

## **Department of Science**

### **Program Outcomes**

- BSc program is tailor-made to inculcate a scientific temperament among the students.
- The course offers theoretical and practical knowledge about the various science subjects such as Botany, Chemistry and Microbiology.
- This program course is most beneficial for students with science background.
- The course also is beneficial for students who wish to pursue multi and inter-disciplinary science careers in future.
- The course offers a platform to improve science and technology in the society and thus help the nation develop rapidly.
- After the completion of the course the students can pursue higher studies i.e. is M.Sc. Ph.D., Research and so on ....
- The course allows mini and major research project which explores the scientists in them.
- The course provides outdoor activities like field trips, Industrial trip, surveys and outdoor experimental reports.
- The above point helps students connect to the outside world and to know how science works outside their books.
- The students can serve the industries or opt to establish their own.
- The students apart from opting research jobs, also find marketing, business and other technical fields.
- Being a para-medical course can also branch to various professional course and jobs.
- By the end of the course they are experts in analytical skills and problem solving skills requiring application of scientific knowledge.
- The course helps the students to think methodically, independently and draw logical conclusion.
- The course gives thorough knowledge of all the subjects delt.

## **Program Specific Outcomes**

The BSc course provides BOTANY, CHEMISTRY and MICROBIOLOGY.

### **BOTANY**

- Students acquire fundamental botanical knowledge through both theory and practical's.
- To get better understanding of life cycle patterns, diversity and their survival in nature.
- Helps understanding the role of living and fossil plants in our life.
- To create awareness about cultivation, conservation and sustainable utilization of biodiversity.
- Help students to master advance techniques in plant science like tissue culture, phytoremediation, formulation of new herbal drug, plant disease management etc.
- They are able to start nursery, mushroom cultivation, bio fertilizer production, fruit preservation and horticultural practices.

### **CHEMISTRY**

- Gain the knowledge from both the theory and practical.
- To explain nomenclature, stereochemistry, reactivity, and mechanism of chemical problems.
- Identify chemical formula, solve numerical problems, and to know structure -activity relationship.
- Use of modern tools, models, chem-draw, charts and equipments.
- Develop research oriented skills, handle sophisticated instruments and laboratory practices.

### **MICROBIOLOGY**

- In depth understanding of basic and applied aspects of microbiology through theory and practicals.
- Capacity to develop, employ and integrate technical and professional skills.
- Analysis of scientific issues across the spectrum of related disciplines and allied inter and multidisciplinary fields through literature research.
- Uphold the responsibility as a global citizen maintaining professional and ethical values.
- Understand microbiology as a social endeavor in context to bringing about harmony with nature.
- Ability to upgrade knowledge independently and act upon means of improvement for life long learning.

## **Department of Chemistry**

### **Program Outcomes**

Chemistry is a central subject of science. It is also closely related to daily life. The broad aims are to help students to :

- Acquire some knowledge of the empirical world and to ensure that conceptual learning of the subject is achieved.
- Broaden chemistry knowledge. The students will broaden and deepen their understanding of theories, concepts and models to enhance their success as scientists and educators.
- Acquire an ability to observe accurately and objectively.
- Acquire an ability to solve problems.
- Acquire an ability to think scientifically, independently and to make rational discussion.
- Acquire an ability to communicate, using the language of chemistry.
- To develop an appreciation of chemistry and its application in daily life.
- Promote an awareness of the social, economic, environmental and technological implication of chemistry..
- Responsible conduct in research/practicals. Graduates will understand and conduct research exhibiting the highest standards of safety, honesty and integrity.
- Make students capable of studying chemistry in academic and professional courses (such as medicine, engineering, technology) at tertiary level.
- Expose the students to various emerging new areas of chemistry and apprise them with their relevance in future studies and their application in various spheres of chemical sciences and technology

### **Program Specific Outcomes**

- Students would have obtained extensive knowledge in understanding the basic concepts of chemistry and competence for employability is developed.
- To encourage students to develop curiosity and a spirit of enterprise.
- To make them understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical problems.

- The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.
- Acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.
- To enable the student develop the ability to effectively communicate scientific information and research results in written and oral formats.
- The student will learn professionalism, including the ability to work in teams and apply basic ethical principles.
- Teamwork and interdisciplinary collaboration. Graduates will have the ability to work effectively as part of a team and to cross traditional boundaries and execute multidisciplinary research.
- To acquire students a readiness in becoming responsible citizens in a changing world.
- To provide students with some insight into future career prospect in the fields related to Chemistry

