Attainment of Programme Outcome

M.Sc Microbiology

CO, PO and PSO Mapping

Name of the Course: Introduction to Microbiology

Blueprint of the question paper	Section	Unit I	Unit II	Unit III	Unit IV	Unit V
	Section A	2	2	2	2	2
	Section B Any FIVE	2	2	1	1	1
	Section C Either OR	2	2	2	2	2
	Section D Any THREE	1	1	1	1	1

SEMESTER - I			
Core I - Fundamentals of Microbiology			
Course Code: 21PMIC11	**Hrs/ Week: 5**	**Hrs/ Sem: 75**	**Credits: 4**

Unit I - Evolution of Microbiology

Contributions of Van Leeuwenhoek, Joseph Lister, Louis Pasteur, Robert Koch, Edward Jenner, Winogradsky and Beijerinck– Further developments in Microbiology **(Self Study)** – identification, characterization and classification of microorganisms – Distinguishing characteristics between prokaryotic and eukaryotic cells – Phenotypic characters – Taxonomic characters – Distinctive characters of major groups of microorganisms – Principles of classification .

Unit II - Microscopy

Microscopy – It's principles and applications in the field of microbiology including the following; Dark field, phase contrast, fluorescence microscopy, transmission and scanning electron microscopy, confocal microscopy – colorimeter, spectrophotometer and lyophilizers – Staining methods- Gram's, acid-fast, meta chromatic granules, nuclear, capsule, flagella, silver impregnation and Giemsa staining methods.

Unit III – Sterilization and Media

Methods of sterilization: Physical and chemical agents, radiation and filtration **(Self Study)** – Indicator microorganisms for sterilization methods- Cultivation of microorganisms – Microbiological media, enrichment media, enriched media, transport media, selective media and pure culture technique – Methods of preservation and maintenance of cultures – Role of disinfectants.

Unit IV - Bacterial anatomy and growth

Bacterial anatomy, structure, properties and biosynthesis of cellular components of bacteria – Sporulation and it's mechanism – Growth and nutrition – Nutritional requirements – Autotrophs – Heterotrophs – Enrichment cultures – Growth curve – Kinetics of growth – Batch culture – Synchronous growth – Measurement of growth and enumeration of cells – Techniques of pure culture.

Unit V – Microbe - Human interaction

Microbe-Human interaction: infection and disease- Resident flora- pathogenicity and virulence. Varied pattern of infection-epidemiology- infectious diseases-recognition of an infectious disease in a population- recognition of an epidemic- the infectious disease cycle- study of disease - virulence and the mode of transmission- the emergence of new disease- control of epidemics.

Books for Reference:

1. Madigan M., T., Martinko. J.M. and Parker J. Brock TD. *Biology of Microorganisms.* London: Hall International Inc. 8th Edition Prentice 1997.
2. Salle, A.J. *Fundamental Principles of Bacteriology*. New Delhi: Tata McGraw – Hill Publishing Company Ltd, 7th Edition. 1996.
3. Stainer R.Y. Ingra ham J.L. Wheelis M.L. and Painter P.R. London:

   General Microbiology, Mac Millan Education Ltd 1986.
4. Tortora, Funke, Case Addison, *Microbiology – An Introduction* –Wesley Longman Inc. 7th Edition 2001.
5. Dubey R.C. and Maheswari,S. *A Text Book of Microbiology*. New Delhi: S. Chand & Co, 2003
6. Talaro K.P. and Talaro.A. *Foundations in Microbiology*. New York: WCP McGraw – Hill, 1999
7. Dubey and Maheshwari.. *A text book of Biotechnology*. Chand publications, 2006
8. Jeffrey C. Pommerville., *Alcamo's Fundamentals of Microbiology* Jones & Bartlett learning 9th edition, 2010.
9. Prescott L.M. Harley J.P. and Klein D.A *Microbiology* New York: McGraw Hill, 7th Edition, 2008.
10. Pelzar Jr. M.J.Chan E.C.S. and Kreig N.R. *Microbiology* – New York: McGraw Hill, Inc 1993.

