

B.Sc. Botany

Programme Outcomes

- PO1. **Knowledge and understanding of:** 1. The range of plant diversity in terms of structure, function and environmental relationships. 2. The evaluation of plant diversity. 3. Plant classification and the flora of Maharashtra. 4. The role of plants in the functioning of the global ecosystem. 5. A selection of more specialized, optional topics. 6. Statistics as applied to biological data.
- PO2. **Intellectual skills – able to:** 1. Think logically and organize tasks into a structured form. 2. Assimilate knowledge and ideas based on wide reading and through the internet. 3. Transfer of appropriate knowledge and methods from one topic to another within the subject. 4. Understand the evolving state of knowledge in a rapidly developing field. 5. Construct and test hypothesis. 6. Plan, conduct and write a report on an independent term project.
- PO3. **Practical skills:** Students learn to carry out practical work, in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain greater proficiency in a selection of them depending on their choice of optional modules. 1. Interpreting plant morphology and anatomy. 2. Plant identification. 3. Vegetation analysis techniques. 4. A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry. 5. Analyze data using appropriate statistical methods and computer packages. 6. Plant pathology to be added for sharing of field and lab data obtained.
- PO4. **Transferable skills:** 1. Use of IT (word-processing, use of internet, statistical packages and databases). 2. Communication of scientific ideas in writing and orally. 3. Ability to work as part of a team. 4. Ability to use library resources. 5. Time management. 6. Career planning.
- PO5. **Scientific Knowledge:** Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form.
- PO6. **Problem analysis:** Identify the taxonomic position of plants, formulate the research literature, and analyze non reported plants with substantiated conclusions using first principles and methods of nomenclature and classification in Botany.
- PO7. **Design/development of solutions:** Design solutions from medicinal plants for

health problems, disorders and disease of human beings and estimate the phytochemical content of plants which meet the specified needs to appropriate consideration for the public health

- PO8. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.
- PO9. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.
- PO10. **The Botanist and society:** Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.
- PO11. **Environment and sustainability:** Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO12. **Ethics:** Apply ethical principles and commit to environmental ethics and responsibilities and norms of the biodiversity conservation.
- PO13. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO14. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO15. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO16. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes of B.Sc. Botany

- CO1. Critically evaluation of ideas and arguments by collection relevant information about the plants, so as recognize the position of plant in the broad classification and phylogenetic level.
- CO2. Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.
- CO3. Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy.
- CO4. Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.
- CO5. Students will be able to present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists.
- CO6. Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.
- CO7. Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.
- CO8. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.
- CO9. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.

CO10. Students will be able to explain how Plants function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants.

CO11. Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

CO12. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

Programme Specific Outcomes: PSOs of B.Sc. Botany:

B.Sc. Part-I, Semester-I

Paper-I: Diversity in Non vascular Plants

On completion of the course, students are able to:

1. Understand the diversity among Algae.
2. Know the systematic, morphology and structure, of Algae.
Understand the life cycle pattern of Algae.
3. Understand the useful and harmful activities of Algae.
4. Understand the Biodiversity of Fungi
5. Know the Economic Importance of Fungi
6. Understand the morphological diversity of Bryophytes.
7. Understand the economic importance of the Bryophytes.

Paper II: Plant Biochemistry, Physiology and Ecology

On completion of the course, students are able to:

1. Understand the Biochemical nature of cell.
2. Know the chemical nature of biomolecules.
3. Understand the different types of interaction in Biomolecules.
4. Structure and general features of enzymes.
5. Concept of enzyme activity and enzyme inhibition.
6. Learn about the movement of sap and absorption of water in plant body.
6. Understand the plant movements.

Semester-II:

Paper-III: Diversity in Vascular Plants:

On completion of the course, students are able to:

1. Understand the morphological diversity of Bryophytes and Pteridophytes and Gymnosperms.
2. Understand the economic importance of the Bryophytes and Pteridophytes and Gymnosperms.
3. Know the evolution of Bryophytes and Pteridophytes and Gymnosperms.
4. Understand the habit of the angiosperm plant body.
5. Know the vegetative characteristics of the plant.
6. Learn about the reproductive characteristics of the plant.
7. Understand the plant morphology and basic taxonomy.

Paper IV: Cytology, Genetics and Utilization of Plants:

On completion of the course, students are able to understand

1. The eukaryotic cell cycle and mitotic and meiotic cell division
2. Structure and organization of cell membrane
3. Process of membrane transport and membrane models
4. Mendelian and Neo-mendelian genetics
5. To study the phenomenon of dominance, laws of segregation, independent assortment of genes.
6. To understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance etc.

B.Sc. Part-II, Semester- III

Paper-V: Algae, Fungi, Bryophytes and industrial applications

On completion of the course, students are able to:

- 1) Understand the diversity among Algae.
- 2) Know the systematic, morphology and structure, of Algae.
- 3) Understand the life cycle pattern of Algae.
- 4) Understand the useful and harmful activities of Algae.
- 5) Understand the Biodiversity of Fungi
- 6) Know the Economic Importance of Fungi
- 7) Understand the morphological diversity of Bryophytes.

- 8) Understand the economic importance of the Bryophytes.
- 9) Know the taxonomic position, occurrence, thallus structure, reproduction of Bryophytes.
- 10) Become aware of applications of different plants in various industries.
- 11) To highlight the potential of these studies to become an entrepreneur.
- 12) To equip the students with skills related to laboratory as well as industries based studies

Paper-VI: Plant Physiology, Ecology and Horticulture

On completion of the course, students are able to:

1. Know importance and scope of plant physiology.
2. Understand the plants and plant cells in relation to water.
3. Understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways.
4. Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.
5. Learn about the movement of sap and absorption of water in plant body
6. Understand the plant movements.

B.Sc. Part-II, Semester-IV:

Paper VII: Pteridophytes, Gymnosperms, Angiosperms and Anatomy

On completion of the course, students are able to:

1. Know the scope and importance of the discipline.
2. Understand plant communities and ecological adaptations in plants.
3. Know the concept of methodology in taxonomy.
4. Learn about conservation of biodiversity, Non-conventional Energy and Pollution.
5. Discover botanical regions of India and vegetation types of Maharashtra.
6. Understand Bioremediation, Global warming and climate change.

Paper VIII: Cytogenetics and Utilization of Plant Resources

1. On completion of the course, students are able to:
2. Gain knowledge about "Cell Science".
3. Understand Cell wall Plasma membrane, Cell organelles and cell division.
4. Learn the scope and importance of molecular biology.
5. Understand the biochemical nature of nucleic acids, their role in living systems, experimental evidences to prove DNA as a genetic material.
6. Understand the process of synthesis of proteins and role of genetic code in polypeptide

formation.

7. Understand the role plants in human welfare.
8. Gain knowledge about various plants of economic use.
9. Know importance of plants & plant products.
10. Understand the chemical contents of the plant products.
11. Know about the utility of plant resources.

B.Sc. Part-III:

Semester-V

Paper-IX: Biology of Non Vascular Plants and Paleobotany.

