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UNIVERSITY
NAAC ACCREDITED
THANJAVUR- 613 403 - TAMIL NADU

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

2019-2020

2.6.1.a The institution has stated learning outcomes (Program and Course outcomes)/graduate attributes which are integrated into the assessment process and widely publicized through the website and other documents and the attainment of the same are evaluated by the institution

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School of Arts and Science
Department of Microbiology
19UGMBGEC
2019 Regulation
Program Outcomes and Course outcomes of
B.Sc., Mapping of COs and POs

PROGRAM EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To gain and apply knowledge of microorganisms concept to solve the problems.
PEO2	To identify, analyze and understand the problems related to microbes.
PEO3	Ability to design and develop solutions to the environment using the microbes.
PEO4	Ability to design, perform experiments, analyse, and interpret data for investigating complex problems.
PEO5	To decide and apply appropriate tools and techniques for manipulations.

PROGRAM SPECIFIC OUTCOME (PSO)	
PSO1	Expose input practical skills/competencies in working through microbes for study and use in the laboratory as well as outside, with the use of good microbiological practices.
PSO2	Obtain information and understanding of the microbiology perception as appropriate to various areas such as medical, industrial, environment, genetics, agriculture, food and others.

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PSO3	Proficient enough to use microbiology knowledge and skills to study problems involving microbes, clear these with peers/ team members/ other stake holders, and undertake remedial measures/ studies etc.
PSO4	Developed a broader standpoint of the regulation of Microbiology to facilitate individual to identify challenging societal troubles and plan them professional career to build up novel decision for such problems.

PROGRAMME OUTCOMES (POS)	
PO1	**Vital Thinking:** Acquire knowledgeable actions after identifying the hypothesis that frame our idea and dealings, read-through out the degree to which these hypothesis are precise and suitable, and give the impression of being at our thoughts and assessments (academic, organizational and individual) from diverse perception.
PO2	**Precious communication:** Study about speak, read, write and listen noticeably in person and throughout electronic media in English and in one Indian language and build meaning of the globe by connecting people, thoughts books, media and technology.
PO3	**Effectual citizenship:** Reveal empathetic social concern and fairnesscentred national progress and the capability to act with andtake part in civic life through volunteering.
PO4	**Ethics:** Be aware of diverse value systems including theindividual, under the ethical dimensions of personal choice, and believe responsibility for them.
PO5	**Environment and Sustainability:** Analyze the importance of microbes for environmental clean-up and sustainable development.
PO6	**Self directed and life-long learning:** To gain the talent to employ in self-determining and life-long learning in the broadest circumstance socio technological transforms.
PO7	**Economic liberty and employability potential:** Attain the ability to be concerned in economically sustainable opening and pound entrepreneurial skill.

B.Sc., CURRICULUM MAPPING
Programme Educational Objectives vs Programme Outcome

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Programme Outcome-PO Programme Educational Objectives – PEO	PO1	PO2	PO3	PO4	PO5
PEO1	*	*	*	*	
PEO2	*		*		*
PEO3		*		*	
PEO4	*	*	*		*
PEO5	*		*	*	

Semester	Course Code	Title of the Course	Cos	POS						
				PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	19110AEC11	Language-I (Tamil-I)	CO1- Learn the changes that have occurred in literature since the classical period.	1	2	1	0	1	2	1
			CO2- Make use of vocabulary systematically.	1	2	1	1	1	2	0
			CO3- Understand how to lead one's life realizing the modernity and its environment/atmosphere.	1	2	1	0	1	2	1
I	19111AEC11	Advanced English-I	CO1- Develop vocabulary	1	2	0	1	1	2	2
			CO2- Learn to edit and do proof reading	1	2	1	1	0	2	1
			CO3- Read and comprehend literature	1	2	0	0	1	0	0
I	19111AEC12	English-I	CO1- Read and comprehend literature	1	2	1	1	0	2	2

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			CO2- Appreciate poetry and prose	1	2	0	1	1	0	0
			CO3- Familiarize students with fiction.	1	3	1	1	1	2	1
I	19111AEC13	Fundamentals of Microbiology	CO1 – Describe the characteristics of microorganisms and classification of biological system	3	1	1	0	0	0	2
			CO2 – Understand concepts of growth and reproduction of microbes	2	0	0	2	0	2	0
			CO3 – Able to explain the beneficial and detrimental effects of microorganisms	2	1	3	0	3	0	3
			CO4 -- Gather theoretical background of microbial cultivation	3	1	0	2	3	0	2
I	19116AEC14L	Fundamentals of Microbiology Lab	CO1 – Develop basic skills in aseptic techniques for microbiology practical.	2	1	1	1	3	2	3
			CO2 – Hands on experience in handling of various important instruments.	2	0	1	1	0	1	2
			CO3 - Able to perform basic experiments to grow and study microorganism in laboratory	2	1	1	1	1	1	3
			CO4 - Develop knowledge on identification of microorganisms	2	0	1	1	1	2	3
	19115AEC15	Bio Chemistry I	CO1 – Develop fundamental knowledge about various biomolecules	3	1	1	1	1	0	3
			CO2 - Understand the basic concepts related to enzymes	2	0	1	1	1	0	3
			CO3 - Know various biochemical pathway	2	1	2	1	1	0	3