Course outcome

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	get an idea about the historical events in microbiology.	1	Kn
CO-2	know the scope of microbiology	1,2	Kn
CO-3	know parts of microscope, type and its principle	1,2	Kn
CO-4	distinguish different methods of staining techniques	3	Un

CO-5	analyse nutritional requirements of microbes.	5,6	En
CO-6	understand the techniques for isolation of its pure culture of microorganisms.	1,5,6	Un

Course code : 21PMIC11 **Course name : Fundamentals of Microbiology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	2	3	3	2	3	3	2	2	**2.5**	3	3	3	2	2	3	3	3	**2.8**
CO-2	3	2	3	3	3	2	3	3	**2.8**	3	3	3	2	2	3	3	3	**2.8**
CO-3	2	3	2	3	2	2	3	3	**2.5**	3	3	3	3	2	3	3	2	**2.8**
CO-4	2	3	2	3	2	3	3	3	**2.6**	2	3	3	2	3	3	2	3	**2.6**
CO-5	2	3	2	3	2	3	2	3	**2.5**	3	3	2	3	3	2	3	3	**2.8**
CO-6	3	2	3	2	3	3	2	2	**2.5**	3	3	3	2	3	3	2	3	**2.8**
Ave.	**2.3**	**2.7**	**2.5**	**2.7**	**2.5**	**2.7**	**2.5**	**2.7**		**2.8**	**3**	**2.8**	**2.3**	**2.5**	**2.8**	**2.7**	**2.8**	
PO Mean									**2.6**	**PSO Mean**								**2.8**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				

Attainment of Course Outcomes of the **M.Sc Microbiology Programme**

2021 – 2023

Course Code	Name of the Course	Course Outcomes															
		Programme Outcomes (PO)								Programme Specific Outcomes (PSO)							
		PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
21PMIC11	Fundamentals of Microbiology	2.3	2.7	2.5	2.7	2.5	2.7	2.5	2.7	2.8	3	2.8	2.3	2.5	2.8	2.7	2.8
21PMIC12	Microbial Diversity and Classification	2.7	2.7	2.7	2.5	2.5	2.8	2.7	2.8	3	3	2.8	2.3	2.5	2.8	2.7	2.8
21PMIC13	Biochemistry	2.8	2.7	2.5	2.5	2.2	2.3	2.7	3	3	2.3	2.8	2.7	2.8	2.8	2.3	3
21PMIC14	Microbial Physiology	2.7	2.2	2.7	2.8	2.2	2.5	2.7	2.3	2.7	2.5	2.8	2.7	2.8	2.3	2.3	2.5
21PMIC21	Immunology	2.5	2.7	2.5	2.7	2.7	2.8	2.7	3	3	2.7	3	2.5	2.7	2.8	2	3
21PMIC22	Medical Microbiology	2.8	2.5	2.7	2.5	2.5	2.5	2.5	2.8	2.8	2.8	2.8	2.5	2.5	2.8	2.3	2.7
21PMIC23	Microbial genetics and Molecular biology	3	2.7	2.5	2.8	2	2.5	2.8	2.5	2.7	2.8	3	2.8	2.5	2.7	2.3	2.8
21PMIC24	Marine Microbiology	2.5	2	2.5	2.5	2.5	2.3	2.7	2.5	2.7	2.8	2.7	2.8	2.7	2.7	2.7	2.5
21PMIC31	Industrial and Pharmaceutical Microbiology	2.5	2.3	2.5	3	2.7	2.7	2.8	2.7	3	2.8	2.7	2.8	2.8	2.8	2.7	2.5
21PMIC32	Genetic Engineering	2.8	2.7	2.8	2.8	3	2.3	3	2.2	2.5	3	2.7	3	2.2	2.8	2.7	3
21PMIC33	Food and Dairy Microbiology	2.5	2	2.5	2.5	2.5	2.3	2.7	2.5	2.7	2.8	2.7	2.8	2.7	2.7	2.7	2.5
21PMIC34	Research Methodology	2.7	2.8	2.7	2.8	2.7	2.7	2.7	2.5	2.8	2.8	2.8	2.8	2.7	2.8	2.7	2.5
21PMIC41	Environmental Microbiology	2.7	2.7	2.7	2.5	2.5	2.8	2.7	2.8	3	3	2.8	2.3	2.5	2.8	2.7	2.8
21PMIC42	Soil and Agriculture Microbiology	2.8	2.5	2.3	2.7	2.5	2.2	2.5	2.7	3	2.5	3	2.5	2.3	2.7	2.5	2.8
21PMIC43	Applied Microbiology	2.7	2.7	2.5	2.5	2.5	2.5	2.7	2.7	2.8	2.7	2.7	2.7	2.5	2.7	2.7	2.7
Average Correlation		**2.7**	**2.5**	**2.6**	**2.7**	**2.5**	**2.5**	**2.7**	**2.6**	**2.8**	**2.8**	**2.8**	**2.6**	**2.6**	**2.7**	**2.5**	**2.7**
Mean Overall Score		**2.6**	**The POs and PSOs are strongly correlated with the COs of the programme**														

