M. Sc. Mathematics

Program outcome-

- The learner will be able to demonstrate and conduct the research independently and pursue higher studies towards the Ph.D. in mathematics.
- The learner will be able to create critical thinking ideas to carry out scientific investigation objectively.

- The learner will be able to apply the knowledge acquired in mathematics in science, technology as well as research and extensions.
- To understand the fundamental axioms in mathematics and capability of developing ideas based on them
- The learner will be able to carry out development work as well as take up challenges in the emerging areas of industry.
- The learner will be able to acquire deeper knowledge of different mathematical disciplines they can qualify different competition examination such as NET/GATE etc.

M.Sc. Mathematics I Semester

Course code: MSM 101 - Advanced Abstract Algebra (I)

Course outcome- The learner will be able -

- To explain the concept of group action and theorem about group actions.
- To analyze the structure of permutation groups.
- To discuss about polynomial rings ,EDs, PIDs and UFDs and relations among them
- To explain the university of polynomial rings.
- To solve problems using the powerful concept of group action
- To explain about the structure of a problem where the problem involves a permutation group – e.g. nature of the roots of polynomial equation
- To discuss the large class of commutative rings by regarding them as quotients of polynomial rings by suitable ideals
- To apply the concept of a group action to real life problems.
- To handle the problems involving polynomial equations
- To solve the real life problems by thinking logically and outside of box

Course code: MSM 102- Real Analysis (I)

Course outcome-

- The learner will be able to define the basic properties of real numbers.
- The learner will be able to recognize the series of real numbers and convergence.
- The learner will be to understand the Bolzano- Weirstrass theorem.
- The learner will be able to explain the real functions and its limits.

- The learner will be able to recognize the continuity of real functions.
- The learner will be able to define the differentiability of real functions and its related theorems.

Course code: MSM 103- Topology (I)

Course outcome- The learner will be able -

- To explain the topological spaces, connectedness, compactness, separation axioms, continuity, metric spaces review, fundamental groups, covering spaces, and computations.
- To generalize the concept like continuity
- To generalize the different theorems
- To distinguish space up to homeomorphism

Course code: MSM S01- Research methodology and computer application:

Basics

Course outcome-

- The learner will be able to explain about significance of research and understanding the research problem
- The learner will be able to talk about the necessary guidelines to be taken while writing research reports and proposals
- The learner will be able to tell about the importance of testing levels of significance to determine the research result to be significant or not.
- The learner will be able to share about necessary guidelines to be taken while writing research reports and proposals
- The learner will be able to analyze the scientific data, importance of statistics and application of various statistical approaches for knowing the significance of data obtained after laboratory experiments.

- The learner will be able to define the fundamental hardware components that make up a computer's hardware and the role of each of these components
- The learner will be able to explain the difference between an operating system and an application program, and what each is used for in a computer.
- The learner will be able to create a document in Microsoft Word with formatting that complies with the APA guidelines.
- The learner will be able to write the functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- The learner will be able to create a presentation in Microsoft PowerPoint that is interactive and legible content.

Course code: MSM A01- Advanced discrete mathematics

Course outcome-

- The learner will be able to prove simple mathematical properties of a variety of discrete structure.
- The learner will be able define the concepts like finite state machine, Boolean algebra, lattice, which develop more useful logic in the development of theories of electronic computers, networks, switching circuits that are applicable in physics
- The learner will be able to construct simple mathematical proofs and posses the ability to verify them
- The learner will be able to use the skills in expressing mathematical properties formally.
- The learner will be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects posses.
- The learner will be able to apply basic counting techniques to solve combinational problems.
- The learner will be able to prove simple mathematical properties of a variety of discrete structure.

M.Sc. Mathematics II Semester

Course code: MSM 201- Advanced Abstract Algebra (II)

Course outcome-

- The learner will be able to gain knowledge and skills.
- The learner will be able to explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- The learner will be able to explain, demonstrate accurate and efficient use of advanced algebraic techniques.
- The learner will be able to demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from advanced algebra.
- The learner will be able to apply problem solving using advanced algebraic techniques applied to diverse situation in physics, engineering and other mathematical disciplines.

Course code: MSM 202- Real Analysis

Course outcome-

- The learner will be able to understand the concept of measure and properties of Lévesque measure.
- The learner will be able to study the properties of Lévesque integral and compare it with Riemann integral.
- The learner will be able to establish the derivative of the indefinite integral of an integrable function which is equal to the integral almost everywhere.
- The learner will be able to establish the equivalent condition an indefinite integral which is absolutely continuous.
- The learner will be able to establish several inequalities involving the $||.||_p$ in the L^p spaces.
- The learner will be able to find a representation for bounded linear function.
- The learner will be able to realize the need of broader concept of length and continuity for extending the notion of integral to wider the class of functions for which derivative and integral are inverse process to each other.