On completion of the course, students are able to:

- 1) Understand the diversity among Algae.
- 2) Know the systematic, morphology and structure, of Algae.
- 3) Understand the life cycle pattern of Algae.
- 4) Understand the useful and harmful activities of Algae.
- 5) Understand the Biodiversity of Fungi
- 6) Know the Economic Importance of Fungi
- 7) Understand the morphological diversity of Bryophytes.
- 8) Understand the economic importance of the Bryophytes.
- 9) Know the taxonomic position, occurrence, thallus structure, reproduction of Bryophytes.
- 10) Know the scope of Paleobotany, types of fossils, its role in global economy and geological time scale.
- 11) Understand the various fossil genera representing different fossil groups.

Paper – X: Genetics and Analytical Techniques in Plant Science.

1. Understand the biochemical nature of nucleic acids, their role in living systems, experimental evidences to prove DNA as a genetic material.
2. Understand the process of synthesis of proteins and role of genetic code in polypeptide formation.
3. Know the details of Microscopy- Principles of light microscopy, electron microscopy (TEM and SEM).
4. Understand & perform Chromatography and cultural techniques in Botany.
5. Understand the methods used in Micrometry, Microtomy and Microphotography.

Paper – XI: Fundamentals of Plant Physiology and Ecology

On completion of the course , students are able to:

- 1) Learn and understand about mineral nutrition in plants.

- 2) Understand the growth and developmental processes in plants.
- 3) Know about Photosynthesis and Respiration in plants.
- 4) Understand the process of translocation of solutes in plants
- 5) Know the nitrogen metabolism and its importance.

Paper XII: Plant Biochemistry

- 1) Understand the properties of Monosaccharides, Oligosaccharides and Polysaccharides.
- 2) They will learn about the Significance of Carbohydrates.
- 3) Understand the Properties of saturated fatty acids, and unsaturated fatty acids.
- 4) Understand lipid metabolism in plants.
- 5) Understand the Beta Oxidation, Gluconeogenesis and its role in mobilization of fatty acids during germination.
- 6) They will learn about the Significance of lipids.
- 7) They will be able to understand Brief outline of biosynthesis of amino acid.
- 8) Understand the protein - structure and classification and protein biosynthesis in prokaryotes and eukaryotes.
- 9) They will learn about the nucleic acid metabolism.

Semester VI:-

Paper – XIII Biology of Vascular Plants

On completion of the course, students are able to:

- 1) Understand the diversity of Gymnosperms in India
- 2) Know the evolutionary trends and affinities of living gymnosperms with respect to external and internal features
- 3) Know the conceptual development of 'taxonomy' and 'systematics'
- 4) Understand the Phylogeny of angiosperms -A general account of the origin of Angiosperms.
- 5) Understand the general range of variations in the group of angiosperms.
- 6) Trace the history of development of systems of classification emphasizing angiospermic taxa.
- 7) To learn the wide activities in angiosperm and trends in classification.
- 8) Learn about the characters of biologically important families of angiosperms.
- 9) Know the floral variations in angiospermic families, their phylogeny and evolution.
- 10) Understand various rules, principles and recommendations of plant nomenclature produces in plant identification.
- 11) Understand major evolutionary trends in various parts of angiospermic plants
- 12) Know the methods of pollination and fertilization.

- 13) Know fertilization, endosperm and embryogeny.
- 14) Understand the scope & importance of Anatomy.
- 15) Know various tissue systems.
- 16) Understand the normal and anomalous secondary growth in plants and their causes.
- 17) Perform the techniques in anatomy.
- 18) With respect to recent knowledge students should know about the different tools in the taxonomy so as to relocate the phylogenetic position of plant or taxa.

Paper – XIV- Microbiology and Plant Pathology:

On completion of the course, students are able to:

- 1) Understand the concept, principle and types of sterilization methods.
- 2) Know the concept and characteristics of antiseptic, disinfectant and their mode of action.
- 3) Know the cultivation methods of bacteria, yeast, fungi and virus.
- 4) Principle, working and applications of instruments viz, pH meters, spectrophotometer, centrifuge, viscometer, and laminar air flow.
- 5) Understand the Microbial Genetics and Recombination in Bacteria.
- 6) Know the terminologies in plant pathology.
- 7) Understand the scope and importance of Plant Pathology.
- 8) Know the prevention and control measures of plant diseases and its effect on economy of crops.

Paper – XV: Plant breeding, Biostatistics, Ethnobotany and Horticulture

On completion of the course, students are able to:

1. Understand the science of plant breeding.
2. To introduce the student with branch of plant breeding for the survival of human being from starvation.
3. To study the techniques of production of new superior crop varieties.
4. Understand the modern strategies applied in Genetics and Plant Breeding to sequence and analyze genomes
5. Get the detail knowledge about modern strategies applied in Plant Breeding for crop improvement i.e. Mass selection, Pureline Selection and Clonal selection.
6. Know about exploitation of Heterosis, hybrid and variety development and their release through artificial hybridization.
7. Understand the role plants in human welfare.
8. Gain knowledge about various plants of economic use.
9. Know importance of plants & plant products.
10. Understand the chemical contents of the plant products.

11. Know about the utility of plant resources.

Paper – XVI Molecular Biology and Biotechnology:

On completion of the course, students are able to Understand

- 1) Know about the genomic organization of living organisms, study of genes genome, chromosome etc.
- 2) Gain knowledge about the mechanism and essential component required for prokaryotic DNA replication.
- 3) Understand the fundamentals of Recombinant DNA Technology.
- 4) Know about the Genetic Engineering.
- 5) Understand the principle and basic protocols for Plant Tissue Culture.
- 6) The concept of operon and its structure and regulation.

B.Sc. Mathematics

Programme Outcomes

- PO17. **Knowledge and understanding of:** On completion of this programme the successful student will have knowledge and understanding of:
1. Core areas of pure mathematics including geometry, algebra, mathematical analysis and discrete mathematics;
 2. Core areas of applied mathematics including statistics, operational research and differential equations;
 3. Several specialized areas of advanced mathematics and its applications;
 4. The correct use of mathematical language to express both theoretical concepts and logical argument;
 5. The use of computers both as an aid and as a tool to study problems in mathematics.
- PO18. **Cognitive(thinking)skills – able to:**
1. Think logically and organize tasks into a structured form.
 2. Assimilate knowledge and ideas based on wide reading and through the internet.
 3. Transfer of appropriate knowledge and methods from one topic to another within the subject.
 4. Understand the evolving state of knowledge in a rapidly developing field.
 5. Construct and test hypothesis.
 6. Plan, conduct and write a report on an independent term project.
 7. Formulate problems in appropriate theoretical frameworks to facilitate their solution;
 8. Develop strategies to solve mathematical problems in a range of relevant areas;
 9. Construct logical arguments solving abstract or applied mathematical problems;
 10. Criticize mathematical arguments developed by themselves and others.