SEMESTER I			
Core – II Microbial Diversity and Classification			
Course Code : 21PMIC12	**Hrs/ Week: 5**	**Hrs/ Sem: 75**	**Credits: 4**

Objectives:

- To understand about the evolution of organisms on earth and variability among living organisms.
- To study about the microbial population and its habitat and about microbial communities which are excellent models for understanding biological interactions and evolutionary history.

Course Outcome:

C O No	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO -1	understand the ubiquitous nature of microbes.	1	Un
CO -2	explain the basic concept of microbial diversity and classification.	3	Re
CO -3	Discuss about the various diversification in microorganism	4	Cr
CO -4	Explain the knowledge of reproduction in microbes	5	Un
CO- 5	describe genetic characters of microbes.	5	Un
CO -6	understand the general classification of microbes	4	Un

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Course code:21PMIC12 Course Name: Microbial Diversity and Classification

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	3	3	2	3	3	2	3	**2.8**	3	3	3	2	2	3	3	3	**2.8**
CO-2	3	2	3	2	3	2	3	3	**2.6**	3	3	3	2	2	3	3	3	**2.8**
CO-3	2	3	2	3	2	3	3	3	**2.6**	3	3	3	3	2	3	3	2	**2.8**
CO-4	2	3	3	3	2	3	3	3	**2.8**	3	3	3	2	3	3	2	3	**2.8**
CO-5	3	3	2	3	2	3	3	2	**2.6**	3	3	2	3	3	2	3	3	**2.8**
CO-6	3	2	3	2	3	3	2	3	**2.6**	3	3	3	2	3	3	2	3	**2.8**
Ave.	**2.7**	**2.7**	**2.7**	**2.5**	**2.5**	**2.8**	**2.7**	**2.8**		**3**	**3**	**2.8**	**2.3**	**2.5**	**2.8**	**2.7**	**2.8**	
PO Mean									**2.7**	**PSO Mean**								**2.8**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				

SEMESTER I			
Core III- Biochemistry			
Course Code: 21PMIC13	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 4**

Objectives:

- To be recognized as a centre for excellence in biochemistry that provide an atmosphere to acquire skills in identifying the link between biological and human resources and transform it to enhance the quality of life
- To enhance the students with a broad-based knowledge in concepts and principles of biochemistry.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	compare and contrast the structure, classification and function of the carbohydrates.	1,2	Un, Kn
CO-2	understand the structure, classification and function of lipids.	1,3	Un
CO-3	compare and contrast saturated, mono-saturated and poly-saturated fatty acids.	1	Kn
CO-4	know the structure and classification of proteins	5	Kn
CO-5	know the dna, rna structure, function, types and importance	5	Kn
CO-6	understand the functions of enzymes, coenzymes and cofactors	6	Un

COURSE CODE: 21PMIC13 COURSE NAME: Biochemistry

	PO									PSO								
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	Avg	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	Avg
CO-1	3	3	3	2	2	3	3	3	2.8	3	2	3	3	3	2	2	3	2.6
CO-2	3	2	2	3	2	2	3	3	2.5	3	3	3	3	2	3	2	3	2.8
CO-3	2	3	2	2	2	3	3	3	2.5	3	3	3	2	3	3	2	3	2.8
CO-4	3	2	3	3	3	2	2	3	2.6	3	2	2	3	3	3	2	3	2.6
CO-5	3	3	3	2	2	2	2	3	2.5	3	2	3	3	3	3	3	3	2.9
CO-6	3	3	2	3	2	2	3	3	2.6	3	2	3	2	3	3	3	3	2.8
Average	2.8	2.7	2.5	2.5	2.2	2.3	2.7	3		3	2.3	2.8	2.7	2.8	2.8	2.3	3	
PO Mean									2.6	PSO Mean								2.8
Strength of PO Correlation									Strong	Strength of PSO Correlation								Strong

SEMESTER – I			
Core – IV Microbial Physiology			
Course Code : 21PMIC14	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 4**

Objectives:

- To give the students knowledge about the physiological processes of microorganisms.
- To impart advanced level information in the subject of microbial physiology