**Course Outcomes - Dept. of Chemistry**

<b>SL.NO</b>	<b>Name of the Paper</b>	<b>Course Outcomes</b>
<b>1.</b>	<b>Chemistry Paper-I</b>	<ul style="list-style-type: none"><li>• The student will understand the importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information.</li><li>• To understand structure and bonding in molecules</li><li>• Students will describe and apply the law of conservation of mass.</li><li>• Parts of Atoms and Nuclear Changes.</li><li>• Students will describe and apply the history of atomic theory.</li><li>• To gain knowledge about the basic concepts in organic chemistry.</li><li>• To understand about organic reactions and reaction intermediate.</li><li>• Apply fundamental chemical principles to gather and explain data.</li><li>• Exhibit memory of previously learned material by recalling facts, terms, basic concepts</li></ul>

<p>2.</p>	<p><b>Chemistry Paper-II</b></p>	<ul style="list-style-type: none"> <li>• Relate an element's valence electron structure to its position in the periodic table.</li> <li>• Describe and compare the properties of metals, nonmetals, and metalloids.</li> <li>• Predict chemical behavior of the main group elements</li> <li>• Relate chemical behavior to electron configuration and atomic size.</li> <li>• Relate the chemical and physical properties of the transition elements to their electron configurations.</li> <li>• Compare the number of electrons in the outer energy level of metals, nonmetals, and metalloids.</li> <li>• Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way</li> <li>• To understand the postulates of quantum mechanics and be able to apply knowledge to electronic structure calculation</li> </ul>
<p>3.</p>	<p><b>Chemistry Paper-III</b></p>	<ul style="list-style-type: none"> <li>• Write equilibrium expressions, and use them to calculate the equilibrium constant for reactions.</li> <li>• Interpret the behavior of ideal gases in terms of kinetic-molecular theory, including diffusion and effusion</li> <li>• To understand the various purification techniques available and the need for purity of</li> </ul>

		<p>compounds</p>
		<ul style="list-style-type: none"> <li>• Introduction to polymer history, its function and importance as well as the nature and structure of crystallized polymers.</li> <li>• To understand the concepts of thermodynamics and apply it to physical and chemical systems</li> </ul>
<p><b>4.</b></p>	<p><b>Chemistry Paper-IV</b></p>	<ul style="list-style-type: none"> <li>• Introduction to electro analytical methods of research and observe chemical changes over the years.</li> <li>• Explain how some isotopes are made of unstable nuclei, which decay over time emitting particles and energy.</li> <li>• Explain how the process of decay can change the isotope's atomic and mass numbers.</li> <li>• Contrast the three kinds of emissions (alpha, beta, and gamma), the composition of the emission, and the material required to shield them.</li> <li>• . Differentiate between nuclear fission and fusion.</li> <li>• Identify the common uses of nuclear fission and fusion.</li> <li>• To identify and detect various anions and cations through coloured reactions of metal ions.</li> <li>• To develop the skill of semi micro analysis</li> <li>• To learn the principles of green chemistry</li> </ul>

5.	<b>Chemistry Paper-V {ORGANIC CHEMISTRY}</b>	<ul style="list-style-type: none"><li>• Differentiate between properties of inorganic and organic compounds.</li><li>• . Differentiate between alkanes, alkenes, alkynes, and cyclic hydrocarbons.</li><li>• Identify, name and draw structural formulas for the first ten alkanes.</li><li>• Recognize that many organic compounds contain functional groups, which determine the properties and uses of that compound.</li><li>• To understand the concepts and principles of UV, IR, NMR and Mass Spectroscopy</li><li>• To employ the spectroscopic techniques for the structural identity of organic molecules</li><li>• To enable the students to check the purity of organic compounds by determining the melting or boiling points . To analyze and characterize simple organic functional groups</li><li>• Understanding of the methods of isolation, purification and structural elucidation of natural products.</li></ul>
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<p><b>6.</b></p>	<p><b>Chemistry Paper-VI {PHYSICAL CHEMISTRY}</b></p>	<ul style="list-style-type: none"> <li>• It studies the reaction and properties of matter on a molecular and atomic level along with focusing on how chemical reactions occur. Further, it also explores the macroscopic and particulate phenomena in chemical systems and a wide range of concepts of Physics.</li> <li>• To learn about the principles and applications of electrochemistry.</li> <li>• To understand basics of phase equilibrium</li> <li>• To enable the students to understand the effect of pressure and temperature on phase equilibrium.</li> <li>• To understand the principles potentiometric and conduct metric titration.</li> </ul>
<p><b>7.</b></p>	<p><b>Chemistry Paper-VII {INORGANIC CHEMISTRY}</b></p>	<ul style="list-style-type: none"> <li>• Focusing on inorganic compounds, this subject peruses these compounds in terms of their structure, properties and reactions to chemical elements and compounds except for organic compounds</li> <li>• To understand the basic concepts of coordination chemistry and early theory.</li> <li>• To understand the reactivity of coordination compounds . To understand the active roles played by metal ions and coordination compounds in biological systems.</li> </ul>

