DEPARTMENT OF MICROBIOLOGY

PROGRAMME OUTCOMES (M. Sc)

PO1:	Students to get acquired knowledge and skills to make a better career in research, Life sciences related industries.
PO 2:	Experimental ability to overcome the problems to solve chemical problems in the living System.
PO 3:	Applying the advanced techniques in Molecular biology, Microbiology, Clinical Microbiology, Agricultural Microbiology, and Microbial Biotechnology.
PO 4:	Getting depth knowledge in the field of Microbiology, Medical Virology,Bacteriology, Mycology,Parasitology,Genetics, Molecular biology, rDNA technology Immunology,and Research Methodology.
PO 5:	Industrial oriented Microbiology, Microbes based food production, Pharmaceutical products, Diagnostic Clinical microbiology and development etc.
PO 6:	Inclusion of the Massive Open Online Courses (MOOCs) with zero credits available on SWAYAM, NPTEL and other such portals approved by the University Authorities.

COURSE OUTCOMES

S. No	Course code	Course title	Course outcomes
1	GAM11	General Microbiology And Microbial Physiology	• **LO3:** Decide on the correct type of microscopy and staining. Gain knowledge on the various classifications of microorganisms. • **LO3:** Study the morphology and structure of microorganisms. Acquainted with various sterilization techniques. • **LO3:** Outline on the nutritional requirement and nutritional types of bacteria. Demonstrate various techniques employed in the

			cultivation of microorganisms. • **LO3:**Discuss on the different phases of microbial growth • **LO3:**Explain the basic concepts of microbial metabolism
2	GAM12	Immunology And Immunotechnology	• **LO1:** To procure knowledge on the basic principles and definitions of immunology, its modern achievements and practical ways of implementation. • **LO2:** To impart knowledge about the underlying concepts of molecular and cellular mechanisms involved in the development and regulation of the immune response. • **LO3:**To learn the important concepts in Major histocompatibility and Hypersensitivity Reactions • **LO4:** To understand about autoimmune diseases and the principles behind immune modulation.
3	GAM13	Food And Dairy Microbiology	• **LO1:** Outline the important microorganisms present in food. • **LO2:** Elaborate the principles and methods of food preservation. • **LO3:** Compile the contamination, spoilage and spoilage of various foods. • **LO4:** Demonstrate and prepare fermented foods. • **LO5:**Principles of Dairy Technology explained **LO6:**Students will learn about traditional systems of cattle and concepts of farming Learning about general classification, characteristics, scope of microbes in dairy industry
4	GEAM14 A	Computational Biology	• **LO1:** Develop computational skills relevant to solving problems in bioinformatics. • **LO2:** Develop relevant skills in math, statistics and biology that enable success in the field of bioinformatics. • **LO3:** Develop analytical skills that will allow them to identify important problems in

			bioinformatics and to identify solutions. • **LO4:** Gain research skills that allow them to apply their academic training to real-world problems.
5	GEAM14 B	Algal Technology	• **LO1:**Understanding of the lower plant groups and Microbial world • **LO2:** To accumulate the knowledge about economical and ecological importance of algae and microbes. • **LO3:** Utilization of algal community and microbes in medicinal industry for human welfare. • **LO4:** Understanding of their importance in relation to the biodiversity.
6	GEAM14 C	Biosafety	• **LO1:** An awareness of the criteria for the appointment of local BSOs. • **LO2:** A thorough knowledge of the responsibilities, duties and limitations of their role. • **LO3:** An understanding of the function of Bio safety committees, in order to be able to participate as a member and keep appropriate records. • **LO4:** An understanding of the difference between common and statute law and the implications of each.
7	GOAM15A	Microscopic Techniques	• **LO1:** Learn about to basics principles of microscopes. • **LO2:** Different types of microscopes in Research field. • **LO3:** Preparation of Sample and staining methods.
8	GOAM15B	Basics Of Microbiology	• **LO1:** Understand the scope and relevance of microbiology as a scientific discipline. • **LO2:** Gain knowledge on the various classifications of microorganisms. • **LO3**: Study the morphology and structure of various microorganisms. • **LO4:** Study about the structural