Course code: MSM 203- Topology (II)

Course outcome-

- The learner will be able to analyze complex network, ex. Social networks, Biological networks, Internet etc.
- The learner will be able to apply differential topology to probability to identity multivariate interactions.
- The learner will be able to discuss using cell phones to actually map out the topology of indoor spaces.
- The learner will be able to discuss the shape of molecules by an analysis of the topology of a related graph.
- The learner will be able to understand the application for medical imaging software and technology

Course code: MSM B01- Advanced Discrete Mathematics (II)

Course outcome-

- The learner will be able to understand the basic concepts of different graphs.
- The learner will be able to study the properties of trees and able to find a minimal spanning tree for a given weighted graph.
- The learner will be able to understand the purpose of introduction of concepts like path, circuits, cycles, and Induced sub graphs Degree of vertex and connectivity.
- The learner will be able to understand the utility of planar, directed Trees, search trees and tree traversals.
- The learner will be able to apply the shortest path algorithm to solve some real life problem.

M.Sc. Chemistry

Program outcome-

- The learner will be able to explain in-depth and detail about the functional knowledge of the fundamental theoretical concepts and experimental methods of chemistry.

- The learner will be able to discuss on the following areas of chemistry - Analytical, Inorganic, Organic, and Physical Chemistry.
- The learner will be able to express and share her view of understanding of major areas of research.
- The learner will be able to communicate scientific results in writing and in oral presentation.
- The learner will be able to become proficient in their specialized area of chemistry and acquire the basic tools needed to carry out independent chemical research.

M.Sc. Chemistry I Semester

Course code: MSC 101- Inorganic Chemistry I

Course out come-

- The learner will be able to explain about the basic concepts of nuclear chemistry and types of nuclear reactions.
- The learner will be able to explain the Basics of metallic clusters, preparation, properties and applications of metallic clusters
- The learner will be able to summarize the structure and bonding in molecules / ions and predict the structure of molecules / ions.
- The learner will be able to discuss on the type of defects in metals and about semi –conductors
- The learner will be able to define the inorganic and organ metallic chemistry, catalysis in the molecular level

Course code: MSC 102- Organic Chemistry-I

Course Outcome-

- The learner will be able to explain the concept aromaticity and various types of aromaticity.
- The learner will be able to discuss on the various types of electrophonic and nucleophilic substitution reactions and their Mechanism.
- The learner will be able to apply the familiar addition and elimination reactions.
- The learner will be able to define the concept of reaction intermediates
- The learner will be able to explain about the synthesize aromatic compounds using electrophonic and nucleophilic substitution, addition and elimination reactions.

Course code: MSC 103- Analytical Chemistry I

Course outcome-

- The learner will be able to talk about quantitative inorganic analysis.
- The learner will be able to discuss on the different colorimetric analysis.
- The learner will be able to apply the electrochemical methods of analysis.
- The learner will be able to explain about the different chromatographic techniques.
- The learner will be able to use the method to analyze the data obtained.

Course code: MSC S01- Research Methodology and Computer Application: Basics

Course outcome-

- The learner will be able to explain about significance of research and understanding the research problem

- The learner will be able to talk about the necessary guidelines to be taken while writing research reports and proposals
- The learner will be able to tell about the importance of testing levels of significance to determine the research result to be significant or not.
- The learner will be able to share about necessary guidelines to be taken while writing research reports and proposals
- The learner will be able to analyze the scientific data, importance of statistics and application of various statistical approaches for knowing the significance of data obtained after laboratory experiments.
- The learner will be able to define the fundamental hardware components that make up a computer's hardware and the role of each of these components
- The learner will be able to explain the difference between an operating system and an application program, and what each is used for in a computer.
- The learner will be able to create a document in Microsoft Word with formatting that complies with the APA guidelines.
- The learner will be able to write the functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- The learner will be able to create a presentation in Microsoft PowerPoint that is interactive and legible content.

Course code: MSCA04- Medicinal Chemistry

Course output-

- The learner will be able to formulate the chemical synthesis of some drugs.
- The learner will be able to explain the Quantitative structural activity relationship of different class of drugs.
- The learner will be able to share the knowledge about the mechanism pathways of different class of medicinal compounds.

- The learner will be able to discuss on the chemistry of drugs with respect to their pharmacological activity.
- The learner will be able to explain the various aspects of Receptors and drug receptor bindings.