8.	<b>Chemistry Paper-VIII</b> <b>{BIO- CHEMISTRY}</b>	<ul style="list-style-type: none"> <li>• To understand the organic chemistry of biomolecules.</li> <li>• To learn about how enzymes work in the biological system.</li> <li>• To gain knowledge about peptide and protein chemistry. To understand the structure of nuclei acids.</li> <li>• Fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms. Understanding of the concepts of mole, mole fraction, molarity, etc. and to apply them in preparations of solutions of desired strengths.</li> <li>• To acquire training to determine saponification value and iodine value of oil and different types of fats.</li> </ul>
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### STUDENT OUTCOMES

**The curriculum and syllabus for Bachelor degrees conform to outcome based teaching learning process.**

**The syllabus has been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.**

**On successful completion of this Programme, students will have the ability to:**

**a. Apply knowledge of computing, mathematics, and basic sciences appropriate to the discipline**

**b. Acquire knowledge and understanding of essential facts, concepts, principles and**

**theories relating to the subject areas identified.**

**c. Develop Skills to evaluate, analyse and interpret the chemical information and data.**

**d. Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem.**

**e. Apply such knowledge and understanding to the solution of qualitative and quantitative problems mostly of a familiar nature.**

**f. Use of computers and available software in data analysis.**

**g. Use standard laboratory equipments, modern instrumentation and classical techniques to carry out experiments.**

**h. Develop skills to interpret and explain the limits of accuracy of experimental data in terms of significance and underlying theory.**

**i. Think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.**

**j. Function effectively on teams to accomplish a common goal.**

## **Department of Botany**

### Botany Career Opportunities and Job Prospects

After duly completing a bachelor's education in Botany, a candidate can look forward to being a part of the industry by working as a **technician**, whereas, a candidate after completing his/her master's education can look forward to working with some industry giants or being a part of good **research** teams.

The amount of diversity in the field of Botany gives it students to choose their **specializations** as per their choice, aptitude and interests. There is huge scope of being a part of this industry merely keeping in mind the amount of diversity it has to offer.

One can be a part of any reputed organization as a

**Plant explorer:** Botanist with a passion for plants who could be a photographer, writer, expeditioner, etc

**Conservationist:** Is an individual who works for the conservation of the environment and is often linked to organisations working for the cause.

**Ecologist:** A person who works for the eco-system and a balanced environment.

**Environment consultant:** Some botanists qualify to work as environmental consultants, providing inputs and advice for the conservation of the environment.

**Horticulturist:** A horticulturist knows the science behind different plants, flowers, and greenery. They conduct research in gardening and landscaping, plant propagation, crop production, plant breeding, genetic engineering, plant biochemistry, and plant physiology.

**Plant biochemist:** Biochemists study the chemical and physical principles of living things and of biological processes, such as cell development, growth, heredity, and disease.

**Molecular biologist:** Molecular biologists conduct research and academic activities. The research component involves the study of biological structures in well-equipped laboratories with advanced technology to help them explore complex molecular structures and their particular functions. The equipment may include microscopes, lab centrifuges, computers with specific software that allows them to analyze obtained data, and many more.

The number of professions botanists can go into nowadays is endless. Moreover the application of plant sciences improves the yield and supply of medicines, foods, fibers, building materials and other plant products. The knowledge of **plant sciences** is essential for development and management of forests, parks, waste lands, sea wealth etc.

Few of the **industries** which one can work with are:

- Chemical Industry
- Food Companies
- Arboretum
- Forest Services
- Biotechnology Firms
- Oil Industry
- Land Management Agencies
- Seed And Nursery Companies
- Plant Health Inspection Services
- National Parks
- Biological Supply Houses
- Plant Resources Laboratory
- Educational Institutions
  - Educational sector, food and chemical industry, national parks, etc.

Ecologist (Jobs)	The job of an ecologist demands the individual to work for the betterment of the ecosystem and its conservation. Average salary is Rs 2,00,000 to Rs 2,50,000 p.a.
Plant Biochemist (Jobs)	The profile of a plant biochemist is helpful for the health industry. Average salary is Rs 5,50,000 p.a.
Researcher (Jobs)	The researcher works in a research institute and works on finding new aspects related to botanical sciences. A Research Scientist earns an average salary of Rs 5,88,339 per year.

Environmental consultant (Jobs)	This kind of job requires the person to suggest the best possible methods for environment conservation and also they are usually consulted before construction practices. A Research Scientist earns an average salary of Rs 6,00,000 p.a.
Park Ranger (Jobs)	The job of a park ranger is very interesting; they work in wildlife sanctuaries and national parks.
Botanist (Jobs)	A botanist is a person who studies various plants and flowers. A botanist earns an average salary of Rs 12,00,000 p.a.
Nursery or Green House manager (Jobs)	This is a managerial career which deals with managing the nursery.
Farming Consultant	An expertise who works as a consultant related to farming queries on the molecular or physical level.
Geneticist	A growing and developing the field with a lot of scopes who are interested in plant genetics, heredity and variation in organisms.
Paleobotanist	Recovery and identification of plants from geological context.