Course outcome

CO No	Upon completion of this course students will be able to	PSO addressed	CL
CO -1	illustrate the basic knowledge about the microbial physiology fuctions and its various metabolism	3	Re
CO - 2	define various components of electron transport chain and their functions.	4,3	Re
CO -3	elaborate the bacterial growth curve and the measurement of their cell growth	4	Cr
CO - 4	explain the various bacterial transport mechanisms and their secretion system	2	Un
CO - 5	discuss about various electron transport takes place under aerobic and anaerobic condition.	1,3	Cr
CO- 6	interpret the list of fermentation mechanisms for atp regeneration.	7	Un

Course Code : 21PMIC14 **Course Name : Microbial Physiology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	3	3	3	2	3	3	3	**2.9**	3	2	2	3	3	2	2	3	**2.5**
CO-2	3	2	3	3	2	2	2	2	**2.4**	3	2	3	3	3	3	3	2	**2.8**
CO-3	2	2	2	3	3	2	2	2	**2.3**	2	3	3	3	3	2	2	3	**2.6**
CO-4	3	2	3	2	2	3	3	3	**2.6**	3	2	3	2	3	2	2	2	**2.4**
CO-5	3	2	2	3	2	3	3	2	**2.5**	3	3	3	3	3	2	3	3	**2.9**
CO-6	2	2	3	3	2	2	3	2	**2.4**	2	3	3	2	2	3	2	2	**2.4**
Ave.	**2.7**	**2.2**	**2.7**	**2.8**	**2.2**	**2.5**	**2.7**	**2.3**		**2.7**	**2.5**	**2.8**	**2.7**	**2.8**	**2.3**	**2.3**	**2.5**	
PO Mean									**2.5**	**PSO Mean**								**2.6**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				

SEMESTER – II			
Core – V Immunology			
Course Code : 21PMIC21	**Hrs/Week : 5**	**Hrs/Sem : 75**	**Credits : 4**

Objectives:

- To impact advanced level information in the study of the immune system.
- To study about the various immune responses of the human system towards the pathogens.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	prioritize various applications of monoclonal antibodies and types of vaccines.	1	Un
CO - 2	recall about the classification of various immune cells and their functions in elevating immune response.	4	R e
CO - 3	improve knowledge about the nature , functions and characteristics of antigen and antibodies involved in immune response.	3,2	C r
CO - 4	improve the knowledge about various hypersensitivity reactions and transplantation immunology.	3,4	Cr
CO - 5	illustrate various complement fixation pathways and their basic mechanisms.	6	U n
CO - 6	interpret the knowledge about various antigen and antibody reactions with their principle.	1	Un

	PO									PSO								
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	AVG.	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	AVG.
CO-1	2	3	3	2	3	2	3	3	2.6	3	3	3	3	3	3	2	3	2.9
CO-2	3	2	2	3	3	3	3	3	2.8	3	3	3	3	2	3	2	3	2.8
CO-3	2	3	2	3	3	3	3	3	2.8	3	3	3	2	3	3	2	3	2.8
CO-4	3	2	3	2	3	3	2	3	2.6	3	3	3	2	3	3	2	3	2.8
CO-5	3	3	2	3	2	3	2	3	2.6	3	2	3	3	2	3	2	3	2.6
CO-6	2	3	3	3	2	3	3	3	2.8	3	2	3	2	3	2	2	3	2.5
Ave.	2.5	2.7	2.5	2.7	2.7	2.8	2.7	3		3	2.7	3	2.5	2.7	2.8	2	3	
PO Mean									2.7	PSO Mean								2.7
Strength of PO Correlation					Strong					Strength of PSO Correlation				Strong				

SEMESTER-II			
Core-VI Medical Microbiology			
Course Code: 21PMIC22	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credits:4**

Objectives:

- A centre of excellence for training and research in medical microbiology.
- To train quality healthcare professionals carry out creative innovative and inventive research and provide reliable diagnostic services in the field of medical microbiology.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	recall the clinical microbiology concept to patient care	1	Re
CO -2	analyse the level information in the subject of medical microbiology	6	An
CO -3	illustrate the different classes of microbes	3	Un
CO -4	describe the applied microbiology aspects of clinical technique**.**	1	Un
CO- 5	describe the role of chemotherapic technique	4	Un
CO -6	explain the drug resistance capacity of microbes	4	Un