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			CO4 - Understand the concept of microbial metabolism	3	0	1	0	1	0	3
I	19115AEC16L	Bio Chemistry I Lab	CO1 - Practical knowledge about various techniques used in Biochemistry	0	1	2	1	1	3	3
			CO2 - Exhibit the well practical knowledge about estimation of carbohydrates, protein.	0	0	1	0	0	2	3
			CO3 – Learn the quantitative and qualitative estimation biochemical analysis	2	1	2	1	1	0	3
I	19120SEC01A	Skill Based Elective-I	CO1- Recognize when to use each of the Microsoft Office programs to create professional and academic documents.	2	2	0	0	1	2	3
			CO2- Use Microsoft Office programs to create personal, academic and business documents following current professional and/or industry standards.	2	2	1	0	1	2	3
			CO3- Apply skills and concepts for basic use of computer hardware, software, networks, and the Internet in the workplace and in future coursework as identified by the internationally accepted Internet and Computing Core (IC3) standards.	2	3	1	1	2	2	3
	19111SEC01L	Communicative English Lab-I	CO1- Learn grammar.	2	2	1	1	0	2	2
			CO2- Enrich vocabulary	2	2	0	0	0	0	0
			CO3- Understand the process of communication	2	3	0	0	1	0	0

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			CO4- Develop listening skill	2	2	1	0	1	1	0
I	191INDCONS	Indian Constitution	CO1- Democratic values and citizenship Training and gained	2	1	1	1	0	2	1
			CO2- Awareness on fundamental Rights are established	2	0	1	1	1	1	1
			CO3- The functions of union Government and State Government are learnt	2	0	0	3	1	1	1
			CO4- The Power and functions of the Judiciary learnt thoroughly	2	1	2	2	1	1	1
			CO5- Appreciation of Democratic Parliamentary Rule is learnt	1	1	2	2	1	2	1
II	19110AEC21	Language-II (Tamil-II)	CO1-Know what devotion really is.	1	2	0	1	2	2	1
			CO2-Know the fruitfulness obtained through devotion	1	2	1	0	2	2	0
			CO3-Perceive the progress achieved in the society through devotion.	2	2	1	1	0	2	2
II	19111AEC21	Advanced English-II	CO1- Develop technological skill.	1	2	0	1	1	2	2
			CO2- Able to write in a variety of formats	0	2	0	1	0	2	0
			CO3- Read biographies and develop personality	2	2	1	1	1	2	1
II	19110AEC22	English-II	CO1- Appreciate different forms of literature	1	2	1	1	0	2	1

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			CO2- Acquire language skills through literature	1	2	0	0	2	2	0
			CO3- Broadens the horizon of knowledge	1	2	0	0	0	2	0
II	19116AEC23	Microbial Physiology	CO1- Determining the growth features of the microbes with various environmental factors.	3	0	0	0	2	2	1
			CO2 – Analysis of essential nutrients ensuring microbial growth.	3	0	1	1	2	2	0
			CO3 -The significance of microbial surveillance like autotrophs, heterotrophs, etc…	3	1	1	1	1	1	1
			CO4- Electron transport and metabolic pathway of living systems	2	1	0	1	1	0	1
II	19116AEC24L	Microbial Physiology Lab	CO1- Understand and predict the various metabolic reactions in microbial cell.	0	1	1	1	2	1	1
			CO2-Predict the intermediate products which can be employed in industrial production.	3	1	1	1	1	3	1
			CO3- Environmental growth kinetics of microorganism	2	0	0	1	2	2	1
	19115AEC25	Bio Chemistry II	CO1- Developed a very good understanding of various biomolecules	3	0	1	0	0	2	1
			CO2 - knowledge about lipids and fatty acids	2	0	0	1	1	1	1
			CO3- Well knowledge about multifarious function of proteins	2	1	1	0	1	2	1
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			CO4- Gain knowledge about metabolism.	3	1	1	1	1	2	1
II	19115AEC26L	Bio Chemistry II Lab	CO1- To demonstrate an understanding of fundamental biochemical principles	2	1	1	1	1	1	1
			CO2- To learn the structure/function of biomolecules, metabolic pathways, and regulation	2	0	1	1	1	2	2
			CO3- Students are able to make buffers, study enzyme kinetics	2	0	1	0	1	2	2
II	19116RLC27	Research LED Seminar	CO1- Exposure to various research domains	3	0	1	1	0	0	2
			CO2- Acquaintance with languages of research	3	1	1	1	1	1	1
			CO3- Development of research aptitude	3	1	0	0	0	2	2
II	19120SEC02A	Skill Based Elective –II	CO1- Identify the names and functions of the PowerPoint interface.	2	2	0	1	2	2	2
			CO2- Create, edit, save, and print presentations.	2	2	0	0	2	2	3
			CO3- Format presentations.	2	2	0	0	1	2	3
			CO4- Add a graphic to a presentation.	2	2	0	0	1	2	3
			CO5- Create and manipulate simple slideshow with outlines and notes.	3	3	0	0	1	2	2
			CO6- Create slide presentations that include text, graphics, animation, and transitions.	3	3	1	1	2	2	3

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II	19111SEC02L	Communicative English Lab-II	CO1- Learn grammar.	1	1	0	2	2	2	2
			CO2- Use a variety of reading strategies	0	0	0	0	0	2	0
			CO3- Enhance the skill of making grammatically correct sentences.	1	2	0	1	2	2	1
III	19110AEC31	Language-III (Tamil-III)	CO1- Achieve one's goal by following the ancestral path	1	2	1	0	1	2	1
			CO2- Learn to lead life of perfection by realizing the uncertainty in the life	1	2	0	1	2	2	2
			CO3- Attain happiness through honesty	1	2	1	0	1	2	2
III	19111AEC31	Advanced English-III	CO1- Understand phonetics.	2	2	0	2	2	2	1
			CO2- Develop writing skill	0	0	0	0	0	0	0
			CO3- Able to develop creative writing	2	2	1	1	1	2	2
III	19111AEC32	English-III	CO1- Enable to appreciate different types of prose	1	2	0	1	1	2	1
			CO2- Develop the conversational skills through one-act plays	0	3	0	0	0	2	0
			CO3- Enhance the skill of making grammatically correct sentences.	1	3	0	0	0	2	0
III	19116AEC33	Immunology	CO1- Theory linked to cells and organs related to immune system.	3	0	1	1	1	2	2
			CO2- Able to know Immune response and immune mechanism.	2	0	1	1	1	3	2