			characteristics and its applications of algae • **LO5:** Knowledge about Protozoan diseases..
9	GOAM15C	Molecular Biology	• **LO1:** Know the terms and terminologies related to molecular biology and microbial. Understand the properties, structure and function of genes in living organisms at the molecular level. • **LO2** Explain the significance of central dogma of gene action. Have a conceptual knowledge about DNA as a genetic material, enzymology, and replication strategies.
10	GPAM16	Lab Course - 1	• **LO1:** Demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures • **LO2:** Know various Culture media and their applications and also understand various physical and chemical means of sterilization • **LO3:** Comprehend the various methods for identification of unknown microorganisms • **LO4:** Explain a primary antigen –antibody interaction. • **LO5:** To determine the presence of soluble antigen- or antibody in a fluid and in a gel. • **LO6:** Able to detect and determine the Quality of milk and spoiled food.
11	GAM21	Medical Bacteriology And Mycology	• **LO1:** Account for systematic of bacteria and classification of bacteria, especially the methods that are used for classification. • **LO2:** Account for mechanisms of transmission, virulence, pathogenicity of pathogenic microorganisms and methods for treatment and prevention of medical important microorganisms. • **LO3:** Account for the factors that influence the virulence of pathogenic microorganisms and how virulence evolves. • **LO4:** The student able to understand diagnostic methodology for bacteria and fungi.

12	GAM22	Industrial Microbiology	• **LO1:** To know how to source for microorganisms of industrial importance from the environment. • **LO2:** To know about design of fermentors, factors affecting growth and production. • **LO3:** To understand the rationale in medium formulation & design for microbial fermentation and to appreciate the different types of fermentation processes • **LO4:** To comprehend the techniques and the underlying principles in downstream processing.
13	GAM23	Molecular Biology And Microbial Genetics	• **LO1:** Know the terms and terminologies related to molecular biology and microbial. Understand the properties, structure and function of genes in living organisms at the molecular level. • **LO2** Explain the significance of central dogma of gene action. Have a conceptual knowledge about DNA as a genetic material, enzymology, and replication strategies. • **LO3:**Understand the molecular mechanisms involved in transcription and translation.Describe the importance of genetic code and wobble hypothesis. • **LO4:** Explain the concept of recombination, linkage mapping and elucidate the gene transfer mechanisms in prokaryotes and eukaryotes.
14	GEAM24 A	Mushroom Cultivation	• **LO1:** To impart knowledge on types of mushrooms. • **LO2:** To provide knowledge on cultivation process. • **LO3:** To create awareness on edible mushrooms. • **LO4:** To impart basic knowledge on mushroom storage. • **LO5:** To develop sound knowledge on mushroom nutritive values and recepies.
15	GEAM24 B	Biofertilizer Technology	• **LO 1:** General account about the microbes

			used as biofertilizer. • **LO 2:** To understand about the Mycorrhizal association and organic farming.
16	GEAM24 C	Intellectual Property Rights	• **LO1:** To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights. • **LO2:** To identify the significance of practice and procedure of Patents. • **LO3:**To make the students to understand the statutory provisions of different forms of IPRs in simple forms. • **LO4:**To learn the procedure of obtaining Patents, Copyrights, Trade Marks &Industrial Design **LO5:**To enable the students to keep their IP rights alive.
17	GOAM2 5A	Food Processing Technology	• **LO1:** Outline the important microorganisms present in food. • **LO2:** To learn about the Effect of Freezing and drying on Foods . • **LO3:** Food processed by Irradiation and Packaging of foods. • **LO4:** Knowledge about HACCP and its applications.
18	GOAM2 5B	Infectious Diseases And Its Control	• **LO1:** Students gain the knowledge role of Microbiology in diseases. • **LO2:** To understand about Foodborne, Waterborne and Airborne diseases . • **LO3:** Students Able to learn the mode of transmission and prevention diseases.
19	GOAM2 5C	Microbial Ecology	• **LO1:** Basic concepts and Types of microbial habitats. • **LO2:** Microbial diversity in Natural environments. • **LO3:** Microbial degradation of environmental pollutants. • **LO4:** Interactions between marine environment and microbes.
20	GPAM26	Lab Course - 2	• **LO1:** Able to collect and process of different specimens and isolate the pathogen • **LO2:** Distinguish different types of staining