- PO19. **Practical skills:** On completion of the programme the successful student will be able to:
1. Solve practical problems in a range of areas of mathematics;
 2. Determine the appropriateness of different methods of solving mathematical problems;
 3. Communicate mathematics effectively to a wide range of audiences;
 4. Use computer packages where appropriate to develop a deeper understanding of mathematical problems.
- PO20. **Transferable skills:**
1. Use of IT (word-processing, use of internet, statistical packages and databases)
 2. Communication of scientific ideas in writing and orally.
 3. Ability to work as part of a team.
 4. Ability to use library resources.
 5. Time management.
 6. Career planning.
- PO21. **Graduate Skills:** On completion of this programme the successful student will be able to:
1. Work effectively and constructively as part of a team.
 2. Motivate and communicate complex ideas accurately using a range of formats.
 3. Identify and benefit from opportunities for personal and career development.
 4. Work confidently and accurately with formulae and numerical information.
 5. Learn effectively.
- PO22. **Individual and team work:**
1. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO23. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make

effective presentations, and give and receive clear instructions.

- PO24. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO25. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes of B.Sc. Mathematics

- CO1. Students will be able to explain the core ideas and the techniques of mathematics at the college level.
- CO2. Students will be able apply rigorous, analytic, highly numerate approach to analyze, execute tasks and solve problems in daily life and at work.
- CO3. Students will be able to recognize the power of abstraction and generalization, and to carry out investigative mathematical work with independent judgment.
- CO4. Students will be able to setup mathematical models of real world problems and obtain solutions in structured and analytical approaches with independent judgment.
- CO5. Students will be able to carry out objective analysis and prediction of quantitative information with independent judgment.
- CO6. Students will be able to demonstrate a systematic knowledge of learning processes and a professional attitude in classroom teaching of mathematics and IT;
- CO7. Students will be able to communicate effectively about mathematics to both lay and expert audiences utilizing appropriate information and communication technology.
- CO8. Students will be able to work independently, and to collaborate effectively in team work and team building.
- CO9. Students will be able to conduct self-evaluation, and continuously enrich themselves through lifelong learning.
- CO10. Students will be able to communicate to lay audiences and arouse their interest in the beauty and precision of mathematical arguments and science.

CO11. Students will be able to recognize the importance of compliance with the ethics of science and being a responsible citizen towards their community and a sustainable environment.

Programme Specific Outcomes: PSOs of B.Sc. Mathematics:

B.Sc. Part-I, Semester-I

Paper-I: Algebra and complex numbers

On completion of the course, students are able to:

- Understanding of operations on matrices.
- Understanding the concept of inverse of a matrix.
- Matrices are used in solving linear equations.
- Linear equations are vital for solving any differential equations
- To learn properties of complex numbers.
- To understand the use of complex numbers in the field of Calculus.

Paper II: Calculus

On completion of the course, students are able to:

- It is used in almost all branches of engineering.
- It is a science that deals with rate of change.
- Understanding the concept of differentiation.
- Understanding the concept of Integration.
- It is used in almost all branches of engineering.
- It deals with calculus of several variables.
- To understand the importance of Taylors series.
- To understand Mean value theorem.

Semester-II:

Paper-III: Geometry

On completion of the course, students are able to:

- Understanding the concept of distance between two points.
- Understanding the concept of slope.
- Understanding the change of origin and change of scale.
- Learn various forms of straight lines.
- Learn about various conic sections.
- It is used in Mechanics and Astronomy.

Paper IV: Differential Equations

On completion of the course, students are able to:

- To understand the necessity of differential equations
- To learn about forming differential equations from physical situations
- To know various types of differential equations
- To practice methods of solution for various types of differential equations.
- It is useful for methods of momentum and energy transfer.
- It is used in all branches of engineering.

B.Sc. Part-II, Semester- III

Paper-V: Differential calculus

On completion of the course, students are able to:

- Study of Rate of change of vectors is vector calculus.
- It is widely used in Physics and Mechanics.
- To study various operations on vectors.
- To learn about differentiation and integration of vectors.
- To understand the concepts of gradient, divergence and curl.

Paper-VI: Differential Equations

On completion of the course, students are able to:

- It is used in all branches of engineering.
- It is useful for methods of momentum and energy transfer.
- To study existence and uniqueness about solutions.
- To learn about the simultaneous differential equations.
- To understand the methods of solution for total differential equations

B.Sc. Part-II, Semester-IV:

Paper VII: Integral calculus

On completion of the course, students are able to:

- To find area by double integration.
- To find volume by triple integration.
- It is useful for measuring areas and volumes.
- It is used in all branches of engineering.
- To study differentiability and integrability.
- To learn mean value theorem of integral calculus.
- To learn how to solve improper integrals.
- To understand the importance of Legendre polynomials.
- To know the Fourier series.
- To study half range series.

Paper VIII: Discrete Mathematics

On completion of the course, students are able to:

- Understand the basics of graph theory.
- To learn operations on graphs.
- To learn about connected graphs.

- To understand various problems related with planar graphs
- It is used in Genomics, networks, etc.
- To know about number system
- To learn division algorithm and its application
- To know about congruence classes

B.Sc. Part-III:

Semester-V

Paper-IX: Real Analysis

On completion of the course, students are able to:

- It is a branch of pure mathematics.
- It is useful in Statistics, Probability, Operations Research, etc.
- To study sequences.
- To study series of real functions.

Paper – X: Modern Algebra

On completion of the course, students are able to:

- Algebra is science of operations.
- It is widely used in Computer science and Information Technology.
- To understand the concept of groups.
- To learn homomorphism and isomorphism.
- To understand the structure of ring and integral domain.
- To learn normal subgroups.
- To study permutations.
- To know about quotient and polynomial rings.

Paper – XI: Partial Differential Equations

On completion of the course, students are able to:

- To understand the importance of ordinary and partial differential equations.
- It is used in solving many problems of engineering and physics.
- To learn about exact differential equations and various types.
- To learn about second order linear differential equations.
- To study series method of solution.
- To study about linear partial differential equations.

Paper XII: Numerical Methods-I

On completion of the course, students are able to:

- It is used for solving a system of equations
- It has application in all branches of engineering.
- To know how to find the roots of transcendental equation.
- To learn how to interpolate the given set of values
- To understand the curve fitting for various polynomials
- To learn numerical solution of differential equations.

Semester VI:-

Paper – XIII: Metric Spaces

On completion of the course, students are able to:

- A **metric space** is a set for which distances between all members of the set are defined
- It is used in fixed point theorem and mapping principles.
- To study continuous functions on metric spaces.
- To learn connected metric spaces.
- To understand complete metric spaces.
- To study compact metric spaces.

Paper – XIV: Linear Algebra

On completion of the course, students are able to:

- It is a branch of Algebra.
- It is used in Computer Science, Electrical engineering, etc.
- To learn about vector spaces.
- To understand theorems on basis and dimension.
- To know about eigen values and eigen vector.

Paper – XV: Complex Analysis

On completion of the course, students are able to:

- It is widely used in Fluid Mechanics and Electrical engineering.
- To learn properties of complex numbers.
- To understand the use of complex numbers in the field of Calculus.
- To learn the importance of analytic functions.
- To gain knowledge of singularities and residues.
- To apply the knowledge of residues in complex integration.

Paper – XVI: Numerical Methods-II

On completion of the course, students are able to Understand

- It is a branch of numerical analysis
- It is used for solving a system of equations and used in all branches of engineering.
- To solve a system of linear equations.
- To learn numerical differentiation and integration.
- To learn about interpolation polynomials.
- To apply numerical methods for differential equations.