COURSE CODE: 21PMIC22 **COURSE NAME: Medical Microbiology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	2	3	3	3	2	3	3	**2.8**	3	2	3	2	2	3	3	3	**2.6**
CO-2	3	2	3	2	2	3	2	3	**2.5**	3	3	3	2	3	2	3	3	**2.8**
CO-3	2	2	2	3	3	2	3	3	**2.5**	2	3	3	3	3	3	2	2	**2.6**
CO-4	3	3	2	2	3	3	2	2	**2.5**	3	3	3	2	2	3	2	3	**2.6**
CO-5	3	3	3	3	2	2	2	3	**2.6**	3	3	3	3	2	3	2	3	**2.8**
CO-6	3	3	3	2	2	3	3	3	**2.8**	3	3	2	3	3	3	2	2	**2.6**
Ave.	**2.8**	**2.5**	**2.7**	**2.5**	**2.5**	**2.5**	**2.5**	**2.8**		**2.8**	**2.8**	**2.8**	**2.5**	**2.5**	**2.8**	**2.3**	**2.7**	
PO Mean									**2.6**	**PSO Mean**								**2.7**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**			**Strong**					

SEMESTER – II			
Core – VII Microbial Genetics and Molecular Biology			
Course Code: 21PMIC23	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credit: 4**

Objectives:

- To make the students knowledgeable in the field of Microbial Genetics and Molecular Biology.
- To make the students aware of the concepts of Microbial Genetics and Molecular Biology.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	relate the genetics of microorganisms	1	Re
CO-2	recall the molecular mechanisms of microorganisms	1	Re
CO-3	explain all important topics to prepare for competitive exams	5	Un
CO-4	examine the history of molecular biology	2	An
CO-5	analyse about nucleic acids, their damage and repair mechanism	6	An
CO-6	compare all gene transfer methods	2	Ev

COURSE CODE: 21PMIC23 **COURSE NAME: Microbial Genetics and Molecular Biology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	3	2	3	2	2	3	3	**2.6**	3	3	3	3	3	3	2	3	**2.9**
CO-2	3	3	3	3	3	2	3	2	**2.8**	3	3	3	3	2	3	2	3	**2.8**
CO-3	3	2	3	3	2	3	3	3	**2.8**	2	3	3	3	3	3	3	3	**2.9**
CO-4	3	2	2	3	2	3	3	3	**2.6**	2	2	3	2	2	2	2	2	**2.1**
CO-5	3	3	3	3		2	3	2	**2.4**	3	3	3	3	2	2	2	3	**2.6**
CO-6	3	3	2	2	3	3	2	2	**2.5**	3	3	3	3	3	3	3	3	**3.0**
Ave.	**3**	**2.7**	**2.5**	**2.8**	**2**	**2.5**	**2.8**	**2.5**		**2.7**	**2.8**	**3**	**2.8**	**2.5**	**2.7**	**2.3**	**2.8**	
PO Mean									**2.6**	**PSO Mean**								**2.7**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**			**Strong**					

SEMESTER – II			
Core VIII -Marine Microbiology			
Course Code :21PMIC24	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits:4**

Objectives:

- To provide the learners with the best learning experience in Marine Microbiology providing standard education and enabling the students to become entrepreneurs and socially responsible.
- To develop young students with active and creative minds in the field of microbiology.
- To motivate learners to contribute to sustainable development of nation through environmental protection and social responsibility

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	describe the basic knowledge on marine ecosystem.	1	Re
CO -2	acquire the knowledge about diversity of marine ecosystem	1,2	Kn
CO-3	can analyses the aware of bio fouling and prevention.	2,3,4	Ev
CO-4	interpret the knowledge on marine microorganisms.	1,2	Ap
CO-5	determines the microbial indicator organisms.	1	Kn
CO-6	explain the concept of marine pollution	2,3,4	Co

Course Code :21PMIC24 **Course Name: Marine Microbiology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	2	3	3	2	3	2	2	**2.5**	2	3	3	3	3	2	3	3	**2.8**
CO-2	2	2	2	2	3	3	3	3	**2.5**	3	3	2	3	3	2	3	2	**2.6**
CO-3	3	2	2	2	2	2	3	3	**2.4**	3	3	3	3	2	3	3	3	**2.9**
CO-4	2	2	2	3	3	2	2	2	**2.3**	2	3	2	3	3	3	2	2	**2.5**
CO-5	2	2	3	2	3	2	3	2	**2.4**	3	2	3	3	2	3	3	3	**2.8**
CO-6	3	2	3	3	2	2	3	3	**2.6**	3	3	3	2	3	3	2	2	**2.6**
Ave.	**2.5**	**2**	**2.5**	**2.5**	**2.5**	**2.3**	**2.7**	**2.5**		**2.7**	**2.8**	**2.7**	**2.8**	**2.7**	**2.7**	**2.7**	**2.5**	
PO Mean									**2.5**	**PSO Mean**								**2.7**
Strength of PO Correlation				**Strong**						**Strength of PSO Correlation**			**Strong**					