## **Course Outcomes of B.Sc Botany Offered by the Department of Botany**

### **Programme Outcomes in B.Sc Botany (PO)**

#### **a) 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.
4. The role of plants in the functioning of the global ecosystem.

#### **b) Practical skills: Students learn to carry out practical work, in the field as well as in the laboratory.**

1. Interpreting plant morphology and anatomy.
2. Plant identification in the field with the help key characters of the family.
3. Vegetation analysis techniques – to know the different type of habit of plants in their habitat.
6. Plant pathology by collecting the specimens in field and know the etiology of them.

#### **c) Scientific Knowledge:**

Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form, Molecular Biology, Biotechnology, Plant Tissue culture.

#### **d) Individual and team work:**

Function effectively as an individual and as a member in teams while doing a project of embryology and collecting specimens or making permanent slides.

### **Course Outcomes in B.Sc Botany (CO)**

1. It provides a critical knowledge of the plants by evaluation and arguments by collection relevant information about the plants from algae to flowering plants (from the class, books, internet), so as recognize the position of plant in the broad classification.
2. 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, bryophytes and Pteridophytes that differentiate them from each other and from other forms of life.
3. Students will be able to understand the theory of evolution which offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explain how modification has taken place in plant morphology, physiology, and life history.

4. Students will be able to explain the ecological interdependence 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.

5. Students will be able to explain how Plants function at the level of the gene, genome, cell, tissue, Flower development, cellular respiration, photosynthesis in each minute cell. 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.

6. Students will be able to demonstrate some experiments – like analysis of O<sub>2</sub>, Chlorides in different water samples from different localities, estimation of ascorbic acid in different plant materials etc, appropriate for their area of specialization within biology.

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

<b>S.No</b>	<b>Name of the Paper</b>	<b>Program Specific Outcomes</b>
1	Semester-I, Paper-I: Diversity in Non vascular Plants - Part-I	On completion of the course, students are able to understand the diversity among Algae, their systematic position, morphology and structure, the useful and harmful activities of Algae, Viruses, and Bacteria. Applied aspects in microbiology like biogas production, bioremediation, bio fertilisers etc. Understand the concept, principles of Microbiology and types of sterilization methods and media preparation; Know the culture methods of bacteria.
2	Semester-II, Paper-II: Diversity in Non vascular Plants - Part-II and Plant Anatomy	Understand the Biodiversity of Fungi and Bryophytes, lichens and mycorrhiza and to know the Economic Importance of them. They will also know how Saccharomyces are used as genetic model. Understand the scope and importance of Plant Pathology. Know the prevention and control measures of plant diseases and its effect on economy of crops. Students will have comprehensive knowledge of meristematic tissue, secretory and permanent tissues. They can easily understand how the girth of plant increases in old trees- the normal and anomalous secondary growth in plants and their causes.
3	Semester-III, Paper-III: Pteridophytes, Paleobotany, Environmental Biology and Phytogeography	Understand the Biodiversity and Economic Importance of Pteridophytes, understanding the stellar evolution in Pteridophytes because they are vascular cryptogams, importance of seed habit characters. Know the scope of Paleobotany, types of fossils, fossilization and geological time scale, contribution of Birbal Sahni, understand the



		various fossil genera representing different fossil groups. Understand plant communities, ecological factors, and ecological adaptations in plants. Learn about conservation of natural resources and biodiversity. Learn Phytogeographical zones of India and Karnataka.
4.	Semester-IV, Paper-IV: Gymnosperms and Embryology of Angiosperms.	Understand the general characters and economic importance of Gymnosperms. Contributions of P.Maheswari and B.G.L.Swamy to the field of Embryology of Angiosperms. Students will know micro and megagametophyte and its development, fertilization, endosperm and embryogeny, seed, palynology, aero and melissopalynology. Understand the concept of Plant tissue culture, method of some organ and tissue culture and Embryology in relation to Taxonomy.
5	Semester-V, Paper-V: Taxonomy and Economic Botany	Understand the general range of variations in the group of angiosperms. Trace the history of development of systems of classification emphasizing angiospermic taxa, understand various rules, principles and recommendations of plant nomenclature and study phylogenetic system of classification. Understand major Botanical gardens, applied taxonomy, studies of families belonging to dicot and monocot according to the Engler and Prantl system of classification. 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. Economic importance of edible oil, sugar and starch, fibres, paper & pulp, beverages, spices, timbers, medicinal and aromatic plants. Learn Ethnobotany.
6	Semester-V, Paper-VI Molecular biology, Genetics, Genetic Engineering, Biotechnology and Plant Physiology	On completion of the course, students are able to Understand the genomic organization or living organisms, study of DNA, RNA, they gain knowledge about the mechanism of protein synthesis, and DNA replication. Understand the fundamentals of Recombinant DNA Technology and microbial biotechnology. The concept of Operon and its structure and regulation and bioinformatics. They will gain knowledge of water relation, stress physiology, water absorption and ascent of sap, transpiration,