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			CO3- Understanding the mechanism of Immunological disorders.	2	1	1	1	1	3	2
			CO4- Learn the importance and precautions of Immunodeficiency syndromes	3	0	1	1	1	2	2
	19116AEC34L	Immunology Lab	CO1- Able to know about principles and techniques Blood grouping	3	1	0	0	1	1	3
			CO2- Understanding the immunological experiments for clinical field	2	1	1	0	1	1	2
III			CO3- Counting of RBC, WBC and platelets	2	0	1	1	1	1	2
	19112AEC35	Biostatistics	CO1-Basic knowledge of mathematics as applied to biological phenomenon.	2	2	1	1	1	2	2
			CO2- Improve the concepts of statistics and their importance	2	2	1	0	1	2	2
III			CO3- Communicate the results of statistical analyses- accurately and effectively	2	2	0	0	1	2	2
	19112AEC36L	Biostatistics Lab	CO1: Read and learn statistical measures individually.	2	2	0	1	1	1	2
			CO2- Collection and analysis of data from experiments and interpretation of the results	2	1	1	1	1	1	1
III			CO3- study the multivariate analysis in biostatistics	1	1	0	0	1	1	1
	19116RMC37	Research Methodology	CO1- Understanding research questions and tools	3	2	1	0	1	3	1
			CO2- Experience in scientific writings	3	2	2	1		3	1

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			CO3-Practice in various aspects of scientific publications	3	2	1	1	1	3	3
			CO4-Inculcation of research ethics	3	2	0	1	1	2	2
III	19120SEC03A	Skill based Elective-III	CO1- Indicate the names and functions of the Excel interface components.	1	3	1	1	2	2	3
			CO2- Enter and edit data.	2	3	0	0	1	2	3
			CO3- Format data and cells.	2	3	0	0	2	2	1
			CO4- Construct formulas, including the use of built-in functions, and relative and absolute references.	2	3	1	0	1	2	2
			CO5- Create and modify charts.	2	2	0	0	2	2	2
			CO6- Preview and print worksheets	2	2	0	0	1	2	1
III	19111SEC03L	Communicative English Lab-III	CO1- Learn grammar.	2	2	0	1	1	2	0
			CO2- Enhance their fluency in English	2	2	1	0	1	2	0
			CO3- Develop speaking and writing skills	2	2	0	1	0	2	0
			CO4- Develop individual perspectives that demonstrate critical thinking skills	0	2	0	0	1	1	0
IV	19110AEC41	Language-IV (Tamil-IV)	CO1- Realize how the ancient people changed their life style according to the ages	2	3	1	0	1	1	1
			CO2- Learn how to change one's lifestyle according to the needs of the future	2	3	0	0	1	1	2
			CO3- Accept the modern trends and its uses	2	3	1	0	1	1	1

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IV	19111AEC41	Advanced English-IV	CO1- Develop writing skill.	2	3	0	0	2	2	1
			CO2- Comprehend and describe poems	2	0	1	0	2	2	1
			CO3- Learn interviewing skills	0	3	0	0	0	2	0
IV	19111AEC42	English-IV	CO1- Improve their ability to read and understand them	2	2	0	1	1	2	1
			CO2- Know the genius of Shakespeare	0	2	0	0	0	2	0
			CO3- Express in writing their views.	2	2	0	0	1	2	0
IV	19116AEC43	Virology	CO1- Understanding the characteristic features of viruses.	3	1	1	1	1	2	1
			CO2 – Gain the knowledge about the biology of bacteriophages.	3	1	0	1	1	2	2
			CO3 – Learn the range of plant viruses and animal viruses.	2	1	1	1	0	2	2
			CO4 - To know the role of viruses in causing of cancer	3	0	1	1	0	2	2
IV	19116AEC44L	Virology Lab	CO1- Knowledge on structure of plants, animal, bacteria and viruses.	2	1	1	0	1	2	3
			CO2- This paper also enables the student on isolation, propagation of various viruses	2	1	1	0	1	2	3
			CO3- Despite advances in clinical laboratory testing devices	1	0	0	0	0	2	1
IV	19116AEC45	Bioinformatics	CO1- Developed skills to use computers for analysis of biological data.	3	1	1	0	1	2	1
			CO2 – Gains the biological databases and compares the data of the biological macromolecules.	3	2	1	1	1	2	2
			CO3 – Analysis of data retrieval, representation, analysis and interpretation	3	1	1	1	1	2	2