SEMESTER-III			
Core-IX- Industrial and Pharmaceutical Microbiology			
Course Code:21PMIC31	**Hrs/Week:5**	**Hrs/Sem:75**	**Credits:4**

Objectives:

- To impart the professional ability and skill by increasing the global knowledge.
- To understanding and application in Industrial and Pharmaceutical Microbiology.
- To empower the learners to address current and future challenges faced by the humanity using Industrial and Pharmaceutical Microbiology.

Course outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	revise the idea about the usage of microorganisms in the field of industrial microbiology	3	An
CO -2	analyse the knowledge of various industrial and pharmaceutical products and its impacts on the society.	4	Un
CO -3	knowledgeable in industrial fermentation	3	Un
CO -4	have an insight on industrial microbiological techniques	2	Re
CO -5	understands in the field of pharmaceutical microbiology	1	Un
CO-6	Knowledge of basics and applied microbiological aspects of industries.	1	Un

COURSE CODE: 21PMIC31 COURSE NAME: Industrial and Pharmaceutical Microbiology

	PO									PSO								
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	AVG.	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	AVG.
CO-1	3	2	3	3	2	3	2	3	2.6	3	3	3	3	3	2	3	3	2.9
CO-2	2	3	2	3	3	3	3	3	2.8	3	3	2	3	3	3	3	2	2.8
CO-3	3	2	2	3	2	2	3	3	2.5	3	3	3	3	3	3	3	3	3.0
CO-4	2	2	2	3	3	2	3	2	2.4	3	3	2	3	3	3	2	2	2.6
CO-5	2	3	3	3	3	3	3	2	2.8	3	2	3	3	2	3	3	3	2.8
CO-6	3	2	3	3	3	3	3	3	2.9	3	3	3	2	3	3	2	2	2.6
Ave.	2.5	2.3	2.5	3	2.7	2.7	2.8	2.7		3	2.8	2.7	2.8	2.8	2.8	2.7	2.5	
PO Mean									2.7	PSO Mean								2.8
Strength of PO Correlation					Strong					Strength of PSO Correlation				Strong				

SEMESTER-III			
Core-X- Genetic Engineering			
Course Code -21PMIC32	**Hrs/Week:5**	**Hrs/Sem:75**	**Credits:4**

Objectives:

1. To promote applicable genetics, bioengineering, and bio technological knowledge through education and state of the art technologies.

2. Educate students for technical competence and knowledge management in different areas of Genetic engineering.

Course outcomes:

CO. No	Upon completion of this course, students will be able to	PSO's Addressed	CL
CO- 1	Explain the knowledge about cloning	2	An,Un
CO -2	Perceive the applications of genetic engineering in various fields	4	Un, Re
CO- 3	Understands the hazardous and potential risk in releasing transgenic into environment	5	Un
CO -4	Create the techniques used in genetic engineering	2	An, Re
CO -5	Understands the concepts of blotting techniques and its applications	3	Un
CO -6	Discuss the cloning techniques and the production of transgenic materials	4	Un,An

COURSE CODE: 21PMIC32 **COURSE NAME: Genetic Engineering**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	2	3	3	3	3	3	3	2	**2.8**	2	3	2	3	2	3	3	3	**2.6**
CO-2	3	3	3	3	3	3	3	3	**3.0**	2	3	2	3	2	2	2	3	**2.4**
CO-3	3	2	2	3	3	2	3	2	**2.5**	3	3	3	3	2	3	2	3	**2.8**
CO-4	3	2	3	2	3	2	3	2	**2.5**	3	3	3	3	2	3	3	3	**2.9**
CO-5	3	3	3	3	3	2	3	2	**2.8**	2	3	3	3	2	3	3	3	**2.8**
CO-6	3	3	3	3	3	2	3	2	**2.8**	3	3	3	3	3	3	3	3	**3.0**
Ave.	**2.8**	**2.7**	**2.8**	**2.8**	**3**	**2.3**	**3**	**2.2**		**2.5**	**3**	**2.7**	**3**	**2.2**	**2.8**	**2.7**	**3**	
PO Mean									**2.7**	**PSO Mean**								**2.8**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				