M.Sc. Chemistry II Semester

Course code: MSC 201- Inorganic Chemistry-II

Course outcome-

- The learner will be able to explain about how to name coordination compounds and to be able to draw the structure based on its name.
- The learner will be able to use the Crystal Field Theory to understand the magnetic properties (and in simple terms the color) of coordination compounds.
- The learner will be able to describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.
- The learner will be able to recognize the types of coordination compounds like metal carbonyls, carboxylic pi complexes in coordination compounds.
- The learner will be able to become familiar with some reactions and applications of coordination compounds 6. Predicted the geometries of simple molecules.

Course code: MSC 202- Organic Chemistry-II

Courses outcome-

- The learner will be able to share the knowledge on substitution, elimination, addition, oxidation and reduction, photochemical and per cyclic reactions.
- The learner will be able to explain about the organic compounds and their methods of preparation.
- The learner will be able to explain the uses of reaction mechanisms.
- The learner will be able to use the various reagents and the mechanism of their action.
- The learner will be able to Prepare and use the various classes of organic compounds.

Course code: MSC 203- Physical Chemistry

Course outcome-

- The learner will be able to differentiate between classical and quantum mechanics.
- The learner will be able to connect the quantum mechanical operators to observables
- The learner will be able to explain how molecular phenomena can be related to model problems
- The learner will be able to talk about the theoretical aspects of homogenous catalysis.
- The learner will be able to apply different electro analytical techniques for the detection of metal ions

- The learner will be able to put connection between common approximation methods and standard chemical frameworks (Born - Oppenheimer approximation, molecular orbital's, for example)
- The learner will be able to identify the point groups of molecules and apply the concept of group theory to predict the spectroscopic properties

Course code: MSC B04- Applied Chemistry

Course outcome-

- The learner will be able to explain about the classification and synthesis of polymers
- The learner will be able to summarize the manufacturing process of cement and glass
- The learner will be able to discuss on the Chemical Industries in Kerala, raw materials used and the chemistry involved in the manufacture.
- The learner will be able to explain the chemical, generic and trade names of drugs with examples
- The learner will be able to define the Preparation, classification, advantages and disadvantages of soaps and detergents: Cleaning action
- The learner will be able to discuss on the composition of shaving creams and shampoos
- The learner will able to find out the pesticides and their harmful effect
- The learner will be able to explain the classification of dyes.
- The learner will be able to talk about the common food adulterants and preservatives used
- The learner will be able to explain about the harmful effects of modern food habits Social outreach and Skill development.

M.Sc. Chemistry III Semester

Course code: MSC 301- Applications of Spectroscopy-Inorganic Chemistry

Course outcome-

- The learner will be able to use the skill in interpreting the one, two-dimensional NMR spectroscopy, EPR and Mass spectroscopy to derive the information regarding the structure, stereochemistry of the molecules.
- The learner will be able to define the basic principles, theory and instrumentation of 1H NMR, 13C NMR, 2D NMR, solid state, EPR and Mass spectrometry.
- The learner will be able to explain the application of spectroscopy- inorganic chemistry.
- The learner will be able to impart knowledge in the theory and applications of these spectroscopic techniques which are very important characterization techniques to understand the structure of the molecules in chemistry.
- The learner will be able to apply the fundamental instrumental techniques in the physical characterization of inorganic molecules.

Course code: MSC 302- Application's of Spectroscopy- Organic Chemistry

Course Outcome-

- The learner will be able to use the skill in interpreting the one, two-dimensional NMR spectroscopy, EPR and Mass spectroscopy to derive the information regarding the structure, stereochemistry of the molecules.
- The learner will be able to define the basic principles, theory and instrumentation of 1H NMR, 13C NMR, 2D NMR, solid state, EPR and Mass spectrometry.
- The learner will be able to explain the application of spectroscopy- organic chemistry.

- The learner will be able to impart knowledge in the theory and applications of these spectroscopic techniques which are very important characterization techniques to understand the structure of the molecules in chemistry.
- The learner will be able to apply the fundamental instrumental techniques in the physical characterization of organic molecules

Course code: MSC 303- Photo Chemistry and Pericyclic Reaction

Course Outcome-

- The learner will be able to recall the fundamental principles of photochemical reactions.
- The learner will be able to explain the concepts related to light induced organic synthesis, mechanisms and the functions of various reagents.
- The learner will be able to apply their understanding about the photochemical reactions of industrial significance.
- The learner will be able to analyze the product distribution and the stereochemistry of various organic products derived from photochemistry.

Course code: MSC S03- Intellectual Property Rights, Human Rights & Environment: Basics

Course outcome-

- The learner will be able to create awareness on protection of the rights of IP owners to enable them to reap the rewards of their creativity.
- The learner will be able to explain about the implication of patent, copy rights, trade mark to an inventor and business organizations.

