



Evaluation Scheme & Syllabus

Of

Bachelor of Science (I Year) (Biotechnology)

(w.e.f. Academic Session 2019)

Department of Biotechnology

INVERTIS UNIVERSITY - INVERTIS VILLAGE

Bareilly-Lucknow NH-24, Bareilly

Programme Outcomes (PO) of B.Sc Biotechnology

After completion of the program of study of B.Sc. in Biotechnology, every student will know the following attributes:

PO1: Ability to apply the **fundamentals of mathematics, science and engineering** for biotechnological processes

PO2: Ability to **well design a specific problem or appropriate protocol** based on review of literature or biological data so that it can be solved or reach the conclusions in the areas of Biotechnology such as bioprocess engineering, plant biotechnology, medical biotechnology, biophysics, molecular biology and environmental biotechnology.

PO3: Ability to design a system, a component or biological process within the umbrella of realistic constraints such as economic, environmental, societal, health and safety, manufacturability and sustainability.

PO4: Ready to carry out research and solve complex problems by utilizing sophisticated biotechnology tools such as NMR spectroscopy, microarray technology, crystallography, flowcytometry, next generation sequencing in different fields of biotechnology resulting in patents, journal publications and product development.

PO5: Ability to use the **conceptualized biotechnology solutions** towards the sustainable development and focus on the **environmental sustainability** such as preventing the loss of biodiversity due to Desertification and Deforestation, use of white biotechnology, Bioremediation, Biofuels, Biosensors, Biocatalyst, Biomining and other technologies to prevent continuous degradation of the environment and making its more sustainable to ideal environment.

PO6: Knowledge on different aspects of **ethics** related to biotechnology areas such as genetically modified species, patenting human biological materials, organ transplantation, diagnosis of genetic defects, and use of genetically engineered crops and uses this knowledge very professionally and legally so that it will be not hurt the moral code of the society.

PO7: Ability to **tackle** the issues effectively either as a member and/or in a heterogeneous work environment or should be able to work in **interdisciplinary areas** of biotechnology to manage the project financially and effectively with their limitations.

PO8: Attend good **writing skills** (such as abstract, summary, project report) or **oral presentation** and contribute better in interdisciplinary areas of biotechnology or in the society at large and to develop habit of lifelong learning with the **technological changes**.

SCHEME OF EVALUATION
B.Sc -BIOTECHNOLOGY
(Effective from the academic session 2019)

I Year								
I Semester			Teaching Scheme			Marks Distribution		
SN	CODE	SUBJECT	L	T	P	ESM	MSM	Total
1	BST101	Chemistry I	3	1	0	70	30	100
2	BST102	Introduction to Biotechnology	3	1	0	70	30	100
3	BST103	Cell Biology	3	1	0	70	30	100
4	BST104/ BST105	Elementary Math I / Remedial Biology I	3	1	0	70	30	100
5	BST106	Computer Fundamental	3	1	0	70	30	100
6	BST151	Chemistry Lab I	0	0	2	35	15	50
7	BST152	Biotechnology Lab I	0	0	2	35	15	50
Total			15	5	4	420	180	600
II Semester								
SN	CODE	SUBJECT	L	T	P	ESM	MSM	Total
1	BST201	Chemistry II	3	1	0	70	30	100
2	BST202	Biochemistry	3	1	0	70	30	100
3	BST203	Microbiology	3	1	0	70	30	100
4	BST204/ BST205	Elementary Math II/ Remedial Biology II	3	1	0	70	30	100
5	BST206	Ecology & Environment Biotechnology	3	1	0	70	30	100
6	BST251	Chemistry Lab II	0	0	2	35	15	50
7	BST252	Biotechnology Lab II	0	0	2	35	15	50
Total			15	5	4	420	180	600
Note : Elementary Math-I (BST-104) and Elementary Math-II (BST-204) are for the students of PCB group. Remedial Biology-I (BST-105) and Remedial Biology-II (BST205) are for the Students of PCM group.								

BST101: Chemistry I

Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks
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Prerequisite: - General knowledge of Chemistry of intermediate standard

Course Objectives:

1. To give an overview of Chemical reactions
2. To give basic knowledge of chemicals and their reactions
3. To have an overview of bond formation and its types.
- 4 To explain the various types of isomerism.
5. To explain the molecular orbital theory.
6. To explain the kinetic theory of gases.

Detailed Syllabus**Module-1**

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, shapes of s, p, d orbital's. Aufbau and Pauli exclusion principles, Hund's multiplicity rule.

Module-2

Bonding concept: Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Vander Waals interactions, Hydrogen bonding and its applications. Molecular orbital theory: and its applications for homo and hetro nuclear diatomic molecules. Concept of isomerism: Types of isomerism. molecular chirality, enantiomers, optical activity, properties of enantiomers, meso compounds.