SEMESTER –III			
Core- XI - Food and Dairy Microbiology			
Course Code : 21PMIC33	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Objectives:

To impact the advanced level knowledge in the subject of food microbiology

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO- 1	Recall the techniques in food microbiology.	1	An
CO- 2	Explain the about microorganisms important in food	2,5	Un
CO -3	Knowledge about the microbial contamination of food.	1,2,4	Un
CO- 4	knows about the techniques in food preservation and fermented foods	3,4,6	Re
CO -5	Knowledge about beneficial and harmful aspects of microbes in dairy products	2,4,5,6	Cr
CO -6	Communicate the recent techniques on good manufacturing.	2,4,5,6	Un

Course Code: 21PMIC33 **Course Name: Food and Dairy Microbiology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	2	3	3	2	3	2	2	**2.5**	2	3	3	3	3	2	3	3	**2.8**
CO-2	2	2	2	2	3	3	3	3	**2.5**	3	3	2	3	3	2	3	2	**2.6**
CO-3	3	2	2	2	2	2	3	3	**2.4**	3	3	3	3	2	3	3	3	**2.9**
CO-4	2	2	2	3	3	2	2	2	**2.3**	2	3	2	3	3	3	2	2	**2.5**
CO-5	2	2	3	2	3	2	3	2	**2.4**	3	2	3	3	2	3	3	3	**2.8**
CO-6	3	2	3	3	2	2	3	3	**2.6**	3	3	3	2	3	3	2	2	**2.6**
Ave.	**2.5**	**2**	**2.5**	**2.5**	**2.5**	**2.3**	**2.7**	**2.5**		**2.7**	**2.8**	**2.7**	**2.8**	**2.7**	**2.7**	**2.7**	**2.5**	
PO Mean									**2.5**	**PSO Mean**								**2.7**
Strength of PO Correlation									**Strong**	**Strength of PSO Correlation**								**Strong**

SEMESTER –III			
Core – XII Research Methodology			
Course Code : 21PMIC34	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Objectives:

1. To impart advanced level information in the subject of Research methodology.
2. To show various biological techniques used in research, and study about research project, paper presentation and article publication.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Analyse the laboratory equipment's	2	An
CO-2	Evaluate the rights granted by IPR	6	Ev
CO-3	determine the process involved in centrifugation and chromatography techniques	6	Ev
CO-4	Examine electrophoresis techniques	6	An
CO-5	Apply research methods in biological science.	1	Ap
CO-6	Estimate project writing method and to estimate Data's used in projects.	1	Ev

COURSE CODE: 21PMIC34 **COURSE NAME: Research Methodology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	2	3	3	3	3	2	3	3	**2.8**	3	3	3	3	3	2	3	3	**2.9**
CO-2	3	3	2	3	3	2	3	2	**2.6**	3	3	2	3	3	3	3	2	**2.8**
CO-3	3	3	3	3	2	3	3	3	**2.9**	3	3	3	3	2	3	3	3	**2.9**
CO-4	2	3	2	3	3	3	2	2	**2.5**	2	3	3	3	3	3	2	2	**2.6**
CO-5	3	2	3	3	2	3	3	3	**2.8**	3	2	3	3	2	3	3	3	**2.8**
CO-6	3	3	3	2	3	3	2	2	**2.6**	3	3	3	2	3	3	2	2	**2.6**
Ave.	**2.7**	**2.8**	**2.7**	**2.8**	**2.7**	**2.7**	**2.7**	**2.5**		**2.8**	**2.8**	**2.8**	**2.8**	**2.7**	**2.8**	**2.7**	**2.5**	
PO Mean									**2.7**	**PSO Mean**								**2.8**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				

SEMESTER – IV			
Core – XIII- Environmental Microbiology			
Course Code :21PMIC41	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credit: 4**

Objectives:

1. To provide the learners with the best learning experience in Microbiology by providing standard education and enabling the students to become entrepreneurs and socially responsible.

2. Developing young students with active and creative minds in the field of microbiology enabling the students to become entrepreneur by applying the microbial technology.

3. Motivating learners to contribute to sustainable development of nation through environmental protection and social responsibility.