Course code: MSCC04- Heterocyclic Chemistry

Course outcome-

- The learner will be able to talk about the significance of fundamental aspects of heterocyclic compounds.
- The learner will be able to explain the concepts related to the nomenclature, structural aspects, synthesis, reaction mechanisms and the functions of various reagents or catalysts.
- The learner will be able to apply their understanding about the organic and heterocyclic reactions of industrial significance.
- The learner will be able to analyze the product distribution and the stereochemistry of various heterocyclic products through spectroscopic data.
- The learner will be able to evaluate the heterocyclic reactions based on the influence of the substituent's on substrate molecules and nature of solvent and the parametric conditions.

M.Sc. Chemistry IV Semester

Course code: MSC 401- Bioinorganic Chemistry

Course outcome-

- The learner will be able to explain the effect of various legend field strengths on d-metal ions and find out ground state terms with their energies, microstates, degeneracy and microstate table for different transition metal ions and complexes.
- The learner will be able to talk about the electronic spectra of complexes with respect to spin and orbital selection rules, various transitions, charge transfer spectra and luminescence spectra with LASER application.
- The learner will be able to summarize the magnetic properties of complexes and understand spin-only and effective magnetic moments, Zeeman Effect, properties of complexes with A, E, and T terms.

Course code: MSC 402- Environmental Chemistry

Course outcome-

- The learner will be able to analyze different trace elements. in soil by Chemical analysis.
- The learner will be able to evaluate parameters to be controlled in solid waste and adopt methods for reduction and recycling of solid waste.
- The learner will be able to analyze water quality through different analytical methods.
- The learner will be able to apply absorption and emission and chemical analysis analyzing water pollutants and understand their impact.
- The learner will be able to analyze different parameters in Air quality monitoring and adopt methods for their reduction.

Course code: 403- Solid State Chemistry

Course outcome-

- The learner will be able to use the knowledge on design and development of materials with pre-required properties based on understanding the structure of solids in its influence on physical chemical properties, understanding of phase relations, chemical synthesis, reaction kinetics as well as characterization methods.

Course code: MSC D01- Photo Inorganic Chemistry

Course Outcome-

- The learner will be able to explain the photochemical excitation and Jablonski diagram.
- The learner will be able to talk about the photochemistry of ketone -photo reduction -photo cyclo –addition.
- The learner will be able to discuss on the molecular rearrangements, Pericyclic reactions and Cyclo addition and sigmatropic reactions.
- The learner will be able to define the basic concepts and terms involved in stereochemistry, stereo chemical Synthesis involving chiral reagents and catalysts.

M.Sc. Microbiology

Programme Outcome-

Microbiology is the study of microorganisms or microbes such bacteria, viruses, fungi, algae, cyanobacteria, protozoa and prions. They are extremely important as their diverse activities range from causation of deadly diseases in humans, animals and plants to production of highly useful products like antibiotics, enzymes, alcohol, fermented foods, and recycling of dead and decaying organic matter in the nature. Thus the science of microbiology has an important role to play in health, agriculture, environment and industry. Several discoveries in the last two to three decades, which significantly impact this area, have put Microbiology on the centre stage of teaching, research and development all over the globe.

M.Sc. Microbiology I Semester

Course code: MMBA01- Cell Biology and Genetics

Course Outcome- The learner will be able -

- To talk about the Organelle Biology and cell-cell interactions.
- To explain about the Cell transduction and translation.
- To discuss about Bacterial genetics and recombination methods.
- To explain about the Mechanism of protein translocation in prokaryotes and eukaryotes.
- To explain about Protein export in bacteria, transmembrane helices.

Course code: MMB 101- General Microbiology

Course Outcome- The learner will be able -

- To introduce the subject of microbiology by its history, microscopy, aseptic techniques, sterilization, isolation of bacteria, study of morphological characters, identifying and classification of bacteria.
- To tell about the Preservation of microbes, staining techniques, understanding nutritional types of bacteria.
- To give Detail explanation of some clinically important bacteria.
- To describe about the Microbiology of water, milk and microbial interactions in nature.

Course code: MMB S01- Computer Application Instrumentation and Biostatistics

Course Outcome- The learner will be able -

- To talk about the detailed principles, procedures and applications of various chromatographic techniques for example in learning the purification of proteins by using ion exchange and affinity chromatography, and molecular weight determination by size exclusion chromatography.
- To discuss about the principles, procedures and applications of various electrophoretic techniques, importantly knowing the difference between SDS and native PAGE, and isoelectric focusing.
- To study the principles, procedures and applications of various spectrophotometric methods especially in quantization of desired compound in the given solutions.
- To explain about the principles, procedures and applications of radioactive methods for measurement of radioactivity, electrochemical methods, and biosensors.
- To focus on the usage of different statistical methods learned with respect to bioanalytical techniques perspectives.