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IV	19116AEC46L	Bioinformatics Lab	CO1 - Investigate the literature data of the given protein using PubMed.	2	1	1	2	0	1	3
			CO2 - Explore the nucleotide sequence data of the given species using NCBI / EMBL / DDBJ.	3	1	0	2	0	1	3
			CO3 - Investigate the protein sequence of the species using PIR and Swissprot / UniProt	1	2	0	2	1	1	3
IV	19120SEC04A	Skill based Elective-IV	CO1- Examine database concepts and explore the Microsoft Office Access environment.	2	3	0	0	2	2	3
			CO2- Design a simple database.	2	3	0	1	0	2	2
			CO3- Build a new database with related tables.	2	3	0	0	2	2	2
			CO4- Manage the data in a table.	2	3	0	0	0	2	2
			CO5- Query a database using different methods.	2	2	2	0	2	2	3
			CO6- Design a form.	2	2	0	0	0	2	3
			CO7- Generate a report.	2	2	1	1	2	2	3
			CO8- Import and export data.	2	3	0	1	0	2	1
IV	19111SEC04L	Communicative English Lab-IV	CO1- Learn grammar.	1	2	0	1	1	2	1
			CO2- Enable to express their views in conversation	1	2	0	0	2	2	1
			CO3- Develop soft skills	1	2	1	0	2	2	1
			CO4- Enhance presentation skills	2	3	0	0	1	2	0
IV	191ENVTSTU	Environmental Studies	CO1- Understand eco-system	3	1	1	0	2	1	2
			CO2- Know social issues and the environment	2	1	2	1	2	1	2
			CO3- Learn keep the environment eco-friendly	2	1	2	1	2	2	2

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V	19116AEC51	Food and Dairy Microbiology	CO1 – Illustrate the role of microorganisms in the production of food	2	0	1	0	1	1	2
			CO2 – Investigation of milk and foods quality test for detecting microorganisms	3	1	1	0	1	2	3
			CO3 – Gain the knowledge regarding food preservation	2	1	0	1	2	2	3
V	19116AEC52	Molecular Biology	CO1 - Concept of central dogma of the cell and gene regulation.	2	1	1	0	1	1	
			CO2 - Principles and applications of various molecular techniques.	3	3	1	0	1	3	2
			CO3 - Concept, methods and application of r-DNA technology.	3	2	1	3	1	3	3
			CO4 - Gene library and gene mapping	3	2	1	2	1	3	3
V	19116AEC53	Agricultural and Environmental Microbiology	CO1 - Students acquire the information about microbes	2	1	0	0	3	1	2
			CO2 - Know about microbes and its role in environment.	2	1	0	0	3	1	1
			CO3 - Able to understand about microbes in agriculture and environmental practice	3	1	0	0	3	2	2
V	19116AEC54L	Food and Dairy Microbiology and Molecular Biology Lab	CO1 - Analyze the microbes in food and dairy industry products	3	0	1	0	1	2	3
			CO2 - Production of Food and dairy products using microbes	2	0	1	1	1	2	2
			CO3 - Knowledge about Molecular Genome analysis and quantification	2	0	1	1	1	1	3

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			CO4 - Isolation of DNA and amplification using PCR technique.	2	1	1	1	1	1	2
			CO5 - Protein and DNA separation technique	2	1	2	0	1	1	2
V	19116AEC55L	Agricultural and Environmental Microbiology Lab	CO1 - Students acquire the information about microbes role in agriculture	2	1	2	1	2	1	2
			CO2 - Learn about Biofertilizer production	3	1	1	1	2	2	3
			CO3 - Know about microbes and its role in environment	2	0	1	1	3	2	3
V	19116DSC56A	Discipline Specific Elective -I Proteomics	CO1- Students acquire knowledge in protein functional and expressions.	2	0	0	1	0	0	2
			CO2- Knowledge about 3-D structural prediction of proteins	3	2	1	1	1	1	2
			CO3- Study the protein purification with various chromatograpy techniques.	2	2	1	0	1	1	2
			CO4- Knowledge about MALDI-TOF (Matrix assisted laser Desorption and Ionization)	1	2	1	0	1	1	2
V	19116DSC56B	Bioinoculants	CO1- Students acquire knowledge in microbial products	3	1	1	1	1	1	3
			CO2-Separation of primary and secondary metabolites	2	2	1	1	1	1	2
			CO3- Applications of value added products	2	0	0	1	1	1	2
			CO4- Scope of microbial inoculants in agricultural practices	3	0	0	0	1	1	3
V	19116BRC57	Participation in Bounded Research	CO1-Hands on exposure to problem solving tools in contemporary research	3	0	1	0	1	2	2
			CO2- Evolution of research intuitiveness and orientation	2	2	1	1	1	2	1

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			CO3- Familiarity with cutting edge research trends	2	2	1	0	1	2	1
V	19120SEC05A	Skill based Elective-V	CO1- work with the Photoshop workspace	2	3	1	1	1	2	2
			CO2- navigate images	2	3	0	0	0	2	2
			CO3- resize and crop images	2	2	0	0	0	2	1
			CO4- make and work with selections	2	2	1	0	2	2	2
			CO5- create new layers and perform other basic layer functions	2	2	0	1	0	2	2
			CO6- transform images	2	3	0	0	0	2	1
V	19111SEC05L	Communicative English Lab-V	CO1- Develop corporate skills.	2	3	0	1	1	1	1
			CO2- Handle their day to day affairs well with their knowledge of language skills.	1	2	0	1	2	1	2
			CO3- Get a Job.	2	2	0	0	1	2	2
VI	19116AEC61	Industrial Microbiology	CO1- Learning of different types of reactors or fermenters	3	0	1	0	1	2	3
			CO2-. Capable to understand the vital role of various substrate used in fermentation.	2	0	1	1	1	2	3
			CO3 – Learn about Industrial Product production	2	0	1	2	1	2	2
			CO4- knowledge about upstream and downstream processing	2	1	0	2	1	3	2
VI	19116SEC62	Clinical Microbiology	CO1- Understood the basic and general concepts of Normal flora of the human body	3	1	1	1	1	2	1