B.SC. ELECTRONICS

PROGRAMME OUTCOMES

PO1: Knowledge and Understanding of:

1. The aim of course is to generate the man power with adequate theory knowledge of the Electronic circuit design, instrumentation and practical work.
2. Programming techniques for microprocessor and microcontrollers and its applications.

PO2: Intellectual skills-able to:

1. Think logically and organize tasks into a structured form.
2. Assimilate knowledge and ideas based on wide reading and through the internet.
3. Transfer of appropriate knowledge and methods from one topic to another within the subject.
4. Understand the evolving state of knowledge in a rapidly developing field.
5. Plan, conduct and write a report on an independent term project.

PO3: Practical Skills:

1. Students learn to carry out practical work, in the field and in the laboratory with minimal risk.
2. They gain experience in applying skills and greater proficiency.
3. The practical work along with hands on experience of practical work.
4. To equip students with necessary fundamental concepts and knowledge base.
5. To develop specific practical skills.

PO4: Transferable Skills:

1. Use of IT (word-processing, use of internet, statistical packages and databases).
2. Communication of scientific ideas in writing and orally.
3. Ability to work as part of a team.
4. Ability to use library resources.
5. Time management.
6. Career planning.

PO5: Design and Development of:

1. To impart training on circuit design, analysis, building and testing.
2. To prepare students for demonstrating the acquired knowledge.
3. To encourage students to develop skills for accepting challenges of up-coming technological advancements.

PO6: Conduct investigations of Complex Problems: Use research – based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.

PO7: Modern tools usage: Apply appropriate techniques and modern instrument and equipment to study Electronic Circuit analysis for low frequency, mid frequency and high frequency, with the help of signal generator and Digital Storage Oscilloscope.

PO8: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.

PO9: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage project in multidisciplinary environments.

PO10:Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OUTCOMES OF B.Sc. ELECTRONICS

CO 1 :- Apply the knowledge to understand the Basics of Electronic Circuits.

CO2 :- Apply the Boolean theorems to simplify Logic Circuit Design.

CO3 :- Study the I-V Characteristics of Semiconductor Devices.

CO4 :- Students will be able to analyze the various pins and it's functions of microprocessor, microcontroller and advance microcontroller.

CO5 :- Interface the external devices with microprocessor and microcontroller for various Real-time applications.

CO6 :- Write Assembly Language Program for microprocessors and microcontroller, writing Embedded-C Programs for different applications.

CO7 :- Design and development of various types of products in automated industry by using PLC.

Programme Specific Outcomes : PSOs of B.Sc. Electronics

B. SC. I- Semester - I

PAPER I - BASIC ELECTONICS

Objectives :-

1. To understand the basics of Electronics component.
2. To understand the basics of transducer and connectors

3. To understand the basic concepts of magnetic, AC & DC circuits
4. To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.
5. To Gain knowledge about the fundamentals of wiring and earthing.

Outcome:-

1. An ability to apply knowledge of science, and engineering
2. An ability to identify, formulate, and solve Scientific problems

PAPER II- SEMICONDUCTOR DEVICES

Objectives :-

Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their Applications.

Outcome :-

On successful completion of the course, the students will be able to

1. Describe the properties of materials and Application of semiconductor electronics
2. Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
3. Demonstrate the control Applications using semiconductor devices.
4. Understand construction, V-I characteristics and application of diode and thyristor.
5. Classify and describe the semiconductor devices for special Application

B. SC. I - Semester - II

PAPER III- BASIC DIGITAL ELECTRONICS

Objectives :-

To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. To prepare students to perform the analysis and design of various digital electronic circuits.

Outcome :

1. Understand the fundamental concepts and techniques used in digital electronics.
2. Understand and examine the structure of various number systems and its application in

digital design

3. The ability to understand, analyze and design various combinational and sequential circuits.
4. Develop skill to build, and troubleshoot digital circuits.

PAPER IV - ELECTRONICS CIRCUITS

Objectives :-

1. To understand the operation of different Flip-Flop
2. To understand the operation and design of various types of power amplifier circuits.
3. To understand the effects of negative feedback on amplifier circuits.
4. To analyze the different RC and LC oscillator circuits to determine the frequency of oscillation.

Outcome :

After successful completion of the course student will be able to

1. Know about the operation characteristics and data storage application of Flip- Flop.
2. Know about the multistage amplifier using BJT in various configurations to determine frequency response and concept of voltage gain.
3. Know about different power amplifier circuits, their design and use in electronics and communication circuits.
4. Know the concept of feedback amplifier and their characteristics.
5. Design the different oscillator circuits for various frequencies

B. SC. II Semester - III

PAPER V- DIGITAL ELECTRONICS

Objectives:

1. To analyze logic processes and implement logical operations using combinational logic circuits.
2. To understand characteristic of various Flip -flop.
3. To understand characteristics of memory and their classification.
4. To understand concepts of sequential circuits and to analyze sequential systems

Outcome:

After successful completion of the course student will be able to

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze, design and implement combinational logic circuits.

3. Analyze, design and implement sequential logic circuits.

PAPER VI - INTRODUCTION TO MICROPROCESSOR

Objectives:

1. To understand basic architecture of 8 bit microprocessors.
2. To understand memory and peripheral chips involving system design.
3. To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors.
- 4 To study instruction Set of 8 bit microprocessor

Outcomes:

Learner will be able to...

1. Write programs to run on 8085 microprocessor based systems.
2. Understand and device techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.

B. SC. II Semester - IV

PAPER VII- LINEAR AND WAVE SHAPING CIRUCITS

Objectives:

1. To analyze the Circuits in time and frequency domain
2. To study network Functions, two port network and multivibrators.
3. To analysis passive network by various methods
4. Study Laplace transform and fourier series and transform.

Outcome:

After successful completion of the course student will be able to

1. Apply their knowledge in analysing Circuits by using network theorems.
2. Apply the time and frequency method of analysis.
3. Find the various parameters of two port network and multivibrators.
- 4 Analysing Laplace transform and fourier transform.

PAPER VIII- MICROPROCESSOR INTERFACING AND MICROCONTROLLER 8051

To develop an in-depth understanding of the operation of microprocessor and microcontrollers, machine language programming and interfacing techniques

Objectives :

- 1.To understand interfacing of 8 bit microprocessor with memory and peripheral chips involving system design.
2. To develop the microprocessor based programs for various applications.
3. To make the interfacing in between microprocessor and various peripherals.
4. To develop the microcontroller based programs for various applications.
5. To enable the students to understand basic feature of 8051 controller.

Outcome:

1. Design and develop Microprocessor based systems for real time applications using low level language like ALP.
2. Interface external peripherals and I/O devices and program the 8085 microprocessor.
3. Write Interrupt service Routine(ISR) to handle interrupts in 8085 microprocessor.
4. Basic understanding of 8051 microcontrollers architectures and its functionalities

B.Sc.III - Semester - V

PAPER IX -LINEAR INTEGATED CIRCUITS

Objectives:

- 1.To understand the concepts, working principles and key applications of linear integrated circuits.
 2. Study OPAMP basics and characteristics
 3. Study OPAMP configurations
 4. Study OPAMP based filters
 5. To perform analysis of circuits based on linear integrated circuits.
 6. To design circuits and systems for particular applications using linear integrated circuits.
- Course
7. Study PLL and timer

Outcome:

After successful completion of the course student will be able to

1. Understand the fundamentals and areas of applications for the integrated circuits.
2. Analyze important types of integrated circuits.
3. Demonstrate the ability to design practical circuits that perform the desired operations.
4. Select the appropriate integrated circuit to build a given application.