- To define the fundamental hardware components that make up a computer's hardware and the role of each of these components Understand the difference between an operating system and an application program, and what each is used for in a computer.
- To create a document in Microsoft Word with formatting that complies with the APA guidelines.
- To write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- To create a presentation in Microsoft PowerPoint that is interactive and legible content.

Course code: MMB 102- Microbial Biochemistry

Course Outcome- The learner will be able -

- To become familiar with fundamentals forces of attraction operating in living systems.
- To appreciate the importance of pH and buffers in living systems.
- To explain the chemical structures and functions of carbohydrates, proteins, lipids and nucleic acids.
- To explain the structure and function of various water soluble and fat soluble vitamins.
- To explain the structure and functions of important porphyries.

Course code: MMB 103- Molecular Biology

Course Outcome- The learner will be able-

- To share knowledge about the organization of genetic material in prokaryotes and eukaryotes.
- To talk about the mechanisms and crucial factors involved in understanding the three complicated processes replication, transcription and translation.

- To focus on the important phenomenon of regulation of gene expression in prokaryotes and eukaryotes.

M.Sc. Microbiology II Semester

Course code: MMB 201- Immunology

Course Outcome- The learner will be able-

- To gain knowledge about the immune system and its functions.
- To explain the Key components of the innate and adaptive immune responses.
- To discuss about the Fundamental working knowledge of the basic principles of immunology and diagnostic immunology.
- To summarize Mechanism of hypersensitivity, autoimmunity and immunological disorders
- To understand the Basic principles of immunization.

Course code: MMB 203- Microbial Physiology and Metabolism

Course Outcome- The learner will be able-

- To explain about the metabolism and regulation of carbohydrates under aerobic and anaerobic conditions.
- To discuss about the pathways exclusively found in microbes and their importance.
- To explore metabolism of proteins, lipids and nucleotides.
- To tell the mechanism of enzymes, enzyme kinetics and their applications.
- To describe the importance of different types of enzyme inhibitions.

Course code: MMB 202- Medical Microbiology

Course specific Outcome- The learner will be able -

- To study normal flora of human body, process of infection, virulence factors and pathogen city.
- To gain knowledge on classification of pathogenic bacteria and their detailed study.
- To tell about the medically important viruses.
- To share about the drug susceptibility testing.

Course code: MMB B01- Plant and Animal Biotechnology

Course Outcome- The learner will be able -

- To summarize the components of plant genetic engineering, recombinant DNA technology and its application in trait improvement in plants, importance of dwarfing genes and their contribution in green revolution, molecular evolution of important agri-traits
- To assess the applications of different methods of gene expression and design experiments for function characterization of plant genes and to identify those suitable for creating beneficial traits.
- To describe about a GM project, choose utility genes, design vector, promoters and procedures for generating GM plants.
- To explain the basics, methodology and applications of plant tissue culture, including Agro bacterium-mediated and direct methods of T-DNA transfer.
- To describe what GM plant and products are in the market and pipeline, and their contributions to food security, sustainable environment and medicine
- To Interpret the Biosafety and Bioethics concerns, risk assessment of genetically engineered crops and evaluate critically and objectively safety issues of GM plants and products
- To tell the requirements for the basic cell cultures are known to the students

- To check and screen cell for cell viability and cytotoxicity and cell death parameters.
- To understand basic biology of stem cells, properties, and applications.
- To discuss about the tissue engineering and its applications
- To share knowledge on the production of transgenic animals and applications.
- To explain about the biopharmaceuticals, cell-based vaccines and toxicity.

M.Sc. Microbiology III SEMESTER

Course code: MMB 301- Industrial Microbiology

Course Outcome- The learner will be able -

- To describe a large number of substrate that is used for the industrial fermentation processes. Outcome.
- To discuss on the understanding of different types of reactors or fermenters which are used for laboratory, pilot and industrial scale fermentations and their processes parameters.
- To share the knowledge of number of products which are produced by industrial fermentation processes in detailed.

Course code: MMB 302- Food and Agricultural Microbiology

Course specific Outcome- The learner will be able -

- To impart knowledge on traditional foods, preparation of fermented foods and genetically modified foods.
- To share knowledge in spoilage of foods, prevention of spoilage and preservation methods.
- To describe the basic concepts of soil structure and nitrogen phosphorous Sulphur cycles.
- To discuss about the degradation of lignocellulosic compounds.
- To differentiate the Biofertilizers and Biopesticides.