			• **LO3:** Appreciate how microbiology is applied in manufacture of industrial products like wine, ethanol,etc.. • **LO4:** Able to isolate and quantify Genomic DNA, Plasmid, and RNA • **LO5:** Able to estimate and quantitate amino acids,proteins.
	Semester - III		
21	DAM31	MEDICAL VIROLOGY AND PARASITOLOGY	• **CO1:** Explain viruses, and parasites including their classification, morphology, and laboratory diagnosis and prevention measures • **CO2:** Perform laboratory investigations for the diagnosis of infectious diseases caused by viruses, and parasites of human. • **CO3:** Discuss various viral and parasitic diseases.
22	DAM32	Agricultural And Environmental Microbiology	• **LO1:** Know the diverse group of soil microorganism. • **LO2:** Understand the nutrient sources and cycles. • **LO3:** Know about concept of disease, causal agent of plant disease identification methods and management of crop diseases. • **LO4:** To learn about microbial life in extreme environments.
23	DAM33	Biotechnology	• **LO1:** To get insight about gene transfer technology in animals and applications of Animal biotechnology. • **LO2:** To deliver extensive knowledge on Medical Biotechnology. • **LO3:** To impart knowledge about bioremediation and its significance in the Environmental biotechnology. • **LO4:** To offer comprehensive information and insights in pharmaceutical biotechnology and drug designing. • **LO5:** To increase awareness of

			professional, ethical and social responsibilities with relationship to biotechnology thereby increasing the opportunities to pursue higher studies in foreign countries.
24	DEAM34A	Bioremediation	• **LO1:** To provide the strong knowledge on bioremediation and its types. • **LO2:** To impart basic knowledge on xenobiotics. • **LO3:** To understand about bioleaching and bio mining. • **LO4:** To develop sound knowledge on wastes management. • **LO5:** To understand about theories of environmental nanotechnology
25	DEAM34B	Research Methodology	• **LO1:** To impart knowledge on research problem and finding scientific articles with Internet. • **LO2:** To provide knowledge on collection and analysis of data using statistical tools. • **LO3:** To create awareness on bioinformatics and biological databases. • **LO4:** To impart basic knowledge on animal experimentation and intellectual property rights. • **LO5:** To develop sound knowledge on preparation of research reports.
26	DEAM34C	Marine Microbiology	• **LO1:** the students learn a basic theoretical and practical understanding of the interactions between microorganisms and ocean processes and discuss their future role. • **LO2:** Planktonic unicellular organisms are fundamental players of marine food webs mediating all fluxes of matter and energy in the oceans. • **LO3:** the underlying oceanographic physico-chemical properties and processes affecting microbial life to a thorough

			review of microbial ecology, from viruses to phytoplankton, and the role of these microorganisms in global biogeochemical cycles
27	DOAM35A	Mushroom Cultivation	• **LO1:**Outline the structure, cultivation of mushroom • **LO2:** Elaborate the Cultivation of important Mushroom varieties. • **LO3:** Appreciate the nutritional value of mushrooms. • **LO4:** Describe the economic aspects of mushroom cultivation.
28	DOAM35B	Public Health Microbiology	• **LO1:** To learn about common microbial diseases and their transmission. • **LO2:** Prevention and control of airborne and waterborne diseases. • **LO4:** To establish knowledge about hospital acquired infections.
29	DOAM35C	Intellectual Property Rights	• **LO1:** To recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights. • **LO2:** To identify the significance of practice and procedure of Patents. • **LO3:** To make the students to understand the statutory provisions of different forms of IPRs in simple forms. • **LO4:** To learn the procedure of obtaining Patents, Copyrights, Trade Marks &Industrial Design **LO5:** To enable the students to keep their IP rights alive.
30	DPAM37	Lab Course - 3	• **LO1**: Able to demonstrate parasites in stool sample. • **LO2:** Compare and contrast methods used for diagnosis of viral diseases. • **LO3:** Able to isolate and identify the nitrogen fixing bacteria, phosphate solubilizing bacteria • **LO4:** Able to assess water quality by MPN test