PAPER X- COMMUNICATION SYSTEM- I

Objectives:

1. To introduce students to various modulation and demodulation techniques of analog communication.
2. To analyze different parameters of analog communication techniques.
3. To study pulse modulation and demodulation.
4. Understand Function of various stages of AM, FM transmitters Know Characteristics of AM & FM receivers
- 5.To understand various stages of television system

Outcome:

After successful completion of the course student will be able to

1. Use different modulation and demodulation techniques used in analog communication
2. Identify and solve basic communication problems
3. Analyze transmitter and receiver circuits
4. Compare advantages, disadvantages and limitations of analog communication systems.
5. Analysis of various stages of television system.

PAPER XI- 8051 Microcontroller Interfacing And Embedded C

Objectives:-

1. To understand a working knowledge of microcontroller busses and the flow of data within a microcontroller system.
2. Understand how to accomplish a given task using Assembly and “C” language on a microcontroller.
3. Understand a working knowledge of the necessary steps and methods used to interface a microcontroller system to devices such as motors ADC, DAC etc.
4. Understand the use of interrupts and other advanced concepts related to microcontrollers, to provide in depth knowledge of 8051 assembly language programming.
5. To impart the I/O interfacing concepts for developing real time embedded systems.
6. To encourage the students in building real time applications.

Outcomes :-

1. Familiarize with the assembly level and embedded C programming using 8051.
2. Design circuits for various applications using microcontrollers.
3. Apply the concepts on real- time applications.

PAPER XII- POWER ELECTRONICS DEVICES AND APPLICATIONS**Objectives:**

- 1.To understand construction, switching characteristics and protection of power devices.
- 2.To understand construction, switching characteristics and protection of thyristors.
- 3.To understand construction and operating principle of DC machines.
- 4.To understand construction and operating principle of AC machines (1 ϕ and 3 ϕ).

Outcomes:

After successfully completing the course students will be able to

1. Explain construction, switching characteristics and justify the selection of power devices and thyristors.
2. Explain operating principle and suggest protection circuit for power devices and thyristors.
3. Explain construction and operating principle of DC machines and AC machines (1 ϕ and 3 ϕ).
4. Students shall be able to identify the causes of bad commutation and suggest remedies

B.Sc.III - Semester - VI**PAPER XIII- INDUSTRIAL PROCESS CONTROL AND PLC PROGRAMMING****Objectives:**

1. Identify Practical Programmable Logic Controller Applications. Demonstrate Basic PLC Skills.
2. Explain Fundamentals of Process Control Including • Process and Control • Proportional • Integral • Derivative (PID) Control
3. To develop different types of algorithm for digital controllers
4. To provide adequate knowledge about the various ways of using computers for control.
5. To give an introductory knowledge about PLC and the programming languages.
6. To give adequate knowledge about of application of PLC.

Outcomes:

1. Students will be able to describe typical components of a Programmable Logic Controller.
2. Explain the basic concepts of a Programmable Logic Controller.
3. State basic PLC terminology and their meanings.
4. Explain and apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction.
5. Students will be able to design and program basic PLC circuits for entry-level PLC applications.
6. Students will be able to design and program a small, automated industrial production line.

PAPER XIV- COMMUNICATION SYSTEM II

Objectives:

1. To understand the Telephone system and concept of value added services.
2. To understand optical fiber communication
know Frequency Division Multiplexing
3. Learn about theoretical digital communication system and represent a digital signal using several modulation methods
4. Know Frequency code and time division Multiplexing.

Outcomes:

1. Understand the basics of information theory, source coding techniques.
2. Learn the generation and detection of communication system.
3. Understand the generation, detection signal.
4. Understand and analyse wireless, gps, bluetooth ,ZIGBEE, cellphone technology, optical fiber System.

PAPER XV: ADVANCED MICROCONTROLLER ARCHITECTURE PIC

Objectives:

1. PIC μ C training course curriculum is designed to develop to equip the participants with all the all required skills required to work with Programmable Interface Controllers (PIC microcontrollers) at both the hardware and software fronts.
2. This training program enables the aspirants to work on the architecture, pin diagram, and input-output interfacing.
3. Exposure using assembly functions/programs in C.

Outcomes:

1. Understand the evolution in microcontroller technology
 2. List the features of 18F458 microcontroller
 3. Study the architecture, pin diagram, an port input-output configuration
 4. Understand the significance of input-output device interface
 5. Work on different application making use of the PIC microcontroller
-

PAPER XVI- ELECTRONIC INSTRUMENTATION

Objectives:

1. To provide basic knowledge about the various sensors and data acquisition systems applied in Wireless sensor network.
2. To provide a basic understanding of instrumentation and general Instrumentation systems. Explain the operation/working of different sensors.
3. To get fundamental knowledge of sensors and transducers and their operating principles, for measurement of mechanical parameters.
4. To impart interdisciplinary knowledge regarding transducers, pneumatic actuators, hydraulic actuators.
5. Describe advantages, disadvantages, and applications of limit switches, photoelectric sensors, inductive sensors, capacitive sensors, and ultrasonic sensors Transform a temperature reading among different scales
6. Explain the operation of pressure, flow, and level transducers in context with applications.
7. Understand the concept of final control elements in various applications

Outcomes:

1. After successfully completing the course students will be able to Applications and selection of sensors/transducers for particular application.
 2. Describe the various types of sensors including thermal, mechanical, electrical, electromechanical and optical sensors.
 3. Select appropriate transducers and instrumentation system components for a specific application.
 4. Design and development of temperature/pressure/flow etc measurement systems.
 5. Select appropriate Switches and final control elements for a specific application.
 6. Selection of communication protocol and smart sensors for particular application.
-

Department of Microbiology

Course outcomes.

CO1: To make the students knowledgeable with respect to the subject and its practicable applicability.

CO2: To promote understanding of basic and advanced concepts in microbiology.

CO3: To expose the students to various emerging areas of Microbiology.

CO4: To prepare students for further studies, helping in their bright career in the subject.

CO5: To expose the students to different processes used in industries and in research field.

CO6: To develop their ability to apply the knowledge of microbiology in day to day life.

CO7: To prepare the students to accept the challenges in life sciences.

CO8: To develop skills required in various industries, research labs and in the field of human health.

Credits:

1. Theory period of one to two hours per week over a semester.
2. practical period of 3 hour week over a semester.

Program outcome

1. **PO1.Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
- PO2.Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- PO3. Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings.
- PO4. Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. **Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. **Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.

PO7. **Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

**Programme
Specific Outcomes**

PSOs of BSc Microbiology

PSO1. Understand the nature and basic concepts of cell microbiology, microbial Biochemistry, Taxonomy and ecology.

PSO2. Analyse the relationships among animals, plants and microbes

PSO3. Perform procedures as per laboratory standards in the areas of Microbiology, Micerobial Biochemistry.