Module-3

Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state. Critical Phenomena: PV isotherms of real gases, continuity of states, Vander Waals equation, relationship between critical constant and Vander Waals constants, the law of corresponding states, reduced equation of state.

Text and Reference Books

1. A Textbook of Physical Chemistry, A. S. Negi, S. C. Anand
2. Physical Chemistry, Gilbert William Castellan
3. Physical chemistry, Walter John Moore
4. Organic Chemistry, Benjamin List, Keiji Maruoka
5. Advanced Organic Chemistry, 4th ed. Part A: Structure and Mechanisms F. Carey and R. Sundberg, Kluwer Academic

Course Outcomes:

After completing the course, students will be able to:

1. Understand various types of chemical reactions
2. Analyze different chemicals and their usage in day to day life and in industries and other sectors
3. Identify various bonds that exist in a molecule or a compound
4. Understand the concept of orbitals and sharing of electrons
5. Evaluate the role of kinetic theory of gases
6. Understand the concept of vander walls forces and weak bonds

BST 102: Introduction to Biotechnology	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Biotechnology of intermediate standard

Course Objectives:

1. To give an overview of biomolecules and their significance
2. To give basic knowledge of Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids).
3. To have an overview of Microorganism: Origin of microbiology, Types of microbes, Classification of microbes.
4. To explain about the Introduction Genes & Genome.
5. To explain the Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases).
6. To explain the Basic Local Alignment Search Tool (BLAST) & its types.

Detailed Syllabus

<p>Module-1 Introduction of Biomolecules - Structure and dynamics, Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids). Enzymes: History, Nomenclature & Classification of Enzymes, Intracellular and Extracellular Enzymes, Purification and characterization of enzymes from natural sources, industrial application of enzymes.</p>
<p>Module-2 Cell as a basic unit of life, Microorganism: Origin of microbiology, Types of microbes, Classification of microbes, macro and micro molecules required for growth of microorganism, Media: defined and undefined, Study of Microbes (culture techniques and staining method), Application of microbes in fermentation biotechnology, Basics of Chromatography: Concept, types and Application.</p>
<p>Module-3 Central Dogma of Life, Introduction Genes & Genome, Human Genome Project, Concept of Annotation, ORF & Gene Prediction, Genome similarity, Single Nucleotide Polymorphism (SNP), comparative genomics. History of Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases), Primary and Secondary Database, Information retrieval from Databases, Sequence file formats. Basics of pattern matching and Sequence Analysis, Basic Local Alignment Search Tool (BLAST) & it's types.</p>
<p>Text and Reference Books</p> <ol style="list-style-type: none"> 1. H.K.Dass, "Text book of Biotechnology" (Wiley India publication) 2. B.D.Singh,"Biotechnology" (Kalyani Publishers) 3. R.C.Dubey, "Text book of Biotechnology" (S. Chand and company) 4. William J. Thiemann," Introduction to Biotechnology", Michael A. Palladino, Publisher: Benjamin Cummings. 5. Colin Ratledge," Basic Biotechnology Publisher": Cambridge University Press

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of Biotechnology
2. Analyze various biomolecules and their significance, structure and function
3. Identify different types of microbes and their importance
4. Understand the concept of databases used in sequence alignment
5. Knowledge of Genes and their impact
6. To understand the biodiversity analysis tools

BST103: CELL BIOLOGY

Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks
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Prerequisite: - General knowledge of Biology of intermediate standard

Course Objectives:

1. To give an overview of biomolecules and their significance.
2. To give basic knowledge of Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids).
3. To have an overview of Microorganism: Origin of microbiology, Types of microbes, Classification of microbes.
4. To explain about the Introduction Genes & Genome
5. To explain the Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases).
6. To explain the Basic Local Alignment Search Tool (BLAST) & it's types.

Detailed Syllabus

Module-1

The Evolution of the Cell: From Molecules to Procaryotes to Eucaryotes, Ultra structure and function of cell and cell organelles. Membrane Structure: Physicochemical Properties; Molecular Organization – asymmetrical organization of lipids, proteins and carbohydrates,. Eukaryotic cell division cycle: Different phases and molecular events. Control of cell division cycle, Transport of Small Molecules Across Cell Membranes: Carrier protein and channel protein, Active Transport

Module-2

Intracellular Compartments and Protein Sorting: Structure, function and transport of proteins into mitochondria and chloroplast. Transport by vesicle formation: Endocytosis and Exocytosis and molecular Mechanism of vesicular transport. Intracellular communication through cell junctions: Occluding junctions, anchoring junctions and communicating junctions.
Molecular mechanism of cell-cell adhesions: Extra-cellular matrix of animals: organization and functions.