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			CO2 –Understand the sources of infectious diseases and transmission	2	1	1	1	1	2	1
			CO3 - Study the pathogenicity of bacterial, fungal, protozoa and viral diseases	2	0	1	1	1	2	1
			CO4- Understand the preventive measures of Hospital acquired infections.	3	0	0	1	1	1	1
VI	19116AEC63L	Industrial Microbiology Lab	CO1- Students acquire hands on training various microbes for industrial practices	1	1	0	0	1	2	3
			CO2- Screening of desired microbes	2	1	1	0	1	2	3
			CO3- Learn the optimization process for scale up process	1	2	1	2	1	1	2
			CO4- Well technical knowledge on upstream and downstream processing	1	2	1	2	1	1	2
VI	19116SEC64L	Clinical Microbiology Lab	CO1- Get practical knowledge in specimen collection and processing	1	1	0	1	1	1	2
			CO2- Knowledge about cyst and protozoa identification.	2	1	0	0	1	1	3
			CO3- Technical practice on diagnosis of pathogenic infection	2	0	0	0	1	2	3
			CO4- Determine antimicrobial activity of microorganisms	1	0	1	0	1	2	2
VI	19116DSC65A	Discipline Specific Elective - II Recominant DNA Technnology	CO1- Students have acquired knowledge in desired DNA and protein separation.	2	1	1	1	1	2	2
			CO2- Learn the gene and operon concept	3	1	1	1	1	2	2

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			CO3- Knowledge about gene cloning and cDNA library	3	0	0	1	1	1	2
			CO4- Learn the blotting techniques	3	0	0	1	1	1	1
VI	19116DSC65B	Bioethics	CO1- Students will identify ethical issues in a research proposal	3	2	1	2	1	1	1
			CO2- Understand the Intellectual property Rights (IPR) and patent filling.	1	1	1	3	1	1	1
			CO3- Knowledge about to ensure ethical conduct of biomedical research	2	1	3	3	1	2	1
			CO4- Describe the basic concepts of legal, ethical, economic, and regulatory measurements	3	3		3	1	2	1
VI	19116PRW67	Project Work	CO1 - Understand basic concepts of research and its methodologies	2	2	1	0	2	2	3
			CO2 - Identify appropriate research problem and parameters	2	2	1	0	2	2	2
			CO3 - Prepare a research report	2	1	0	0	1	1	3
VI	19120SEC06A	Skill Based Elective –VI	CO1- Learn to create animated graphics, add sound and interactivity.	2	3	0	1	1	2	3
			CO2- Can develop Website	2	3	0	0	0	2	3
			CO3- CD based presentations	2	3	0	0	1	2	3

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VI	19111SEC06L	Communicative English Lab-VI	CO1- Apply study skills	2	2	0	1	1	1	1
			CO2- Widen creative thinking	2	2	0	0	2	1	0
			CO3- Be a good team worker	2	3	0	1	0	2	0
			CO4- Make them proficient in English	2	3	0	0	1	2	2

1- Low, 2-Medium, 3- Higher, 0 No correlation

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School of Arts and Science
Department of Microbiology
19PGMBGEC
2019 Regulation
Program Outcomes and Course outcomes of
M.Sc., Mapping of COs and POs

PROGRAM EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To provide detailed knowledge of Microbiology and their application fields. To understand the beneficial and harmful role of microorganisms in the environment and in the industries.
PEO2	To understand the fundamentals of physiological reactions including metabolic pathways and biochemical reactions in microorganisms. To understand the fundamental concepts of immunology, biochemistry, biotechnology and genetics etc.
PEO3	To develop human resource and entrepreneurs in microbiology with the ability to independently start their own ventures or small biotech units in the field of biotechnology.
PEO4	Understand modern microbiology - practices and approaches with an emphasis in technology application in pharmaceutical, medical, industrial, environmental and agricultural areas.
PEO5	Gain experience with standard molecular tools and approaches utilized: manipulate genes, gene products and organisms. Become familiar with handling of Laboratory animals for the research purpose. Interpret differences in data distributions via visual displays.

PROGRAM SPECIFIC OUTCOME (PSo)

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PSO1	Upon master graduation, Microbiology majors will master a set of advanced skills, which would be useful to function effectively as professionals and to their continued development and learning within the field of Microbiology.
PSO2	Able to explain why microorganisms are ubiquitous in nature, inhabiting a multitude of habitats and occupying a wide range of ecological habitats.
PSO3	Able to cite examples of the vital role of microorganisms in biotechnology, fermentation, medicine and other industries important to human well-being.
PSO4	Able to demonstrate that microorganisms have an indispensable role in the environment, including elemental cycles, biodegradation etc
PSO5	Able to systematically collect, record and analyse data, identify sources of error, interpret the result and reach logical conclusion.

PROGRAMME OUTCOMES (POS)	
PO1	**Vital Thinking:** Acquire knowledgeable actions after identifying the hypothesis that frame our idea and dealings, read-through out the degree to which these hypothesis are precise and suitable, and give the impression of being at our thoughts and assessments (academic, organizational and individual) from diverse perception.
PO2	**Precious communication:** Study about speak, read, write and listen noticeably in person and throughout electronic media in English and in one Indian language and build meaning of the globe by connecting people, thoughts books, media and technology.
PO3	**Effectual citizenship:** Reveal empathetic social concern and fairness centred national progress and the capability to act with and take part in civic life through volunteering
PO4	**Ethics:** Be aware of diverse value systems including the individual, under the ethical dimensions of personal choice, and believe responsibility for them.
PO5	**Environment and Sustainability:** Analyse the importance of microbes for environmental clean-up and sustainable development.
PO6	**Self-directed and life-long learning:** To gain the talent to employ self-determining and life-long learning in the broadest circumstance socio technological transforms.