PSO4. Understand the applications of Microbiology in air microbiology , aquatic & marine microbiology , water microbiology, sewage microbiology , microbial biotechnology, soil microbiology, dairy microbiology , food microbiology , medical microbiology , geo microbiology, industrial microbiology

Sample PSOs of BA Economics

PSO1: Understand the behaviour of Indian and World economy,

PSO2: Analyse macroeconomic policies including fiscal and

monetary policies of India

PSO3: Determine economic variables including inflation, unemployment, poverty, GDP, Balance of Payments using statistical methods

PSO4: Understand the behaviour of financial and money markets and perform cost-benefit analysis for making investment decisions

B.Sc. Chemistry

Course outcome / Program outcome and program specific outcomes.

Sr. No.	Course / Program	Course / Program Outcomes
1.	B.Sc.	
2.	Program outcome subject wise (Chemistry) On successful completion of this course a student will have knowledge of	
	1. B.Sc. I	2. Basic concepts in physical, inorganic, organic, industrial chemistry. 3. Handling of glassware and chemicals. 4. Techniques such as distillation, filtration, crystallization, sublimation, chromatography etc. 5. Qualitative and quantitative analysis. 6. Volumetric estimation of commercial samples.
	1. B.Sc. II	2. Concepts in thermodynamics, Kinetics, electrochemistry, reaction mechanism, stereochemistry, co-ordination compounds, theoretical ground of inorganic mixture separation, gravimetric and titrimetric analysis. 3. Analysis of commercial samples, solutions and compounds by titrimetric, gravimetric and instrumental methods. 4. Sampling methods and interpretation of results. 5. Synthesis of organic and inorganic compounds. 6.
	1. B.Sc. III	2. Details of organic, inorganic, physical, analytical and industrial chemistry. 3. Safe working procedures, chemical toxicology, environmental concerns, handling of chemicals, glassware and range of instruments available at graduation level. 4. Synthetic and analytical procedures, preparation of solutions, sampling, physico-chemical analysis. 5. Working independently in chemical, pharmaceutical, food, sugar, foundry, paint industries and allied fields. 6. The scope of chemistry in multidisciplinary fields.
3	Course / Program	Program specific outcome
	1. B. Sc. Part I (Sem I)	Paper I 1. Nernst distribution law, application of distribution law and numerical problems. 2. Basics of thermodynamics,

			<p>spontaneous, nonspontaneous process, carnot's cycle and numerical problems.</p> <p>3. Chemical kinetics, rate, order and molecularity of reaction, numerical Problems .</p> <p>4. Kinetic theory of gases, ideal non-ideal gases, Boyle's law, Charles law and Avogadro law, numerical Problems.</p> <p>5. Nuclear chemistry, radiation, half life, application of radioisotopes and numerical Problems.</p>
		Paper II	<p>1. Ionic solids, Born Haber cycle, radius ration and crystal structure.</p> <p>2. Covalent bonding, VBT, VSEPR, MOT, LCAO, MO diagrams.</p> <p>3. Arrhenius concept, Bronsted-Lowry concept, Lewis concept, Lux-Flood concept.</p> <p>4. Properties of P-block elements.</p> <p>5. Chemistry of noble gases, clathrate compounds, xenon compounds.</p>
	2. B. Sc. Part I (Sem II)	Paper III	<p>1. Fundamental basics of organic reaction mechanism and reactive intermediates.</p> <p>2. Stereoisomerism, optical, geometrical isomerism, D/L, R/S and E/Z system.</p> <p>3. Formation and reactions of cycloalkanes , cycloalkenes and alkadienes.</p> <p>4. Synthesis and applications of EAA, Diethyl malonate and Grignards reagent.</p> <p>5. Aromaticity, modern theory, Huckels rule, electrophilic and nucleophilic reactions in aromatic compound.</p>
		Paper IV	<p>1. Basic Concepts in Industrial Chemistry</p> <p>2. Water, source, uses, characteristics, potability, sterilization methods and quality measurement.</p> <p>3. Fuel, calorific value, octane, cetane number, anti-knocking agents, biofuels.</p> <p>4. Unit operations, distillation, filtration, crystallization.</p> <p>5. Fertilizers, micronutrients, classification, pollution caused.</p>

	6. B. Sc. Part II (Sem III)	Paper V	<ol style="list-style-type: none"> 1. Stereochemistry, conformational isomerism, conformational analysis and stability of alkane and cycloalkane. 2. Synthesis and reactions of naphthalene, anthracene and phenanthrene. 3. Study of pyrrole, pyridine, quinoline and indole 4. Name reactions, mechanistic approach and applications. 5. Green chemistry principle and process.
		Paper VI	<ol style="list-style-type: none"> 1. Introduction to analytical processes, sampling, error, accuracy, numerical problems. 2. Theoretical principles and process involved in gravimetric analysis. 3. Theoretical principles involved in inorganic qualitative analysis, mixture separation. 4. Acid base titrations using conductometry, Weston bridge, cell constant. 5. Sampling and analysis of fertilizers.
	7. B. Sc. Part II (Sem IV)	Paper VII	<ol style="list-style-type: none"> 1. Electrochemistry, Debye-Huckel theory, Hittorf's rule, Kohlrausch law, Henderson's equation, Numerical problems. 2. Concept of entropy, Third law of thermodynamics, Numerical problems. 3. Third order reactions, Methods to determine order of reaction, Numerical problems 4. Physical properties of liquids, Surface tension, Viscosity and Refractive index.
		Paper VIII	<ol style="list-style-type: none"> 1. First transition elements, electronic structure, coloured ions, magnetic properties character, oxidation states, and complex formation. 2. Study of lanthanides. 3. Co-ordination chemistry, Werner's theory, IUPAC nomenclature, CFT, VBT, Jahn-Teller distortion, CFSE. 4. Chelation, chelating agents EDTA and DMG

			<p>5. Homogenous and Heterogeneous catalysis, mechanism and application of catalysis.</p> <p>6. Non aqueous solvents.</p>
8.	B. Sc. Part III (Sem V)	Paper IX	<p>1. Quantum chemistry, De Broglie hypothesis, Heisenberg's uncertainty principle, Schrodinger wave equation, Quantum numbers.</p> <p>2. Spectroscopy, Electromagnetic spectrum, Energy level diagram, Maxwell – Boltzman distribution, Raman spectra.</p> <p>3. Photochemistry, Laws of photochemistry, Photophysical and photochemical processes, Jablonski diagram.</p> <p>4. Ideal solutions, Raoult's law, Phenol – water, Triethyl amine – water, Nicotine – water system.</p> <p>5. E.M.F. series, Types of electrodes, Numerical problems.</p>
		Paper X	<p>1. Hard and Soft Acids and Bases (HSAB), Pearson's HSAB concept.</p> <p>2. Metal ligand bonding in Transition metal complexes, Isomerism in complexes with C.N. 4 and 6, Molecular orbital theory.</p> <p>3. Inorganic Polymers, classification, Polymer back bone, Phosphorus, Fluorocarbons, phosphonitrilic compounds, silicones.</p> <p>4. Metals, Semiconductors and Superconductors, Theories of bonding in metal, Types of semiconductors, Superconductors: Ceramic superconductors, Applications of superconductors.</p> <p>5. Organometallic compounds, Synthesis and structural study.</p>
		Paper XI	<p>1. Introduction to Spectroscopy, Electromagnetic radiation.</p> <p>2. UV Spectroscopy, Beer-Lamberts law, Woodward and Fisher rules,</p>