Module-3

signaling: Signaling via G-Protein linked cell surface receptors, MAP kinase pathways and tyrosine kinase pathway: Initiation, interaction and regulation. Cohesins and condensins Apoptosis: Phases and significance, Morphological and biochemical changes associated with apoptotic cells, Apoptotic pathways and regulators.

Text and Reference Books

1. Cohn, N.S. (1964). Elements of Cytology Brace and World Inc., New Delhi.
2. Darrington, C.D.(1965). Cytology, Churchill, London.
3. Darnell, J., Lodish, KL and Baltimore, D (1991). Molecular Cell biology, Scientific American books.
4. De Robertis, E.D.P. and Robertis, E.M.F.(1991). Cell and Molecular biology. Lea and Febiger, Washington.
5. Dobzhansky, B (1961). Genetksian and The origin of species, Columbia University press, New York.

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of Biotechnology
2. Analyze various biomolecules and their significance, structure and function
3. Identify different types of microbes and their importance
4. Understand the concept of cell and signaling mechanism
5. Knowledge of Genes, genetic disabilities and apoptosis cell pathways and regulators.

BST104 Elementary Math I	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Mathematics of intermediate standard

Course Objectives:

1. To give an overview of mathematical concepts and their significance
2. To give basic knowledge of algebra, geometry and trigonometry.
3. To have an overview of Integration as inverse process of differentiation.
- 4 .To explain about the applications in finding the area under simple curves
5. To explain the Formation of differential equation whose general solution is given.
6. To explain the simple integrals of the type to be evaluated.

Detailed Syllabus

<p>Module-1 Definition, algebra of derivatives of functions, Derivatives of polynomial and trigonometric functions, Rate of change, increasing/decreasing functions, Maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool), Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).</p>
<p>Module-2 Integration as inverse process of differentiation, Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated. Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).</p>
<p>Module-3 Definition, order and degree, General and particular solutions of a differential equation Formation of differential equation whose general solution is given, Solution of differential equations by method of separation of variables.</p>
<p>Text and Reference Books</p> <ol style="list-style-type: none"> 1. Mathematics Part I - Textbook for Class XI, NCERT Publication 2. Mathematics Part II - Textbook for Class XI, NCERT Publication, 3. Mathematics Class XI and XII by R D Sharma. <p>Reference books:</p> <ol style="list-style-type: none"> 1. Glyn James , “Higher engineering mathematics” (Tata Macgraw Hill) 2. B.V.Ramana, “Advanced modern engineering mathematics” (Pearson education)

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of mathematical concepts.
2. Derivation of polynomial and trigonometric functions.

3. Identify different types of Integration as inverse process of differentiation
4. Understand the area under simple curves
5. Analysis of differential equation .

BST 105 Remedial Biology I	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test - 12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Biology of intermediate standard

Course Objectives:

1. To give an overview of biomolecules and their significance
2. To give basic knowledge of Structure, biosynthesis and function of Macromolecules (Carbohydrates, Proteins and Lipids).
3. To have an overview of Microorganism: Origin of microbiology, Types of microbes, Classification of microbes.
4. To explain about the Introduction Genes & Genome
5. To explain the Bioinformatics, Biological databases (nucleotide and Protein Databases, Structure databases).
6. To explain the Human Health & Hygiene: Population and birth control, sexually transmitted diseases.

Detailed Syllabus

<p>Module-1 Diversity in Living World: Diversity of living organisms Classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom), Systematic and binomial System of nomenclature, Salient features of animal and plant classification, viruses, viroid's, lichens, Botanical gardens, herbaria, zoological parks and museums.</p>
<p>Module-2 Cell: Structure and Function Cell: Cell theory; Prokaryotic and eukaryotic cell, cell wall, cell membrane, Nucleus and nuclear organization, Tissue, organ and organ system (elementary idea) Cell Division: Cell Cycle (elementary idea), Somatic Cell division - Mitosis, Germ Cell division – meiosis, Biomolecules of Cell: Basic chemical constituents of living bodies – Carbohydrate, Lipid, Protein, etc</p>
<p>Module-3 Plant Physiology, Movement of water, food, nutrients and gases, Respiration, Photosynthesis, Plant growth and development, Human Health & Hygiene: Population and birth control, sexually transmitted diseases, infertility. Cancer and AIDS, Adolescence and drug / alcohol abuse, Basic concepts of immunology, vaccines, Reproduction Reproductive system in male and female, menstrual cycle, production of gametes, fertilization, embryo development.</p>