		mineral nutrition and phloem transport.
7	Semester-VI, Paper-VII Cytology, Genetics, Evolution and Plant breeding	Learn the structure of chromosome, cell division; understand the mendelian concept, and deviation from mendelism, sex determination. Theories of evolution, numerical changes in chromosome number, aberration and its syndrome. Understand the science of plant breeding. To study the techniques of production of new superior crop varieties. Get the detail knowledge about modern strategies applied in Plant Breeding for crop improvement i.e. Mass selection, Pureline Selection and Clonal selection through the method of hybridization.
8	Semester-VI, Paper-VIII Plant Physiology	Learn and understand the enzyme, nitrogen metabolism, growth and developmental processes in plants. Know about Photosynthesis, photorespiration and Respiration in plants. They will have the knowledge of plant growth hormones, plant movements, photobiology, mechanism and breaking of seed and bud dormancy and defence mechanism of plants.

## **COURSE OUTCOME B.Sc MICROBIOLOGY (CBCS)**

A Candidate who is conferred an BSc degree in microbiology needs to have acquired/developed following competencies during the programme of the study :

Knowledge of the diverse places where microbiology is involved

Understanding of diverse microbial processes

Basic skills such as culturing microbes, safety issues relating handling of microbes, good practices etc.

Knowledge of recent developments in the area of microbiology.

Awareness how some microbiology leads may be developed into enterprise

Developed a broader perspective of the discipline of microbiology to enable him/her to identify challenging societal problems and plan his professional career to develop innovative solutions for such problems.

## **COURSE SPECIFIC OUTCOME OF B.Sc MICROBIOLOGY DEPARTMENT**

Upon completion of the course students are expected to be able to do the following mentioned below :

S. No	Name of the Paper	Course Specific Outcomes
<b>I.</b>	<b><u>SEMESTER-I</u></b>	<b>BASIC MICROBIOLOGY</b>
UNIT 1	<u>INTRODUCTION,HISTORY AND SCOPE OF MICROBIOLOGY</u>	<ul style="list-style-type: none"><li>• Understand the basic microbial structure and function and also to be aware of the history and contributions of the scientists in the field of microbiology.</li><li>• Student would also get to know the various branches in the field of microbiology</li><li>• A brief account on the theories proposed for the origin of life, and the views of various scientist regarding the same</li></ul>

UNIT 2	<u>INSTRUMENTS USED IN MICROBIOLOGY</u>	<ul style="list-style-type: none"> <li>• A complete study guide to various microscopes, and practical knowledge to use and understand the working principles of all kinds of the microscopes.</li> <li>• An understanding of how to use different instruments in the lab, and how to handle them care for them.</li> <li>• The students are allowed to work independently on different instrument and carry out projects and research work.</li> </ul>
UNIT 3	<u>ANALYTICAL TECHNIQUES</u>	<ul style="list-style-type: none"> <li>• A thorough practice is given to the students to work on various instruments, which later could be of great use in the future when they are working in the same field.</li> <li>• It helps students to equip a better understanding while performing quantitative and qualitative analysis.</li> </ul>
UNIT 4	<u>STAINS AND STAINING TECHNIQUES</u>	<ul style="list-style-type: none"> <li>• To demonstrate theory and practical skills in staining procedures.</li> <li>• To master all staining procedures and carry out regular and routine procedures at ease.</li> <li>• To read the results of the microscopy examinations and to get thorough in identifications of stained slides.</li> </ul>
UNIT 5	<u>STERILISATION TECHNIQUES</u>	<ul style="list-style-type: none"> <li>• Study medical terminology related to disinfection and sterilization and also standard terminology used in the same field.</li> <li>• Learn to evaluate antimicrobial agents and to know their significance.</li> </ul>