Programme Educational Objectives vs Programme Outcome

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Programme Outcome-PO Programme Educational Objectives PEO	PO1	PO2	PO3	PO4	PO5
PEO1	*	*	*	*	
PEO2	*		*		*
PEO3		*		*	
PEO4	*	*	*		*
PEO5	*		*	*	

Sem	Course Code	Title of the Course	COs	POS					
				PO1	PO2	PO3	PO4	PO5	PO6
I	19216SEC11	Prokaryotic Microbiology	CO1- Scope and historical importance of microbiology	3	1	0	1	2	2
			CO2- Understanding the features and classification of prokaryotes.	2	0	0	1	2	2
			CO3- study about isolation and identification of microbes	3	0	0	3	2	2
			CO4- Economic value of beneficial bacteria	2	2	1	0	1	2
	19216SEC12	Eukaryotic Microbiology	CO1- General Features and taxonomy of eukaryotes	2	1	1	0	0	1
			CO2- Knowledge about advanced research in mycology, phycology.	3	1	1	2	2	1
			CO3- Scope of Algae used as a food	3	2	1	0	2	2
			CO4- Economic importance of Lichens and algae	3	2	2	0	0	1

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	19216SEC13	Microbial Physiology	CO1- Understand the factors influencing the growth of microbes in ecosystem	2	1	1	2	2	1
			CO2- Learn about Bioluminescence and their advantages.	2	1	1	1	1	1
			CO3- Learn about microorganisms to assimilate the nutrients for growth.	2	1	1	2	1	1
			CO4- Study about metabolic pathway	2	1	0	1	1	1
	19216SEC14L	Fundamentals of Microbiology Lab	CO1- practical knowledge about isolation and purification of microbes from various sources.	2	1	0	0	1	2
			CO2- Training about staining experiments	1	2	0	1	1	3
			CO3- Handling on light and compound microscope.	2	2	1	1	2	2
			CO4- Learn essential biochemical analysis	1	2	1	1	2	2
	19216DSC15A	Immunotechnology	CO1- Learn scope and history of immunology.	3	1	1	0	2	1
			CO2- Study about immune system and lymphatic organs.	3	1	1	0	2	1
			CO3- Learn tumor immunology	3	1	1	1	2	1
			CO4- gain knowledge about various immunological techniques (RIA, ELISA, etc…)	3	0	0	2	1	2
	19216DSC15B	Bioremediation and Waste Management	CO1- Understanding on the management of solid and liquid wastes	3	1	0	3	1	1
			CO2- Learn the principles of remedial measures of recycling, reuse and recover from the wastes.	2	1	0	3	1	1
			CO3- Understand the mechanism and role of microbes in the degradation of various pollutants	2	2	0	3	2	1
	19216RLC16	Research Led Seminar	CO1- Exposure to various research domains	1	1	0	1	1	1
			CO2- Acquaintance with languages of research	1	1	1	1	1	1
			CO3- Development of research aptitude	2	1	1	1	1	1
II	19216SEC21	Industrial Microbiology	CO1- Students will get knowledge on strain improvement.	3	0	2	2	2	1
			CO2- Enable them to work in the fermentation industry.	2	1	1	1	2	2

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			CO3- Students will get idea on upstream and downstream fermentation process	2	1	2	1	1	2
			CO4- Economic importance of Bio products	2	2	2	1	1	2
	19216SEC22	Environmental and Agricultural Microbiology	CO1- Huge Insights into these precious areas of Environmental microbiology.	2	0	0	1	1	2
			CO2- Students able to know detailed ideas about biofertilizer production and plant disease.	2	0	0	1	1	2
			CO3- Role of Microbes in marine and freshwater environment	2	1	1	1	1	2
			CO4- Scope of Recycling of Liquid and Solid wastes	3	0	1	1	1	2
	19216SEC23	Clinical Microbiology	CO1- Learn normal flora of human body	2	1	1	1	1	1
			CO2- Get information about various sources of infection and transmission	3	0	1	0	2	1
			CO3- Epidemiology, pathogenesis and treatment of bacterial, fungal and viral diseases	2	1	1	0	1	1
			CO4- Learn Strategy of antimicrobial therapy	3	1	2	0	2	1
	19216SEC24L	Industrial, Clinical, Environmental and Agricultural Microbiology Lab	CO1- Get practical knowledge in specimen collection and processing	2	1	0	1	2	1
			CO2- Become technically expert which will helpful to work in clinical laboratory	2	0	0	1	2	2
			CO3- Learn practical understanding of diagnosis of pathogens.	1		0	1	2	2
			CO4- Acquire knowledge on fermentation process	1	1	1	1	1	2
			CO5- Learn bio fertilizer and inoculants production	1		0	1	1	2
	19216DSC25A		CO1- They acquire knowledge in the quantitative and qualitative estimation of biomolecules	2	0	0	1	2	1
			CO2- They study the influence and role of structure in reactivity of biomolecules	2	1	1	3	1	1