Text and Reference Books

1. Biology - Textbook for Class XI, NCERT Publication

Reference book:

1. Peter H Raven, George B Johnson, Kenneth A. Mason, Jonathan Losos, Susan Singer, Biology,(Macgraw Hill)
2. Sharma, P.D. (2005) 2nd Edition. Microbiology, Rastogi Publications.
3. Pelczar M. J., E. C. S. Chan and N. R. Krieg (2003) Microbiology, 5th Edition; Tata McGraw Hill Publishing Company , New Delhi

Course Outcomes:

After completing the course, students will be able to:

1. Identify the Diversity of living organisms, their structure and function
2. Systematic and binomial System of nomenclature
3. Cell: Structure and Function Cell: Cell theory; Prokaryotic and eukaryotic cell
4. Plant Physiology and different activities performed by the plants
5. Adolescence and drug / alcohol abuse, Basic concepts of immunology.

BST106 COMPUTER FUNDAMENTAL	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Computer fundamentals of intermediate standard

Course Objectives:

1. To give an overview of biomolecules and their significance
2. To give basic knowledge Evolution of computers
3. To have an overview of Computer peripherals input/output devices
4. To explain about the Basic Gates and Number Systems
5. Introduction to MS-OFFICE-2003, word 2003
6. To explain the Excel-2003, Editing, working Retrieval, Important functions

Detailed Syllabus

Module-1 Digital Computer: Introduction, Basic diagram, Evolution of computers, Generation of Computers, Computer peripherals input/output devices. Computer classification, Microcomputer, Minicomputer, Main frame computer, Super computer, Types of printers-Dot matrix, Inkjet, Laser. Basic Gates and Number Systems: Basic Gates - AND gate OR gate OR NAND gate, NOR gate, EX-OR gates, NOT gate logic diagram of gates, Number Systems - Binary number, Decimal, Hexadecimal, Octal, BCD conversion of number systems.
Module-2 Introduction to MS-OFFICE-2003, word 2003 Document creation, Editing, formatting table handling, Excel-2003, Editing, working Retrieval, Important functions, short cut keys used in EXCEL. MS-Power point 2003-Job Profile, Elements of Power point , ways of delivering Presentation, concept of Four P's (Planning, Preparation, Practice and Presentation) ways of handling presentations e.g. creating, saving slides show controls, Adding formatting, animation and multimedia effects.
Module-3 Database system concepts, Data models schema and instance, Database language, Introduction to MS-Access 2003, main components of Access tables, Queries, Reports, Forms table handling, working on Query and use of database. History of Internet, equipment required for Internet connection, browser (Internet Explorer, Mozilla Firefox, Google Chrome)
Text and Reference Books <ol style="list-style-type: none"> 1. Sinha, P.K., Computer Fundamentals, BPB Publications. 2. Raja Raman, V, Computer Programming in 'C', PHI Publication. 3. Hunt N and Shelley J. "Computers and Common Sense" Prentice Hall of India. 4. Alexis Leon, "Introduction to Computers" Vikas Publishing House

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of computing
2. Idea about MS Word and excel..
3. Identify different types of Basic Gates used in computers.
4. Database system concepts, Data models schema and instance
5. Working on Query and use of database

BST151 CHEMISTRY LAB-I	
Teaching Scheme Lectures: 0 hrs/Week Tutorials: 0 hr/Week Practical: 2 hr/week Credits: 2	Examination Scheme Class Test -00 Teachers Assessment - 00 Attendance – 00 End Semester Exam – 50 marks

Prerequisite: - General knowledge of Computer fundamentals of intermediate standard

Course Objectives:

- 1.To give an overview of Chemical reactions
- 2.To give basic knowledge of chemicals and their reactions
- 3.To have an overview of bond breakage and bond formation
4. To explain the various types of isomerism and chiral activity
- 5.To explain the reaction mechanisms.
- 6.To have an idea of gases.

Detailed Syllabus

<ol style="list-style-type: none"> 1. Preparation of solutions of different Molarity / Normality of titrants 2. Estimation of carbonate and hydroxide present together in mixture. 3. Estimation of Fe (II) and oxalic acid solutions using standardized KMnO₄ solution. 4. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard K₂Cr₂O₇ solution using potassium ferricyanide [K₃Fe(CN)₆] as external indicator. 5. Determination of the melting points of organic compounds and unknown organic compounds (electrically heated melting point apparatus). 6. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds. 7. Determination of boiling point of liquid compounds. (Boiling point lower than and more than 100° C).
Text and Reference Books <ol style="list-style-type: none"> 1. Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS. 2. Vogel, A.I. A Textbook of Practical Organic Chemistry, ELBS

Course Outcomes:

