Mode of Examination** | | |  |
| **Recommended By BOS on:** | | |  |
| **Approved by academic council on:** | | |  |

**CY 261 Fundamentals of Chemistry III Lab(L, T, P) = 2 (0, 0, 3)**

Analysis of mixture containing two cations and two anions of which one will be an interfering ion.

Semi micro methods using the conventional scheme to be adopted.

Cations to be studied. Lead, Copper, Bismuth, Cadmium, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be studied Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

Ten Experiments on Above

**Reference Books:**

1. Vogel’s Qualitative Inorganic Analysis, A.I. Vogel , Prentice Hall ,7th Edition.

2. Vogel’s Quantitative Chemical Analysis, A.I. Vogel , Prentice Hall ,6th Edition.

**CY 262 Fundamentals of Chemistry IV Lab(L, T, P) = 2 (0, 0, 3)**

1. Estimation of borax - Standard Sodium Carbonate

2. Estimation of Sodium Hydroxide - Standard Sodium Carbonate

3. Estimation of HCl – standard oxalic acid. Iodometry

4. Estimation of Copper - Standard Copper sulphate

5. Estimation of Potassium dichromate - Standard Potassium dichromate Complexometry

6. Estimation of Magnesium using EDTA.

7. Estimation of Zinc using EDTA Dichrometry

8 .Estimation of ferrous iron using Diphenyl amine / N-Phenylanthranillic acid as indicator. Precipitation titration

9. Estimation of Chloride in neutral medium. (Demonstration - experiment) Permanganometry

10. Estimation of ferrous sulphate – Standard FAS.

**Reference Books:**

1. Textbook of Practical Organic Chemistry, A.I. Vogel , Prentice Hall, 5th edition.
2. Practical Organic Chemistry, Mann F. G. & Saunders B. C, Orient Longman, 1960.
3. Senior Practical Physical Chemistry, B.D.Khosla, R. Chand & Co.
4. Vogel’s Qualitative Inorganic Analysis, A.I. Vogel , Prentice Hall ,7th Edition.
5. Vogel’s Quantitative Chemical Analysis, A.I. Vogel , Prentice Hall ,6th Edition.