UNIT 6	<u>ANTIBIOTICS AND OTHER CHEMOTHERAPEUTIC AGENTS</u>	<ul style="list-style-type: none"> <li>• Discuss microbial contamination as a problem and learn to use the right methodology of sterilization.</li> <li>• To identify microorganisms and their patterns of antibiotic sensitivity.</li> <li>• To recognize antibiotic resistant strains and Superbugs.</li> <li>• Identify Misuse, overuse, and abuse of antibiotics.</li> </ul>
<b>II.</b>	<b><u>SEMESTER-II</u></b>	<b>MICROBIAL TAXONOMY AND CULTURE TECHNIQUES</b>
UNIT 1	<u>THE MICROBIAL WORLD- STUDY OF VARIOUS GROUPS OF MICROORGANISMS; STUDY OF VIRUS</u>	<ul style="list-style-type: none"> <li>• To understand the classification and taxonomic importance of microorganisms.</li> <li>• To know general bacteriology and microbial culture techniques for isolation of pure cultures of bacteria and fungi.</li> <li>• To study microbial preservation of cultures.</li> <li>• To know how viruses are classified and understand their architecture.</li> <li>• To gain knowledge about their replication and diseases caused by them.</li> </ul>

	<u>STUDY OF BACTERIA</u>	<ul style="list-style-type: none"> <li>• A detailed account on the classification, structure, habitat and significance.</li> <li>• Composition of their cell walls.</li> </ul>
	<u>STUDY OF OTHER GROUPS;</u> <u>RICKETTSIA</u> <u>CHLAMYDIA</u> <u>MYCOPLASMA</u> <u>ACTINOMYCETES</u> <u>CYANOBACTERIA</u> <u>ARCHEA</u> <u>FUNGI</u>	<ul style="list-style-type: none"> <li>• Develop an over view of all other groups of microorganisms.</li> <li>• Study their general characteristics and significance.</li> <li>• Differences between the various groups.</li> <li>• Develop an overall pictures of other organisms and their features</li> </ul>
UNIT 2	<u>CULTURING OF MICROORGANISMS</u>	<ul style="list-style-type: none"> <li>• Ability to master the preparation of various culture media</li> <li>• To use different techniques to isolate into pure culture and isolate them.</li> </ul>

UNIT 3	<u>MICROBIAL GROWTH,</u>	<ul style="list-style-type: none"> <li>• Understanding the nutritional requirements of bacteria and their growth pattern.</li> <li>• Understanding bacterial growth curve.</li> <li>• Macro and micro nutrients of bacteria.</li> <li>• Multiplication of bacteria</li> <li>• Continuous cultivation and counting of bacteria.</li> </ul>
<b>III.</b>	<b><u>SEMESTER-III</u></b>	<b>MICROBIAL PHYSIOLOGY AND MICROBIAL GENETICS</b>
UNIT 1	<u>MICROBIAL PHYSIOLOGY :</u> <u>BIOMOLECULES</u> <u>ENZYMES</u> <u>BIOENERGETICS</u>	<ul style="list-style-type: none"> <li>• To gain knowledge on the different biomolecules and to know their importance.</li> <li>• Study the properties of enzyme, nomenclature and classification.</li> <li>• Gain knowledge about enzyme regulation, activity and inhibition.</li> <li>• To understand free energy, ATP and its production.</li> <li>• Learn other high energy compounds like NADPH, FADH, GTP, etc.</li> </ul>
	<u>OXIDATION-REDUCTION REACTIONS</u> <u>ENERGY YIELDING PROCESSES</u>	<ul style="list-style-type: none"> <li>• To discuss various oxidation, reduction reaction.</li> <li>• To understand various pathway used to breakdown carbohydrate.</li> <li>• EMP Pathway, ED pathway, PPP pathway, Krebs Cycle.</li> <li>• ETC and oxidative phosphorylation and oxidation of inorganic compounds.</li> </ul>

	<u>FERMENTATION</u> <u>BACTERIAL</u> <u>PHOTOSYNTHESIS</u>	<ul style="list-style-type: none"> <li>• Microbial fermentation in microorganisms</li> <li>• Alcoholic, lactic acid, acetic acid propionic butyric and mixed acid fermentation.</li> <li>• Photosynthetic pigments in prokaryotes.</li> </ul>
UNIT 2	<u>MICROBIAL GENETICS :</u> <u>GENOMIC ORGANISATIONS</u> <u>IN PRO AND EUKARYOTES</u> <u>NUCELIC ACIDS</u>	<ul style="list-style-type: none"> <li>• Genomic organization in prokaryotes and eukaryotes</li> <li>• Aware of the composition of both DNA and RNA</li> </ul> <p>Watson and Crick model of DNA, types of DNA.</p>
	<u>DNA REPLICATION IN</u> <u>PROKAYOTES</u> <u>GENETIC RECOMBINATION</u> <u>IN BACTERIA</u>	<ul style="list-style-type: none"> <li>• A thorough knowledge of DNA replication : Conservative and semi conservative method. Rolling circle model,</li> <li>• Learn conjugation, transformation and transduction.</li> </ul>