Course code: MMB 303- Environmental Microbiology

Course Outcome- The learner will be able-

- To share about a fairly good knowledge and understanding of different types of environments and habitats where microorganisms grow including the micro biomes of the human gut and animal gut.
- To identify the important role microorganisms play in maintaining healthy environment by degradation of solid/liquid wastes; how these activities of microorganisms are used in sewage treatment plants, production of activated sludge and functioning of septic tanks.
- To discuss on the significance of BOD/COD and various tests involving use of enumerating fecal E.coli for assessing quality of water.
- To explain the practical skills for conducting experiments to assess the BOD/COD of wastewaters and their interpretation; practically assess the portability of drinking water by the use of standard microbiological tests.

Course code: MMB S03- Recombinant DNA Technology

Course Outcome- The learner will be able -

- To become familiar with emerging field of biotechnology i.e. Recombinant DNA Technology as well as to create understanding and expertise in wet lab techniques in genetic engineering.
- To understand sufficiently the subject and gain good knowledge of application of Recombinant DNA techniques in Life Sciences Research.
- To find different opportunities to experiment and to verify the theoretical concepts of genetic engineering already studied.
- To understand the theoretical principles in a more explicit and concentrated manner.
- To understand and develop the concept of recombinant DNA technique.

- To describe various laboratory protocols for isolation and purification of genomic DNA, RNA & plasmid, and determine the concentration and purity of nucleic acids using UV spectrophotometer.
- To describe the principles of nucleic acid hybridization techniques- Southern blot hybridization, Northern blot hybridization and institution hybridization.
- To design a workflow to carry out recombinant DNA technology experiment.
- To discuss various cloning vectors-plasmid derived vectors, bacteriophage derived vectors hybrid vectors & high capacity vectors with suitable examples and Explain transgenic, antisense technology, RNAI technology and gene knock-out models.

Course code: MMB C01- Ecology and Biodiversity

Course Outcome- The learner will be able -

- To describe the global biodiversity crisis.
- To write a review article on a topical aspect of biodiversity and/or conservation.
- To give outline of the main reasons for decline and threats to biodiversity worldwide.
- To argue the case for and against conserving biodiversity.
- To evaluate the pros and cons of species introductions and reintroductions
- To discuss the importance of conserving ecological interactions.
- To describe ecological networks and what they can tell us.
- To discuss examples of how ecological networks can be used in conservation.
- To appreciate about, how different global impacts can interact to affect ecosystems.
- To give Outline , in which we could mitigate global impacts on ecosystems

M.Sc. Microbiology IV SEMESTER

Course code: MMB 401- Research Methodology

Course Outcome- The learner will be able-

- To talk about significance of research and understanding the research problem.
- To share the necessary guidelines to be taken while writing research reports and proposals.
- To tell the importance of testing levels of significance to determine the research result to be significant or not.
- To explain the necessary guidelines to be taken while writing research reports and proposals
- To analyze the scientific data, importance of statistics and application of various statistical approaches for knowing the significance of data obtained after laboratory experiments.

Course code: MMB 402- Intellectual Property Rights Bioethics and Management

Course Outcome- The learner will be able-

- To create a stable research environment to encourage investigation, analysis and studying the bioethical principles, values, concepts, social and juridical implications.
- To gain knowledge on the human rights contained in the Universal Declaration on Bioethics.
- To create awareness on protection of the rights of IP owners to enable them to reap the rewards of their creativity

- To explain the consequences of releasing the GM organisms into surroundings
- To tell the importance of patenting in research and scientific innovations.
- To apprehend the procedures for patent documentation.

M.Sc. Biotechnology

Program Outcome -

M.Sc. Biotechnology Program is to educate multidisciplinary aspects of subjects with including cell biology, Biochemistry, Microbiology, Enzymology, Agriculture Biotechnology, Genetic engineering, Nanotechnology, Immuno-technology, Developmental Biology, and Bioinformatics. This Program encourages students from multiple disciplines to experience research in the field of biotechnology. The students utilize the basic principles of biotechnology to develop research and work at filed like food processing industry, Crop cultivation in agriculture, vaccine development, and alcoholic beverage industry. Mainly the principles of genetic engineering and tissue culturing methods of Biotechnology have been revolutionizing all the avenues of science and technology. These filed will produce tremendous enhancement in the quality of living with a safer and more resourceful to this world. Biotechnology has contributed enormously to the growth of modern medical and health science and agriculture. Biotechnology has applications in clinical diagnosis, understanding pathology of diseases, treatment of diseases, designing of drugs and understanding their metabolism and manufacture of various biological products like amino acids, proteins, antibiotics, hormones, enzymes, nutrients, etc. Understanding the biochemical basis of vital processes of plants such as photosynthesis, respiration, hormonal regulation, nutrient assimilation have helped in developing superior varieties of crop plants with better growth attributes and yield. Besides, this program will help the student utilize the research experience and create the new ideas and develop the new products from this field.