			• **LO5:** Able to demonstrate bacteria in water, bacteria and fungi in soil.
31	DFS30	Field Study	• **LO1:**Apply, Theory,Knowledge,Skills And Technique obtained in the classroom to a professional settings. • **LO2:** Understand organizational dynamics in a given practice settings • **LO3:** Acquire skills related to policy formulation,implementation, and analysis under the guidance of experienced preceptor. • **LO4:**Provide an opportunity to explore a particular settings as it might relate to future career decisions.
	Semester - IV		
32	DAM41	Recombinant Dna Technology	• **LO1:**This course teaches RDNA technology techniques and their application in the field of genetic engineering They learn about plasmids, • **LO2:** vectors and gain knowledge on the construction of cDNA libraries Student of this course have. • **LO3:** knowledge on gene manipulation, gene expression, etc which prepares them for further studies in the area of genetic engineering.
33	DEAM42 A	Diagnostic Microbiology	• **LO1:** Describe pre-post examination procedures applicable to diagnostic microbiology. • **LO2:** Describe or perform standard microbiological staining techniques. • Explain the principles behind different media utilized for growth, isolation, or identification of microbes. • **LO3:** Describe the use of molecular or serological methods for the detection or identification of microbes. • **LO4:** Describe quality assessment practices for diagnostic microbiology.
34	DEAM42 B	Microbial Nanotechnology	• LO1:This is an interdisciplinary and emerging area LO2:The students are

			taught thebasics of nanotechnology and their applications • LO3: The course introduces thestudents to the new and novel applications to solve biomedical problems through nanotechnology.
35	DEAM42C	Bioethics	• **LO1:** Students will understand and apply the basic concepts, methods, and theories in the Natural Sciences. • **LO2:** Students will understand and apply the basic concepts and theoretical perspectives in the Social Sciences including human development and psychology. • **LO3:** Students will understand and apply the basic concepts and theoretical perspectives in the Humanities. • **LO4:** Students will analyze, evaluate, synthesize, and critically reflect on subject matter knowledge and personal experiences across disciplines.
36	DOAM43A	Computational Biology	• **LO1:** Develop computational skills relevant to solving problems in bioinformatics. • **LO2:** Develop relevant skills in math, statistics and biology that enable success in the field of bioinformatics. • **LO3:** Develop analytical skills that will allow them to identify important problems in bioinformatics and to identify solutions. • **LO4:** Gain research skills that allow them to apply their academic training to real-world problems.
37	DOAM43B	Biosafety	• **LO1:** An awareness of the criteria for the appointment of local BSOs. • **LO2:** Athorough knowledge of the responsibilities, duties and limitations of their role. • **LO3:** An understanding of the function of Biosafety committees, in order to be able

			to participate as a member and keep appropriate records. • **LO4:** An understanding of the difference between common and statute law and the implications of each.
38	DOAM43C	Algal Technology	• **LO1:** Understanding of the lower plant groups and Microbial world • **LO2:** To accumulate the knowledge about economical and ecological importance of algae and microbes. • **LO3:** Utilization of algal community and microbes in medicinal industry for human welfare. • **LO4:** Understanding of their importance in relation to the biodiversity.
39	DPAM44	Project With *Viva Voce*	• To creating knowledge, they grow more empathetic.