	<u>MUTATIONS</u> <u>TRANSPOSABLE ELEMENTS</u>	<ul style="list-style-type: none"> <li>• Aid information on molecular basis of mutation.</li> <li>• Spontaneous and induced mutations.</li> </ul>
<b>IV.</b>	<b><u>SEMESTER-IV</u></b>	<b>MOLECULAR BIOLOGY AND RECOMBINANT TECHNOLOGY</b>
UNIT 1	<u>MOLECULAR BIOLOGY :</u> <u>TYPES OF RNA AND THEIR</u> <u>FUNCTIONS</u> <u>PROTEIN SYNTHESIS</u>	<ul style="list-style-type: none"> <li>• To learn all the terminology related to molecular biology.</li> <li>• It helps the students to understand the function of the gene in living organisms at the molecular level.</li> <li>• Have a conceptual knowledge about DNA as a genetic material, and its strategies.</li> <li>• A better understanding in to understand the mechanism of protein synthesis.</li> <li>• Handle and independently work on lab protocols involving molecular techniques.</li> </ul>

	<u>GENE STRUCTURE AND EXPRESSION</u>	<ul style="list-style-type: none"> <li>• Develop a better knowledge in understanding the gene structure and gene understanding.</li> <li>• The importance of operon system.</li> </ul>
UNIT 2	<u>RECOMBINANT DNA TECHNOLOGY : HISTORY AND FUNDAMENTALS</u> <u>TOOLS FOR r-DNA TECHNOLOGY</u>	<ul style="list-style-type: none"> <li>• Discuss the basic tools required for construction of r-DNA technology.</li> <li>• Significance of restriction enzymes in genetic engg.</li> </ul> <p>Reflect to how DNA technology could be used as a boon.</p>
	<u>GENE CLONNING VECTORS</u> <u>IN-VITRO CONTRUCTION OF r-DNA</u>	<ul style="list-style-type: none"> <li>• Provides an insight to vectors being used as a wonderful tool</li> <li>• An account of vectors for animals, plants and lower forms.</li> </ul>

	<u>CUTTING AND TRASFORMATION OF r-DNA TECHNOLOGY</u> <u>SCREENING AND SELECTION OF RECOMBINANT HOST CELL</u>	<ul style="list-style-type: none"> <li>• A practical understanding to genetic engg experiments conducted in the lab.</li> <li>• To learn and explore different methods to screen and select recombinant cells.</li> </ul> <p>Hands on training on some important techniques.</p>
	<u>MOLECULAR TECHNIQUES</u> <u>POTENIAL HAZARDS AND SAFE GUARDS</u>	<ul style="list-style-type: none"> <li>• Blotting techniques like western, southern blot and other blot techniques.</li> <li>• Enable the student to know the potential hazards and safe guards that are required to be taken during r- DNA technology.</li> </ul>
V.	<u>SEMESTER-V</u>	<b>PAPER-5</b> <b>AGRICULTURAL AND ENVIRONMENTAL MICROBIOLOGY</b>
UNIT 1	<u>MICROBIOLOGY OF SOIL</u>	<ul style="list-style-type: none"> <li>• Importance of soil science, soil profile.</li> <li>• An understanding of soil microflora and their significance.</li> <li>• Understanding between the microorganisms and plant roots and their interactions.</li> <li>• Rhizosphere, rhizoplane and phylloplane.</li> </ul>

UNIT 2	<u>AGRICULTURAL MICROBIOLOGY</u>	<ul style="list-style-type: none"> <li>• Knowledge of microorganisms in agriculture and their role.</li> <li>• Organisms used as biofertilizers and biopesticides.</li> <li>• Plant pathogens another attribute of microorganisms.</li> </ul>
UNIT 3	<u>MICRIBIOLOGY OF AIR</u>	<ul style="list-style-type: none"> <li>• Source of microorganism in air.</li> <li>• Account of indoor and outdoor microorganisms.</li> <li>• Air borne diseases</li> <li>• Trapping devices for microorganisms in air.</li> </ul>
UNIT 4	<u>MICROBIOLOGY OF WATER</u>	<ul style="list-style-type: none"> <li>• An account of water bodies, water pollution.</li> <li>• Sanitary quality of water.</li> <li>• Water purification and water borne diseases.</li> </ul>

<p>UNIT 1</p>	<p><b><u>PAPER -6</u></b></p> <p><b><u>FOOD MICROBIOLOGY ; FOOD SPOILAGE AND POISONING</u></b></p>	<p><b>FOOD AND DAIRY MICROBIOLOGY</b></p> <ul style="list-style-type: none"> <li>• Understanding the beneficial role of microorganisms in fermented food and in food processing.</li> <li>• Identify the spoilage and disease causing organisms in food.</li> </ul> <p>Account on food poisoning.</p>
	<p><b><u>FOOD PRESERVSTION AND EXAMINATION MICROORGANISM AS FOOD</u></b></p>	<ul style="list-style-type: none"> <li>• Methods employed in the process of food preservation.</li> <li>• Techniques involved in examination and grading of food.</li> <li>• Microorganisms as food.</li> </ul>
<p>UNIT 2</p>	<p><b><u>DAIRY MICROBIOLOGY : MICROORGANISMS AND MILK</u></b></p>	<ul style="list-style-type: none"> <li>• Milk as a wholesome food, composition of milk.</li> <li>• Physical and chemical properties of milk, types of microorganisms in milk.</li> <li>• Sources of microbial contamination of milk.</li> </ul>