After completing the course, students will be able to:

1. Understand various types of chemical reactions	
2. Analyze different chemicals and their usage in day to day life and in industries and other sectors	
3. Identify various bonds that exist in a molecule or a compound	
4. Understand the concept of orbitals and sharing of electrons	
5. Evaluate the role of kinetic theory of gases	
6. Understand the concept of vander walls forces and weak bonds	

BST 152: BIOTECHNOLOGY LAB-I	
Teaching Scheme Lectures: 0 hrs/Week Tutorials: 0 hr/Week Practicals: 2 hr/week Credits: 2	Examination Scheme Class Test -00Marks Teachers Assessment - 00Marks Attendance –00 Marks End Semester Exam – 50 marks

Prerequisite: - General knowledge of Biotechnology of intermediate standard

Course Objectives:

- 1.To give an overview of biomolecules and their significance
- 2.To give basic knowledge function of Macromolecules (Carbohydrates, Proteins and Lipids).
- 3.To have an overview of Microorganism and their Types
- 4 To explain about the media preparation and sterilisation
- 5.To explain the DNA,Blood and saliva.

Detailed Syllabus

<ol style="list-style-type: none"> 1. Preparation of chemicals 2. To know the principle and working of various instruments in lab. 3. Media preparation and autoclaving. 4. Tissue Section preparation from plants 5. Tissue Section preparation from Animals 6. Separation of cellular components from saliva 7. Blood hematology

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of Biotechnology
2. Analyze various biomolecules and their significance, structure and function
3. Identify different types of microbes and their importance
4. Understand the concept of DNA
5. Knowledge of Genes, Cellular components and their impact

BST 201: Chemistry II	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Chemistry

Course Objectives:

- 1.To give an overview of Chemical kinetics
- 2.To give basic knowledge of chemicals and their reactions
- 3.To have an overview of mathematical characteristics of simple chemical reactions
- 4.Aromatic electrophilic substitution- general pattern of the mechanism,
- 5.Activating and deactivating substituents
- 5.To explain the complexation tendencies including their function in biosystems

Detailed Syllabus

Module-1 Chemical kinetics and its scope, rate of a reaction, Order of the reactions. Concentration dependence of rates, mathematical characteristics of simple chemical reactions-zero order, first order, second order, pseudo order, half life and mean life.
Module-2 Aromatic electrophilic substitution- general pattern of the mechanism, Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction, Activating and deactivating substituents, orientation and ortho/para ration.
Module-3 s-Block Elements Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, and introduction to alkyls and aryls. p-Block Elements Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides and halides of groups 13-16, hydrides of boron diborane and higher boranes, borazine, borohydrides.
Text and Reference Books 1.A Textbook of Physical Chemistry, A. S. Negi, S. C. Anand 2.Physical Chemistry, Gilbert William Castellan 3.Physical chemistry, Walter John Moore 4.Organic Chemistry, Benjamin List, KeijiMaruoka 5.Advanced Organic Chemistry, 4th ed. Part A: Structure and Mechanisms F. Carey and R. Sundberg, Kluwer Academic

Course Outcomes:

After completing the course, students will be able to:

- | |
|---|
| 1. Understand various types of chemical reactions and their order |
|---|

2. Analyze different aromatic electrophilic substitution
3. Mechanism of nitration, halogenation, sulphonation, mercuration
4. To analyse s-Block Elements Comparative study, diagonal relationships
5. To analyse p-Block Elements Comparative study
6. To learn complexation tendencies including their function in biosystems

BST 202: Chemistry II	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Chemistry

Course Objectives:

- 1.To give an overview of Chemical kinetics
- 2.To give basic knowledge of chemicals and their reactions
- 3.To have an overview of mathematical characteristics of simple chemical reactions
4. Aromatic electrophilic substitution- general pattern of the mechanism,
- 5.Activating and deactivating substituents
- 6.To explain the complexation tendencies including their function in biosystems

Detailed Syllabus

Module-1 Chemical kinetics and its scope, rate of a reaction, Order of the reactions. Concentration dependence of rates, mathematical characteristics of simple chemical reactions-zero order, first order, second order, pseudo order, half life and mean life.
Module-2 Aromatic electrophilic substitution- general pattern of the mechanism, Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction, Activating and deactivating substituents, orientation and ortho/para ration.
Module-3 s-Block Elements Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, and introduction to alkyls and aryls. p-Block Elements Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides and halides of groups 13-16, hydrides of boron diborane and higher boranes, borazine, borohydrides.
Text and Reference Books 1.A Textbook of Physical Chemistry, A. S. Negi, S. C. Anand 2.Physical Chemistry, Gilbert William Castellan 3.Physical chemistry, Walter John Moore 4.Organic Chemistry, Benjamin List, KeijiMaruoka 5.Advanced Organic Chemistry, 4th ed. Part A: Structure and Mechanisms F. Carey and R. Sundberg, Kluwer Academic