			<p>Applications of U.V. Spectroscopy.</p> <p>3. IR Spectroscopy, Principle of I.R. Spectroscopy, Fundamental modes of vibrations types and calculation, Hooks Law.</p> <p>4. NMR Spectroscopy, NMR-Instrumentation, Shielding, & deshielding, Chemical shift, Coupling Constant, application.</p> <p>5. Mass spectroscopy, Mass spectrometer, Fragmentation patterns, McLafferty rearrangement, application.</p>
		Paper XII	<p>1. Manufacture of ammonia, sulphuric acid, nitric acid, sodium carbonate.</p> <p>2. Corrosion and Passivity, Electrochemical theory of corrosion, Methods of protections of metals from corrosion.</p> <p>3. Manufacture and refining of cane sugar, byproducts of sugar industry</p> <p>4. Soaps and Detergents</p> <p>5. Nanomaterials, Characterization and fabrication, Applications of Nanomaterials.</p>
	9. B. Sc. Part III (Sem VI)	Paper XIII	<p>1. Gibbs phase rule, Phase diagram, One two and three component system.</p> <p>2. Free energy : Gibbs function, Helmholtz function, Gibbs Helmholtz equation, Clapeyron – Clausius equation, Gibbs-Duhem equation.</p> <p>3. The solid state, Space lattice, lattice sites, Lattice planes, Unit cell, Weiss indices and Miller indices, Bragg's equation.</p> <p>4. Radioactivity, Scintillation and Geiger Muller, decay constant.</p> <p>5. Chemical Kinetics.</p> <p>6. Surface Chemistry, Adsorption, Freundlich adsorption isotherm, Langmuir adsorption isotherm, BET equation.</p>
		Paper XIV	<p>1. Inorganic Reaction mechanism,</p> <p>2. Thermodynamic and Kinetic aspects</p>

			<p>of metal complexes.</p> <ol style="list-style-type: none"> 3. Nuclear Chemistry, Nuclear reactions and energetic of nuclear reactions, types of nuclear reactions, applications of radio-isotopes as tracers. Study of Actinides 4. Iron and Steel, Blast furnace, Bessemer process, L.D. process, Heat treatment on steel. 5. Bio-inorganic Chemistry, Metalloporphyrins.
		Paper XV	<ol style="list-style-type: none"> 1. Name reactions, Statement, General Reaction, Mechanism and Synthetic applications. 2. Reagents in Organic Synthesis, Preparation and Applications. 3. Electrophilic addition to c-c double bond and triple bond, 4. Studies of natural product, terpenoids, alkaloids. 5. Pharmaceuticals, Introduction, Classification, Qualities of ideal drug, Drug action of sulpha drugs.
		Paper XVI	<ol style="list-style-type: none"> 1. Theory of Titrimetric Analysis, Ostwald's Quinoid theory, Acid base titration, Complexometric titration. 2. Potentiometric Titrations, Quinhydrone and Glass electrodes, Potentiometric titrations. 3. Colorimetry and Spectrophotometry, Theory of Colorimetry and Spectrophotometry 4. Flame Photometry, principles of flame photometry, application and limitations. 5. Chromatography, Types of chromatography, Gas chromatography, Liquid Chromatography, Supercritical-fluid, Chromatography.

B.Sc. Physics

COURSE OUTCOMES/PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES.

Sr. No	Course	Course /Program outcome
1	B.Sc.-I	The main outcome of this course is to acquaint students with some basic concepts in Physics. They will be introduced to some elementary methods of analysis of physical quantities and at the end of this course students are expected to be able,
2	B.Sc.-II	I The curriculum of Physics highlight the fundamental concepts of physics as useful to daily life. ii. With the knowledge of physics , basic principles of living things can be understood easily iii. To explain students with new technique in physics this can be applied in many branches of science.
3	B.Sc.-III	i. Explain the principles and applications related to diffraction, Interference, acoustics, ultrasonic waves ii. Describe and discuss types of semiconductor devices concepts related to different electronic components and circuits iii. Remind and write concepts related to quantum mechanics and classical mechanics
Sr. No.		Program specification outcomes
1	B.Sc.-I	i. The basic concepts of matter are lucidly explained and to know the basic statements, laws, principles and definitions. ii. Introduction diffraction, interference, grating, resolving power and polarisation
2	B.Sc.-II	Intoduction planks quantum theory ,wave particle, duality, Compton

		effect ,phase velocity,group velocity,CRO,different types of amplifiers,oscillators,use of different electronic instruments in physics lab
3	B.Sc.-III	Introductions classification of solid on band theory,Fermi energy,density of states, effect of temperature on Fermi level,Zener diod,LED,solar cell, photo conductive cell. Transistors-types and working,transitor as an amplifier ,oscillator,

Department of Biotechnology

Programme objective:

Three years B. Sc. Biotechnology (Entire) program is formulated for developing competent biotechnologist for which significant job opportunities exist in this country. The course is based on interdisciplinary nature of Biochemistry, Chemistry, Quantitative Biology, Genetics, Microbiology and Biophysics. The program obliges students to read original publications and envisages significant inputs in laboratory work, communication skill, creativity, planning, execution and critical evaluation of the studies undertaken. This program gives common basic knowledge (Biochemistry, Molecular Biology, Research Methodology, Biostatistics, Computer science and Bioinformatics) at first year level to become good /biotechnologist. The specializations introduced in the course at second year and at third year level are in the disciplines of General Biotechnology, Plant Biotechnology, Animal Biotechnology, Bioinformatics, Microbial Technology. Immunology etc.

Course: Objectives :

- 1) To make the students knowledgeable with respect to the subject and its practicable applicability.
- 2) To promote understanding of basic and advanced concepts in Biotechnology.
- 3) To expose the students to various emerging areas of Biotechnology.
- 4) To prepare students for further studies, helping in their bright career in the subject.
- 5) To expose the students to different processes used in industries and in research field.
- 6) To prepare the students to accept the challenges in life sciences.
- 7) To develop skills required in various industries, research labs and in the field of agriculture, food, human health.

Subject objectives:

This syllabus is framed to give sound knowledge with understanding of Biotechnology to undergraduate students of B.Sc. Biotechnology (Entire) degree course. Students learn Biotechnology as a separate subject from B.Sc. I, II and III. The goal of the syllabus is to make the study of Biotechnology popular, interesting and encouraging

to the students for higher studies including research. The new and updated syllabi for all the 3 years is based on a basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The syllabi for the three years are prepared after discussion at length with number of faculty members of the subject and experts from industries and research fields. The units of the syllabi are well defined, taking into consideration the level and capacity of students at each year and semester.