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			CO3- Students have a thorough understanding on the role of biomolecules and their functions	2	2	1	1	1	1
	19216DSC2B	Genomics and Proteomics	CO1- Students gain the knowledge about the interactions between the proteins	3	1		1	1	2
			CO2- Get the information to predict cell behavior or develop drug targets.	1	0	2	0	1	1
			CO3- Rapidly evolving scientific area into genomes, proteomes and databases	3	0	2	0	1	3
			CO4- Learn to store various data NCBI, DDBJ and EMBL	3	0	2	1	2	3
	19216RMC26	Research Methodology	CO1- Understanding research questions and tools	2	1	1	2	2	2
			CO2- Experience in scientific writings	2	1	1	1	1	2
			CO3-Practice in various aspects of scientific publications	2	1	1	1	1	2
			CO4-Inculcation of research ethics	1	2	0	1	1	1
	19216BRC27	Participation in Bounded Research	CO1-Hands on exposure to problem solving tools in contemporary research	2	0	0	0	1	2
			CO2- Evolution of research intuitiveness and orientation	2	0	0	0	1	2
			CO3- Familiarity with cutting edge research trends	2	0	0	2	1	2
III	19216SEC31	Microbial Genetics	CO1- Understood genome organization of model organisms.	2	1	1	1	1	2
			CO2 - Learn molecular mechanisms that underlie mutations.	2	1	1	1	1	2
			CO3- Study about transformation, transduction and conjugation.	3	1	1	1	1	1
			CO4- Are able to describe the nature of the transposable elements	2	1	1	2	2	2
	19216SEC32	Microbial Biotechnology	CO1- Developed an understanding in recombinant DNA technology.	2	2	3	2	2	1
			CO2- candidate to recollect the basics of Molecular Genetics and apply cognitive thinking.	2	1	1	2	1	1

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			CO3-Possibilities ranging from the treatment of human diseases to develop novel medicines	2	2	3	1	2	1
	19216SEC33L	Microbial Genetics and Biotechnology Lab	CO1- Has acquired a fairly good knowledge of the tools and the methods for genetic engineering	2	0	1	1	2	2
			CO2- Separation of DNA and Protein by gel electrophoresis.	1	0	1	1	2	2
			CO3- Students can perform isolation of DNA, amplification of any gene by PCR	2	0	1	1	1	2
			CO4- Hands on experience on Molecular genome isolation and identification techniques	2	1	1	1	1	2
	19216DSC34A	Plant Tissue Culture	CO1- To inculcate the basics of plant tissue culture	3	1	0	2	2	2
			CO2- To impart the knowledge about the various aspects of tissue culture and their applications	3	2	3	2	2	2
			CO3- Learn the role of micro and macro- nutrients in tissue culture plantation	2	2	0	1	1	2
	19216DSC34B	Nanotechnology	CO1- Describe the basic science behind the properties of materials at the nanometre scale	2	0	0	1	1	2
			CO2- Advanced experimental and computational techniques for studying nanomaterials.	2	0	2	1	2	2
			CO3- Learn clearly and effectively using conventional scientific and mathematical notation.	2	0	0	1	1	2
	19216SRC35	Design/Socio technical research	CO1- Sensitization of social needs for innovation	3	2	1	3	3	2
			CO2- Team work towards interdisciplinary synchronous research strategy.	3	2	1	3	2	1
			CO3- Development of critical thinking and synergistic research approach.	3	2	1	2	1	1

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	19212OEC	Applicable Mathematical Techniques	CO1-Students using OR techniques in business tools for decision making	1	1	2	2	2	1
			CO2-Students develop Assignment problem and Replacement problems	1	1	2	2	1	1
			CO3-Understand the concept of decision analysis and game theory	1	1	1	1	1	2
			CO4-Students gets the knowledge about interpolation	2	2	1	1	2	1
	19213OEC	Biomedical Instrumentation	CO1-To familiarize students with various medical equipments and their technical aspects	1	2	0	2	1	2
			CO2-To introduce students to the measurements involved in some medical equipment.	2	0	0	2	2	2
			CO3-Ability to understand diagnosis and therapy related equipments	2	1	0	2	2	2
			CO4-Understanding the problem and ability to identify the necessity of an equipment to a specific problem	0	0	1	1	1	2
	19214OEC	Green Chemistry	CO1-To understand the environmental status and evolution.	1	0	1	2	1	2
			CO2-To know about the Pollution and its prevention measures.	1	1	1	2	2	3
			CO3-To familiarize the green chemistry.	1	1	0	1	1	3
			CO4-To learn about the bio-catalytic reactions.	1	1	0	2		2
			CO5-To understand about the vitamins and antiobiotics.	1	2	0	1	2	3
	19261OEC	Insurance Services	CO1-Learnt the principles of Insurance and the functions of Life and general insurances and the IRDA	1	2	2	1	1	1
	19280OEC	Counselling Psychology	CO1-Learn counselling and its process	1	3	3	1	2	1
	19211OEC	Writing for the media	CO1-Know the intricacies of Media	2	1	1	1	2	1