Course Outcomes:

After completing the course, students will be able to:

- | |
|---|
| 1. Understand various types of chemical reactions and their order |
|---|

2. Analyze different aromatic electrophilic substitution
3. Mechanism of nitration, halogenation, sulphonation, mercuration
4. To analyse s-Block Elements Comparative study, diagonal relationships
5. To analyse p-Block Elements Comparative study
6. To learn complexation tendencies including their function in biosystems

BST 202 BIOCHEMISTRY	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Biology of intermediate level.

Course Objectives:

- 1.To give an overview of biomolecules and their significance
- 2.To give basic knowledge of : properties of water, weak interaction in aqueous systems, Ionization of water
- 3.To have an overview of Protein: Amino acids, peptieds and polypeptiedes
- 4.To explain about the different biosynthetic pathways.
- 5.To explain the translation and post translational modification of proteins
- 6.To explain about the different types of lipids

Detailed Syllabus

Module-1 Water: properties of water, weak interaction in aqueous systems, Ionization of water, weak acids & weak base, Concept and calculation: pH, pKa, Gibbs free energy and enthalpy. Protein: Amino acids, peptieds and polypeptiedes, Primary, secondary and tertiary structure, ramchandran plot, translation and post translational modification. Metabolic Fates of Amino Groups, Nitrogen Excretion and the Urea Cycle, Pathways of Amino Acid Degradation
Module-2 Carbohydrates: Monosaccharides and Disaccharides, Polysaccharides, Glycoconjugates: Proteoglycans, Glycoproteins and Glycolipids. Glycolysis, Feeder Pathways for Glycolysis, Fates of Pyruvate under Anaerobic Conditions: Fermentation, Gluconeogenesis, Pentose Phosphate Pathway of Glucose Oxidation, citric acid cycle: Production of Acetyl-CoA, Reactions of the Citric Acid Cycle, Regulation of the Citric Acid Cycle, The Glyoxylate Cycle. Electron transport chain: Electron-Transfer Reactions in Mitochondria. ATP Synthesis, Regulation of Oxidative Phosphorylation.
Module-3 Lipid: Storage Lipids, Structural Lipids in Membranes, Lipids as Signals, Cofactors, and Pigments, Digestion, Mobilization, and Transport of Fats, Oxidation of Fatty Acids, Ketone Bodies, Triacylglycerides, Phospholipids, polar and nonpolar lipids. Cholesterol, Sphingolipids, cerebrolipids.
Text and Reference Books <ol style="list-style-type: none"> 1. Analytical Biochemistry 3rd Ed. by Holme, D. J. & Peck, H. 2. Basic Concepts in Biochemistry A Student's Survival Guide by Gilbert, H. F. 3. Biochemistry (3rd ed. 1994) by Rawn J. D. 4. Biochemistry by Todd, W. B., Mason, M., Bruggen, R. V. & Macmillan. 5. Biochemistry by Voet&Voet

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of Biomolecules, their structure and function
2. Analyze the Gibbs free energy and enthalpy
3. Identify different types of biosynthetic pathways of different biomolecules
4. Understand the concept of lipids and their significance
5. Knowledge of Electron-Transfer Reactions in Mitochondria. ATP Synthesis, Regulation of Oxidative Phosphorylation.
6. Understand various aspects of metabolism of biomolecules

BST 203 MICROBIOLOGY	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Microbiology of intermediate level.

Course Objectives:

- 1.To give an overview of Classification of Microorganisms, Role of Microorganisms in Disease, Study of Microbial Structure
- 2.To give basic knowledge of Procaryotic & Eucaryotic Cell: Structure Size, Shape and Function
- 3.To have an overview of Microbial Nutrition and Microbial Growth
- 4.To explain about the different Types of Media, Isolation of Pure Cultures, Growth Curve, Measurement of Microbial Growth, Cell Numbers & Cell Mass
- 5.To explain the General Characteristics, Cultivation & Purification, Structure of Viruses
- 6.To explain about the different types of Antimicrobial Agents, Antibacterial Drugs, Antifungal Drugs, Antiviral Drugs. Drug Resistance