Course / Programs outcomes and Programs Specific outcomes (All Papers)

Sr. No.	Course/programme	Course/Programme Outcomes
1.	B.Sc . Biotechnology (Entire)	Three years B. Sc. Biotechnology (Entire) program is formulated for developing competent biotechnologist for which significant job opportunities exist in this country. The course is based on interdisciplinary nature of Biochemistry, Chemistry, Quantitative Biology, Genetics, Microbiology and Biophysics. The program obliges students to read original publications and envisages significant inputs in laboratory work, communication skill, creativity, planning, execution and critical evaluation of the studies undertaken. This program gives common basic knowledge (Biochemistry, Molecular Biology, Research Methodology, Biostatistics, Computer science and Bioinformatics) at first year level to become good biotechnologist. The specializations introduced in the course at second year and at third year level are in the disciplines of General Biotechnology, Plant Biotechnology, Animal Biotechnology, Bioinformatics, Microbial Technology. Immunology etc.
2.	Programme class wise	
	B.Sc. Biotechnology- I	The students are familiarized with basic aspects with subjects required to study biotechnology. This is the very fundamentals required on which they build their knowledge

		of the subjects.
	B.Sc. Biotechnology-II	During this year as the students slowly climb the ladder of their career in this field, they are introduced to more advanced knowledge of various courses of biotechnology.
	B.Sc. Biotechnology- III	Finally the students are made to learn and understand various aspects of biotechnology on which they will build the career like post graduation studies etc.

3. Programme Specific

Sr. No.	Class	Sem.	Paper No.	Title of the Paper	Program Specific Outcomes
1	B.Sc . Biotechnol ogy- I	I	I	Chemistry -I	Any biological and biochemical experiments require some basic knowledge of chemistry and hence it is essential for the students to acquire this knowledge.
			II	Physics-I	Similarly fundamental knowledge of physics is essential for the students to understand certain biotechnology processes.
			III	Plant Science	Students are prepared for a plant biotechnology with the help of basics in plant science.
			IV	Mathematical Methods	It is essential to know certain mathematical rules needed for working with any biotechnological or biochemical process which the students learn from other subjects of biotechnology

			V	Biomolecules	The study of biochemistry helps to understand the chemical concepts of biology. It helps to enhance the functioning of various body processes and physiology by uses of bio-molecules.
			VI	Biotechniques and Instrumentation	It will help the students, to develop analytical skills using different instruments and other techniques in biotechnology.
			VII	Microbiology-I	The students will get some basic knowledge about microorganisms which will be useful in their projects and other practical application. Subjects like classification of microbes helps to understand certain characteristics which will make them determine whether the results obtained are right or wrong.
			VIII	Computer basics and Bioinformatics	The students get familiar to handle computer and manage database for better results.
			IX	English for Communication -I	Enhancement of communication skills of students.
II			X	Chemistry -II	As the students starts learning higher levels of different biotechnological processes, they also need to learn chemistry from fundamentals to a slightly higher level

			XI	Physics-II	This is also a slightly higher level of physics which will help the students to keep track of their higher level of knowledge in different techniques of biotechnology.
			XII	Animal Science	Understanding of the basics in animal science which will help the students to further the students' knowledge in subjects like Animal tissue culture from different organs of different animals.
			XIII	Statistical Methods	Statistical methods are very essential when the students will start working on their projects and entrepreneurship.
			XIV	Proteins and enzymes	Study of proteins and enzymes provides knowledge of structure of protein and their purification. The enzyme study reveals the students with knowledge of how enzymes work and factors affecting enzyme activity.
			XV	Basics in Cell Biology	Useful to understand how the cells do what they need to do, working from molecules, through whole cells, up to tissues and organs.
			XVI	Microbiology-II	To understand the scope and applications of microbiology in various fields like medical, food, industrial microbiology.

			XVII	Computer Programming	By getting familiar with different programmes, the students find it more manageable to learn and do practicals on subjects like Bioinformatics.
			XVIII	English for Communication –II	Improves communication skills and language proficiency of students
2	B.Sc . Biotechnol ogy- II	III	BTE-301	Genetics	Genetics is a prerequisite for cell and molecular biology and useful in the overall study of genetic engineering.
			BTE-302	Fundamentals of Biophysics	Here the students get familiarized with theory of different analytical equipments which will be of use to the students when they will do some analytical work especially with regards to their project.
			BTE-303	Metabolic Pathways	The study of metabolism provides students with a basic understanding of the principles of bioenergetics and enzyme catalysis, the metabolism of dietary and endogenous carbohydrate, lipid, and protein.
			BTE-304	Ecology	Useful for the understanding of ecological concepts as well as the ability to apply ecological knowledge to manage and remediate environmental problems.

			BTE-305	Molecular Biology-I	The subject provides basic concepts of gene and helps to understand the molecular mechanisms of living forms. This knowledge further helps in understanding of rDNA technology.
			BTE-306	Plant Tissue Culture	It is a tool of research, major industrial importance in the area of plant propagation, disease elimination, plant/crop improvement and production of secondary metabolites.
		IV	BTE-401	Immunology	Immunology deals with the study of basic immune system and how it acts inside the body. It is very helpful to understand the serological reactions for the diagnosis of diseases.
			BTE-402	Advances in Cell Biology	Cell biology integrates other biological sciences, such as biochemistry and molecular biology, to explain the structure and function of cells. It's not only considers how cell diversity arises and how cells co-operate but also communicate with each other in normal tissues and in developing embryos.
			BTE-403	Plant Biochemistry	An important field of basic science explaining the molecular function of a plant, but is also an applied science that is in the position to contribute to the solution of

					agricultural field.
			BTE-404	Environmental Biotechnology	Useful in understanding the basics of pollution, xenobiotics and effects of different toxins in human body. It also helps to understand concepts and techniques in Bio-remediation.
			BTE-405	Molecular Biology-II	The subject provides knowledge of the fundamental processes of living beings. This knowledge further enhances their understanding of advances in genetic engineering.
			BTE-406	Animal Tissue Culture	It gives basic knowledge of technique of cell culture, characterization and use of animal cell lines in production of monoclonal antibodies, vaccine and other valuable recombinant products.
3	B.Sc . Biotechnol ogy- III	V	BTE-501	Basics in Genetic Engineering	The subject gives knowledge about how to isolate and amplify gene. Subject provides understandings of cloning methodologies and applications of r- DNA technology In various biology fields.
			BTE-502	Industrial Biotechnology	It gives basic idea regarding the isolation of industrially important microbes, fermenter design, fermentation media preparation and the downstream processing of the product.
			BTE-	Application of	It discuss about the foodstuff

			503	Biotechnology in Agriculture	security which rising the demand in countries growth. It also deals with the production and applications of biofertilizers and biopesticides.
			BTE-504	Developmental Biology (Plant and Animal)	It offers research driven knowledge in various areas of biology to understand organisms develop from a single cell.
		VI	BTE-601	Advances in Genetic Engineering	Genetic engineering technology helps students to know the basics of rDNA technology. Which further helps to understand how to construct rDNA and gene transfer methodologies.
			BTE-602	Food and Microbial Biotechnology	The fermentation technology help to understand the process of production of industrial products like antibiotics, beverages, fermented foods.
			BTE-603	Application of Biotechnology in Health	It provides knowledge of effective diagnostics, and treatment measures. Subject provides effective drug delivery approaches and gene therapy.
			BTE-604	Bioinformatics	The study of bioinformatics reveals the students about the different methods of molecular analysis (genomics and proteomics) using software which further enhances use of tools in drug designing and phylogenetic analysis.