	<p><u>MICROBIAL ANALYSIS OF MILK:</u> <u>METHODS OF PRESERVATION OF MILK</u></p>	<ul style="list-style-type: none"><li>• Microbial analysis of milk – rapid platform tests and other tests involved to determine the quality of milk.</li><li>• Preservation of milk- pasteurization, sterilization, and dehydration</li></ul>
	<p><u>FERMENTATION IN MILK</u></p>	<ul style="list-style-type: none"><li>• Fermentation of milk- souring, lactic acid fermentation</li><li>• Proteolysis, lipolysis, and gassy fermentation</li><li>• Yoghurt and cheese production.</li></ul>

VI.	<u>SEMESTER-VI</u>	<b>PAPER-7 IMMUNOLOGY AND MEDICAL MICROBIOLOGY</b>
UNIT 1	<u>IMMUNOLOGY :</u> <u>IMMUNITY</u>	<ul style="list-style-type: none"> <li>• Innate and induced immunity.</li> <li>• Natural and artificial immunity</li> </ul>
	<u>ANTIGEN</u>  <u>ANTIBODY</u>	<ul style="list-style-type: none"> <li>• Antigens, definition, types, and properties.</li> <li>• Structure, properties, types and function of antibodies.</li> </ul>
	<u>ANTIGEN AND ANTIBODY REACTIONS</u> <u>COMPLEMENT SYSTEM</u>	<ul style="list-style-type: none"> <li>○</li> <li>• Reactions between antigen and antibody</li> <li>• Diagnosis dependent interaction and the principle of the tests</li> <li>• Complement system and their application.</li> </ul>

	<u>IMMUNE RESPONSE</u>	<ul style="list-style-type: none"><li>• Cell mediated immune response</li><li>• Antibody mediated immune response</li></ul>
	VACCINES	<ul style="list-style-type: none"><li>• Definition and types of vaccines</li><li>• Killed vaccines, attenuated vaccines, recombinant vaccines, toxoid vaccines, sub-unit vaccines and synthetic vac</li></ul>



<p>UNIT 2</p>	<p><u>MEDICAL MICROBIOLOGY ;</u> <u>MAJOR DEVELOPMENT IN</u> <u>MEDICAL MB</u> <u>PATHOGENICITY</u> <u>NORMAL FLORAL OF HUMAN</u> <u>BODY</u></p>	<ul style="list-style-type: none"> <li>• New developments in the field of medical microbiology</li> <li>• Factors responsible for pathogenicity.</li> <li>• Normal flora of human body.</li> </ul>
	<p><u>BACTERIAL DISEASE</u></p>	<ul style="list-style-type: none"> <li>• Syphilis</li> <li>• Diphtheria</li> <li>• Tetanus</li> <li>• Cholera</li> <li>• Tuberculosis</li> <li>• typhoid</li> </ul>
	<p><u>VIRAL AND FUNGAL DISEASE</u></p>	<ul style="list-style-type: none"> <li>• Rabies</li> <li>• Hepatitis A &amp; B</li> <li>• HIV</li> <li>• Candidiasis</li> <li>• Cutaneous mycoses</li> </ul>
	<p><u>PROTOZOAN DISEASE</u></p>	<ul style="list-style-type: none"> <li>• Amoebiasis</li> <li>• Malaria</li> </ul>

	<u>SEMESTER -6</u>	<b>PAPER -8 INDUSTRIAL &amp; MICROBIAL TECHNOLOGY</b>
UNIT1	<u>INDUSTRIAL MICROBIOLOGY</u>	<ul style="list-style-type: none"> <li>• History and scope</li> <li>• Isolation and screening of imp microorganisms.</li> <li>• Strain improvement,</li> <li>• Types of fermentation process</li> <li>• Media preparation, fermenters,</li> <li>• Parameters in fermentation process.</li> <li>• Recovery and purification</li> </ul>
UNIT2	<u>MICROBIAL TECHNOLOGY</u>	<ul style="list-style-type: none"> <li>• Production of wine, beer whisky.</li> <li>• Industrial alcohol</li> <li>• Citric acid production</li> <li>• Amylase production</li> <li>• Biogas production</li> <li>• Vitamin B12</li> <li>• Glutamic acid</li> <li>• Penicillin production</li> <li>• Vaccine production</li> <li>• Transformation of steroids</li> <li>• Mushroom cultivation</li> </ul>