Detailed Syllabus

<p>Module-1 History and Scope of Microbiology, Classification of Microorganisms, Role of Microorganisms in Disease, Study of Microbial Structure (Microscopy), Procaryotic & Eucaryotic Cell: Structure Size, Shape and Function, Procaryotic Cell Wall, Peptidoglycan Structure, Gram-Positive Cell Walls, Gram-Negative Cell Walls, Mechanism of Gram Staining, Capsules, Slime Layers, and S-Layers, Pili and Fimbriae, Flagella and Motility, Chemotaxis, The Bacterial Endospore</p>
<p>Module-2 Microbial Nutrition and Microbial Growth: Nutrient Requirements (C, H, O, N, P, S), Nutritional Types of Microorganisms, Growth Factors, Uptake of Nutrients by the Cell, Group Translocation, Iron Uptake, Types of Media, Isolation of Pure Cultures, Growth Curve, Measurement of Microbial Growth, Cell Numbers & Cell Mass, Chemostat & Turbidostat, Sterilization, Control of Microorganisms by Physical and Chemical Agents, Antimicrobial Agent Activity & Evaluation, Bacterial Recombination: General Principles, Bacterial Plasmids, DNA Transformation, Transduction, Recombination and Genome Mapping in Viruses.</p>
<p>Module-3 Viruses: Introduction, General Characteristics, Cultivation & Purification, Structure of Viruses, Virion Size, Structural Properties, Helical Capsids, Icosahedral Capsids, Principles of Virus Taxonomy. Antimicrobial Drugs, Dilution Susceptibility Tests, Disk Diffusion Tests, MIC, Mechanisms of Action of: Antimicrobial Agents, Antibacterial Drugs, Antifungal Drugs, Antiviral Drugs. Drug Resistance, Mechanisms of Drug Resistance Clinical Microbiology, Microbiology of Food, Industrial Microbiology and Biotechnology</p>
<p>Text and Reference Books Powar C. B. and H. F. Dagainawala (2003).General Microbiology Vol.II; Himalaya Publishing House.</p>

Dubey R. C. and D. K. Maheshwari (2004). A Text book of microbiology, 1st Edition; S. Chand and Company Ltd.
H.C. Dube (2005) A Textbook of Fungi, Vikas Publishing House.
A Textbook of Fungi- Vashistha (2003) S. Chand and Company Ltd.
Davis and Harper, General Microbiology
Alexopoulos C. J. and C. W. Mims (1996). Introductory Mycology, 4th Edition; John Wiley and Sons, Inc. USA.
Stanier, R.Y., J.L. Ingraham, M.L. Wheelis and P.R. Painter (1987) Vth edition. General Microbiology, Macmillan Press Ltd.

Course Outcomes:

After completing the course, students will be able to:

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| 1. Understand various applications of microbes in our day to day life |
| 2. Study and isolate the different types of microbes on the basis of staining techniques |
| 3. Identify different types of growth media and factors affecting growth of microbes |
| 4. Control of Microorganisms by Physical and Chemical Agents |
| 5. Drug Resistance and the Mechanisms of Drug Resistance |

BST204 Elementary Math II	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Mathematics

Course Objectives:

- 1.To give an overview of mathematical concepts and their significance
- 2.To give basic knowledge of algebra and quadratic equations.
- 3.To have an overview of Algebraic solutions of linear inequalities in one variable
4. To explain about the applications in finding the area under simple curves
- 5.To explain the Formation of differential equation whose general solution is given.
- 6.Vectors and scalars, magnitude and direction of a vector

Detailed Syllabus

Module-1 Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system.Linear inequalities.Algebraic solutions of linear inequalities in one variable and their representation on the number line.Graphical solution of linear inequalities in two variables.
Module-2 Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two point form, intercepts form and normal form.
Module-3 Vectors and scalars, magnitude and direction of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio.
Text and Reference Books 1.Mathematics Part I - Textbook for Class XI, NCERT Publication 2.Mathematics Part II - Textbook for Class XI, NCERT Publication, 3.Mathematics Class XI and XII by R D Sharma. Reference books: 1.Higher engineering mathematics by B.V.Ramana (Tata Macgraw Hill) 2.Advanced modern engineering mathemtics by Glyn james (pearson education)

Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of mathematical concepts.
2. Derivation of polynomial and trigonometric functions.

3. Identify different types of Integration as inverse process of differentiation
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4. Understand the area under simple curves
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5. Analysis of differential equation .
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BST 206 ECOLOGY&ENVIRONMENT BIOTECHNOLOGY	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - General knowledge of Ecology and Environment Biotechnology

Course Objectives:

- 1.To give an overview of Environment and factors associated with it.
- 2.To give basic knowledge of Effects of human activities on environment-Agriculture, Housing,Industry, Mining and Transportation activities
- 3.To have an overview of Natural Resources- Water Resources- Availability and Quality aspects.
- 4 To explain about the Environmental Pollution, their types and their effects.
- 5.To explain the Current Environmental Issues of Importance
- 6.To explain the Human Health & Hygiene: Population and birth control, sexually transmitted diseases.