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IV	19216SEC41	Pharmaceutical Microbiology	CO1- Acquired detailed knowledge of antimicrobial agents, their mechanism of action	2	0	0	2	1	1
			CO2- Developed understanding of different types of disinfectants/antiseptics bactericidal and bacteriostatic actions	2	0	1	2	1	2
			CO3- Regulatory practices, biosensors and applications in Pharmaceuticals	1	0	0	1	1	2
			CO4- Quality Assurance and Validation	2	1	2	1	1	2
	19216SEC42	Biostatistics and Bioinformatics	CO1- Learn about probability/variable analysis and collection, classification of data	2	1	0	1	2	1
			CO2- Basic ideas of significance test (T-test, ANOVA)	2	1	1	1	2	1
			CO3- Understanding about the information on the search engines and various software tools	1	0	0	1	1	1
			CO4- Scope of Biological databases related software used in the bioinformatics	3	0	0	1	1	2
	19216SEC43L	Pharmaceutical Microbiology Lab	CO1 - Aseptic condition relevance to healthcare and the pharmaceutical industry.	1	1	0	1	2	2
			CO2 - Knowledge and understanding of the practical aspects of pharmaceutical microbiology.	2	1	1	1	2	3
			CO3 - Perform practicals on antimicrobial activity	3	2	2	1	1	3
			CO4- Learn the production of antibiotics from microbes.	3	1	2	2	1	3
	19216DSC44A	Bioethics and IPR	CO1- Students will gain awareness about Intellectual Property Rights (IPRs)	2	2	2	1	0	2
			CO2- To take measure for the protecting their ideas	2	3	1	1	0	2
			CO3- Able to develop business strategies by taking account of IPRs	3	1	2	1	0	2
			CO4- Able to assists in technology up gradation and enhancing competitiveness	3	3	1	1	1	1

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	19216DSC44B	Molecular Immunology	CO1 - Able to identify the cellular and molecular basis of immune responsiveness.	1	1	0	1	1	1
			CO2- Learn about Biosensor assays for assessing ligand –receptor interaction.	2	1	2	1	2	2
			CO3- Rationale for vaccine design about new generation antibodies	3	0	2	3	2	2
			CO4- Multigene organization of immunoglobulin gene	3	1	0	2	2	2
	19216PRW45	Project work	CO1- Experience from a master's project and international literature.	2	0	0	1	2	3
			CO2- Develop ability to independently carry out a complete scientific process.	2	3	1	2	2	3
			CO3- Learn about how to write dissertations and proposals for the scientific community.	2	1	3	2	2	3

1- Low, 2-Medium, 3- Higher, 0 No correlation

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School of Arts and Science

Department of Microbiology

19MPMBGEC

2019 Regulation

Program Outcomes and Course outcomes of

M.Phil., Mapping of COs and POs

PROGRAM SPECIFIC OUTCOME (PSO)	
PSO1	Critically evaluate the basic information and ideas from various fields of microbiology.
PSO2	Developing skilled persons in the sector of Disease diagnosis, treatment and prevention.
PSO3	To integrate the knowledge of microbes and improve the quality of life through sustainable microbiological applications.
PSO4	To train the students to develop, design and apply research projects independently to accommodate them in research.
PSO5	To encourage the students to do original research that ends up in new technological or process applications.
PSO6	To enrich the Graduates with solid fundamentals of microbiology and advanced technologies.
PSO7	To equip the students to identify, define and solve the emerging problem

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PROGRAMME OUTCOMES (POS)	
PO1	Recognize and think critically towards the science curricula with sound knowledge and theoretical skills by questioning and plausible explanations.
PO2	Motivate themselves and develop an interest in planning and implementation of research
PO3	Handle equipment needed for material preparation, characterization and to analyze and interpret the data with theoretical background and software.
PO4	Practice the teaching-learning process by being the proponent in classroom and laboratory experience
PO5	Apply the scientific context to develop innovative ideas, products and methods for the benefits of biosphere
PO6	Adopt changes in the environment with high integrity and transpire ethical professionals

Semester	Course Code	Title of the Course	COs	POS					
				PO1	PO2	PO3	PO4	PO5	PO6
I	193MBC11	Research Methodology	CO1-Understanding research questions and tools	1	1	0	1	2	2
			CO2- Experience in scientific writings	2	1	1	1	2	3
			CO3- Practice in various aspects of scientific publications	3	2	2	1	1	3
			CO4- Inculcation of research ethics	3	1	2	2	1	3
I	193MBC12	Advanced Microbiology	CO1: this paper provide the complete knowledge about microbial taxonomy	2	2	2	1	0	2
			CO2: Learn about molecular characterization of microbes.	2	3	1	1	0	2
			CO3: Gain the knowledge about biodegradation of oils and petroleum products.	3	1	2	1	0	2

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			CO4: Learn completely immunology and immune system mechanism	3	3	1	1	1	1
I			CO5: Knowledge about nanotechnology and synthesis of nano-particles from microbes.	1	1	0	1	1	1
	193MBC13A	Microbial Biotechnology	CO1: Knowledge about isolation, purification and preservation of microorganisms.	2	1	2	1	2	2
			CO2: Learn about the molecular tools of genetic engineering	3	0	2	3	2	2
			CO3: Know about the production of value added products	3	1	0	2	2	2
			CO4: gain knowledge about antibiotic, vinegar and alcohol production from microbes.	2	0	0	1	2	3
			CO5: Learn biofertilizer and biofuels production (Azospirillum, Azolla, hydrogen, etc…)	2	3	1	2	2	3
I	193MBC13B	Bioprocess and Enzyme Engineering	CO1- Learn about enzymes technology	2	1	3	2	2	3
			CO2- Learn essential biochemical analysis of enzymes	3	0	2	3	2	2
II	193MBC21	Project Work	CO1- Learn scope and history of immunology.	3	1	0	2	2	2
			CO2- Study about the immune system and lymphatic organs.	2	0	0	1	2	3
			CO3- Learn tumor immunology	2	3	1	2	2	3
			CO4- gain knowledge about various immunological techniques (RIA, ELISA, etc…)	3	0	2	3	2	2

1- Low, 2-Medium, 3- Higher, 0 No correlation

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