M.Sc. Biotechnology I Semester

Course code: BTC 101- Cell Biology

Course Outcome- The learner will be able -

- To describe about the Organelle Biology and cell-cell interactions.
- To explain about the Mechanism of protein translocation in prokaryotes and eukaryotes.
- To tell about the Protein export in bacteria, transmembrane helices.
- To discuss about the Signal transduction pathways in eukaryotes.

Course code: BTC102- General Microbiology

Course Outcome – The learner will be able -

- To introduce the subject of microbiology by its history, microscopy, aseptic techniques, sterilization, isolation of bacteria, study of morphological characters, identifying and classification of bacteria.
- To describe the preservation of microbes, staining techniques, understanding nutritional types of bacteria.
- To tell about the some clinically important bacteria.
- To discuss about the water, milk and microbial interactions in nature.

Course code: BTC 103- Biochemistry

Course Outcome- The learner will be able -

- To become familiar with fundamentals forces of attraction operating in living systems.

- To appreciate the importance of pH and buffers in living systems.
- To explain the chemical structures and functions of carbohydrates, proteins, lipids and nucleic acids.
- To tell the structure and function of various water soluble and fat soluble vitamins.
- To understand the structure and functions of important porphyrins.

Course code: BTC S01- Computer Application Instrumentation and Biostatistics

Course Outcome - The learner will be able-

- To explain about the detailed principles, procedures and applications of various chromatographic techniques for example in learning the purification of proteins by using ion exchange and affinity chromatography, and molecular weight determination by size exclusion chromatography.
- To tell the principles, procedures and applications of various electrophoretic techniques, importantly knowing the difference between SDS and native PAGE, and isoelectric focusing.
- To study the principles, procedures and applications of various spectrophotometric methods especially in quantization of desired compound in the given solutions.
- To explain the principles, procedures and applications of radioactive methods for measurement of radioactivity, electrochemical methods, and biosensors.
- To focus on the usage of different statistical methods learned with respect to bioanalytical techniques perspectives.
- To describe the fundamental hardware components that make up a computer's hardware and the role of each of these components Understand

the difference between an operating system and an application program, and what each is used for in a computer.

- To create a document in Microsoft Word with formatting that complies with the APA guidelines.
- To write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- To create a presentation in Microsoft PowerPoint that is interactive and legible content.

Course code: BTC A03- Plant Ecology Physiology

Course Outcome – The learner will be able -

- To demonstrate the understanding of the organization of plants from the level of cells through tissues, tissue systems, and organs.
- To explain the understanding of developmental patterns and processes of plants.
- To demonstrate the understanding of organellar function at the cellular level of architecture
- To demonstrate the understanding water potential and its effect on cellular function.
- To describe the detailed understanding of the physiological mechanisms involved in the uptake and transport of water and the translocation of food by plants.
- To demonstrate the understanding of the cellular establishment of membrane potential and its role in solute transport
- To discuss the mechanisms for procurement of mineral ions by plants and mineral nutrition and the role these minerals play in organic molecule synthesis and use.

- To demonstrate the understanding of the interrelationships among plants and micro-organisms symbiosis in nitrogen and phosphorous acquisition by plants.

M.Sc. Biotechnology II Semester

Course Code: BTC 201- Immunology

Course Outcome – The learner will be able -

- To describe the immune system and its functions.
- To tell the Key components of the innate and adaptive immune responses.
- To explain the Fundamental working knowledge of the basic principles of immunology and diagnostic immunology.
- To summarize the Mechanism of hypersensitivity, autoimmunity and immunological disorders•
- To understand the basic principles of immunization.

Course code: BTC 203- Plant Biotechnology

Course Outcome – The learner will be able-

- To summarize the components of plant genetic engineering, recombinant DNA technology and its application in trait improvement in plants, importance of dwarfing genes and their contribution in green revolution, molecular evolution of important agric-traits
- To assess the applications of different methods of gene expression and Design experiments for function characterization of plant genes and to identify those suitable for creating beneficial traits.
- TO conceptualize a GM project, choose utility genes, design vector, promoters and procedures for generating GM plants.

- To explain the basics, methodology and applications of plant tissue culture, including Agro bacterium-mediated and direct methods of T-DNA transfer.
- To describe what GM plant and products are in the market and pipeline, and their contributions to food security, sustainable environment and medicine
- To interpret the Biosafety and Bioethics concerns, risk assessment of genetically engineered crops and evaluate critically and objectively safety issues of GM plants and products

Course code: BTC B01- Animal Biotechnology

Course Outcome – The learner will be able -

- To explain the requirements for the basic cell cultures are known to the students
- To tell how to check and screen cell for cell viability and cytotoxicity and cell death parameters.
- To explain the basic biology of stem cells, properties, and applications
- To describe the tissue engineering and its applications
- To discuss on the production of transgenic animals and applications
- To explain biopharmaceuticals, cell-based vaccines and toxicity.