Detailed Syllabus

Module-1 Definition, Scope & Importance, Need For Public Awareness- Environment definition, Eco system – Balanced ecosystem, Human activities – Food, Shelter, Economic and social Security. Effects of human activities on environment-Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment.
Module-2 Natural Resources- Water Resources- Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles- Carbon, Nitrogen and Sulphur Cycles. Energy – Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources – Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy.
Module-3 Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management. Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming- Effects, Urbanization, Automobile pollution. Acid Rain, Ozone Layer depletion, Animal Husbandry. Environmental Protection- Role of Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environmental Education, Women Education.
Text and Reference Books <ol style="list-style-type: none"> 1. Benny Joseph – “Environmental Studies” –Tata McgrawHill-2005 2. Dr. D.L. Manjunath, “Environmental Studies” –Pearson Education-2006. 3. R. Rajagopalan – “Environmental studies” –Oxford Publication – 2005. 4. M. Anji Reddy – “Text book of Environmental Science & Technology” –BS Publication. Reference Books: <ol style="list-style-type: none"> 1. P. Venugoplan Rao, “Principles of Environmental Science and Engineering” –Prentice Hall of India.

Course Outcomes:

After completing the course, students will be able to:

1. Identify the factors governing the environment and their impact.
2. Current Environmental Issues and solution to curb it.
3. Initiatives taken by Government and Non-governmental Organizations (NGO)
4. Judicious use of Conventional and Non-Conventional sources
5. Legal aspects pertaining to protection of environment.

BST 251 CHEMISTRY LAB-I	
Teaching Scheme Lectures: 0 hrs/Week Tutorials: 0 hr/Week Practical: 2 hr/week Credits: 2	Examination Scheme Class Test -00Marks Teachers Assessment - 00Marks Attendance – 00 Marks End Semester Exam – 50 marks

Prerequisite: - General knowledge of Computer fundamentals of intermediate standard

Course Objectives:

- 1.To give an overview of Chemical reactions
- 2.To give basic knowledge of chemicals and their reactions
- 3.To have an overview of bond breakage and bond formation
- 4 .To explain the various types of isomerism and chiral activity
- 5.To explain the reaction mechanisms.
- 6.To have an idea of gases.

Detailed Syllabus

<ol style="list-style-type: none"> 1. To perform limit test of chloride, sulphate, Iron, Heavy metal and arsenic in the given sample. 2. Salt analysis 3. Preparation of Boric acid 4. Preparation of Magnesium sulphate 5. Preparation of Heavy magnesium carbonate 6. Preparation of Calcium Carbonate 7. Preparation of Alum 8. Preparation of Bakelite resin
Text and Reference Books 1.Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS. 2.Vogel, A.I. A Textbook of Practical Organic Chemistry, ELBS

Course Outcomes:

After completing the course, students will be able to:

1. Understand various types of chemical reactions
2. Analyze different chemicals and their usage in day to day life and in industries and other sectors
3. Identify various bonds that exist in a molecule or a compound
4. Understand the concept of orbitals and sharing of electrons
5. Evaluate the role of kinetic theory of gases
6. Understand the concept of vander walls forces and weak bonds

BST 252: BIOTECHNOLOGY LAB-II	
Teaching Scheme	Examination Scheme
Lectures: 0 hrs/Week	Class Test -00Marks
Tutorials: 0 hr/Week Practicals: 2 hr/week	Teachers Assessment - 00Marks Attendance – 00 Marks
Credits: 2	End Semester Exam – 50 marks

Prerequisite: - General knowledge of Biotechnology

Course Objectives:

- 1.To give an overview of biomolecules and their significance
- 2.To give basic knowledge function of Macromolecules (Carbohydrates, Proteins and Lipids).
- 3.To have an overview of Microorganism and their Types
- 4 To explain about the media preparation and sterilisation
- 5.To explain the DNA,Blood and saliva.

Detailed Syllabus

<ol style="list-style-type: none"> 1. Visualization of cells histology 2. Isolation of nucleus from cells 3. Protein estimation by folin lowery method 4. Protein estimation by Bragg ford method 5. Solubilization of plasma membrane by SDS 6. Determination of Osmosis 7. Determination of Pinocytosis process 8. Biological Oxygen Demand (BOD) 9. Most Probable Number (MPN)
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Course Outcomes:

After completing the course, students will be able to:

1. Understand various applications of Biotechnology
2. Analyze various biomolecules and their significance, structure and function
3. Identify different types of microbes and their importance
4. Understand the concept of DNA
5. Knowledge of Genes, Cellular components and their impact