Course code: BTC 202- Genetics and Molecular Biology

Course specific Outcome – The learner will be able -

- To describe the Cell transduction and translation.
- To talk about the Bacterial genetics and recombination methods.
- To discuss about the organization of genetic material in prokaryotes and eukaryotes.

- To explain about the mechanisms and crucial factors involved in understanding the three complicated processes replication, transcription and translation.
- To focus on the important phenomenon of regulation of gene expression in prokaryotes and eukaryotes.

M.Sc. Biotechnology III Semester

Course code: BTC 301- Bioinformatics

Course Outcome – The learner will be able -

- To describe the importance of DNA and protein sequence alignments, methods of alignment and application.
- To explain dynamic programming algorithms, methods of scoring similarity.
- To describe how to find a best match for a given DNA or protein sequence from the target databases, learn various BLAST methods and algorithms.
- To discuss the methods for alignment of multiple sequences, scoring schemes and become Familiar with various MSA tools.
- To demonstrate the knowledge of various Biological databases and tools
- To describe evolutionary relationships based on sequence comparisons and molecular phylogenetics.
- To apply statistical methods of sequence analysis and comparisons.

Course code: BTC 302- Genetic Engineering and R-DNA Technology

Course Outcome – The learner will be able -

- To explain the basic principles behind molecular cloning.
- To apply the knowledge of molecular cloning and design cloning strategy.

- To apply most appropriate recombinant-DNA techniques and other contemporary molecular techniques to understand the function of gene.
- To explain various contemporary techniques towards gene knockout.
- To analyze published journal articles in the field of recombinant DNA technology.

Course code: BTC S03- Bioprocess Engineering

Course Outcome – The learner will be able **-**

- To describe about the Handle bioreactor, Fast Protein Liquid Chromatography, micro plate reader etc.
- To demonstrate the scale up the culture from frozen sample to flask/ bioreactor.
- To explain the Purify biological molecules from cultured broth through downstream processing.
- To discuss on the Characterize purified protein through enzymatic reaction and spectroscopy.

Course code: BTC 303- Environmental Biotechnology

Course specific Outcome- The learner will be able -

- To tell about the fairly good knowledge and understanding of different types of environments and habitats where microorganisms grow including the micro biomes of the human gut and animal gut.
- To identify the important role microorganisms play in maintaining healthy environment by degradation of solid/liquid wastes; how these activities of microorganisms are used in sewage treatment plants, production of activated sludge and functioning of septic tanks.

- To describe the significance of BOD/COD and various tests involving use of enumerating fecal E.coli for assessing quality of water.
- To explain the practical skills for conducting experiments to assess the BOD/COD of wastewaters and their interpretation; practically assess the portability of drinking water by the use of standard microbiological tests.

Course code: BTC C02- Biodiversity and Conservation

Course Outcome – The learner will be able -

- To describe the global biodiversity crisis.
- To write a review article on a topical aspect of biodiversity and/or conservation.
- To explain the main reasons for decline and threats to biodiversity worldwide.
- To argue the case for and against conserving biodiversity.
- To evaluate the pros and cons of species introductions and reintroductions
- To share the importance of conserving ecological interactions.
- To describe ecological networks and what they can tell us.
- To discuss the examples of how ecological networks can be used in conservation.
- To appreciate how different global impacts can interact to affect ecosystems.
- To tell the outline ways in which we could mitigate global impacts on ecosystems.

M.Sc. Biotechnology IV SEMESTER

Course code: BTC 401- Research Methodology

Course Outcome – The learner will be able -

- To describe the about significance of research and understanding the research problem
- To tell the necessary guidelines to be taken while writing research reports and proposals
- To tell the importance of testing levels of significance to determine the research result to be significant or not.
- To tell the necessary guidelines, which will be taken while writing research reports and proposals
- To analyze the scientific data, importance of statistics and application of various statistical approaches for knowing the significance of data obtained after laboratory experiments.

Course code: BTC 402- IPR, Bioethics and Management

Course Outcome – The learner will be able -

- To create a stable research environment to encourage investigation, analysis and studying the bioethical principles, values, concepts, social and juridical implications.
- To gain knowledge on the human rights contained in the Universal Declaration on Bioethics.
- To create awareness on protection of the rights of IP owners to enable them to reap the rewards of their creativity
- To explain the consequences of releasing the GM organisms into surroundings
- To tell the importance of patenting in research and scientific innovations.
- To apprehend the procedures for patent documentation.