Course Outcome:

CO.No	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO-1	have knowledge about the interaction between microbes and organisms at other tropic level	1	Re,
CO -2	interpret the microbiology of sewage and its treatment	1,2	Un, An
CO-3	explain about aero microbiology and microbial ecology	2,3	Co
CO-4	acquire basic knowledge about water purification	2	Un, An
CO-5	gets knowledge about biogeochemical cycles	2	Ap
CO-6	develop the application of biodegradation and bioremediation.	2,4	Co

COURSE CODE: 21PMIC41 COURSE NAME: ENVIRONMENTAL MICROBIOLOGY

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	3	3	2	3	3	2	3	**2.8**	3	3	3	2	2	3	3	3	**2.8**
CO-2	3	2	3	2	3	2	3	3	**2.6**	3	3	3	2	2	3	3	3	**2.8**
CO-3	2	3	2	3	2	3	3	3	**2.6**	3	3	3	3	2	3	3	2	**2.8**
CO-4	2	3	3	3	2	3	3	3	**2.8**	3	3	3	2	3	3	2	3	**2.8**
CO-5	3	3	2	3	2	3	3	2	**2.6**	3	3	2	3	3	2	3	3	**2.8**
CO-6	3	2	3	2	3	3	2	3	**2.6**	3	3	3	2	3	3	2	3	**2.8**
Ave.	**2.7**	**2.7**	**2.7**	**2.5**	**2.5**	**2.8**	**2.7**	**2.8**		**3**	**3**	**2.8**	**2.3**	**2.5**	**2.8**	**2.7**	**2.8**	
									2.7	**PSO Mean**								**2.8**
Strength of PO Correlation				**Strong**						**Strength of PSO Correlation**			**Strong**					

SEMESTER – IV			
Core – XIV- Soil and Agricultural Microbiology			
Course Code :21PMIC42	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credit: 4**

Objectives:

1) To provide the learners with the best learning experience in Soil and Agricultural Microbiology by providing standard education and enabling the students to become entrepreneurs and socially responsible.

2) To develop young students with active and creative minds in the field of microbiology.

3) To enabling the students to become entrepreneur by applying the microbial technology.

4) To motivate learners to contribute to sustainable development of nation through environmental protection and social responsibility.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recall the ecological groups of microbes and properties of soil	1	Re, Un
CO -2	have knowledge about the soil fertility	1,2	Un
CO-3	recall the previous basic knowledge about nitrogen fixing	1,2	Re, Co
CO-4	explain about plant microbe interaction.	2	Un
CO-5	acquire basic knowledge about important of plant microbe interaction for different layers (rhizosphere, phyllosphere)	2	Ap ,Un
CO-6	gets knowledge about recombinant microbes in agriculture.	2,4	Un, Co

Mapping of Course Outcomes with Pos and PSOs

COURSE CODE: 21UMIC62 COURSE NAME: Industrial Microbiology

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	3	2	2	2	2	2	2	**2.3**	3	3	3	3	2	3	2	3	**2.8**
CO-2	2	3	2	3	2	3	2	3	**2.5**	3	2	3	2	3	3	3	3	**2.8**
CO-3	3	2	2	3	3	2	3	3	**2.6**	3	3	3	2	3	2	3	3	**2.8**
CO-4	3	3	3	3	2	2	3	3	**2.8**	3	2	3	3	2	3	2	3	**2.6**
CO-5	3	2	2	3	3	2	3	2	**2.5**	3	3	3	3	2	3	3	3	**2.9**
CO-6	3	2	3	2	3	2	2	3	**2.5**	3	2	3	2	2	2	2	2	**2.3**
Ave.	**2.8**	**2.5**	**2.3**	**2.7**	**2.5**	**2.2**	**2.5**	**2.7**		**3**	**2.5**	**3**	**2.5**	**2.3**	**2.7**	**2.5**	**2.8**	
PO Mean									**2.5**	**PSO Mean**								**2.7**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				

SEMESTER –IV			
Core XV – Applied Microbiology			
Course Code: 21PMIC43	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits:4**

Objectives:

1) To create the ability to be multi-skilled in the field of applied microbiology with good technical and instrumentation knowledge on various concepts. And providing standard education and enabling the students to become entrepreneurs and socially responsible.

2) To aware the basic knowledge about the applied microbiology and developing young students with active and creative minds in the field of applied microbiology.

Course Outcomes:

C O No	Upon completion of this course, students will be able to	PSO's Addressed	CL
CO-1	Acquire basic knowledge on applied microbiology	4	Un
CO -2	Explain the basics of composting technology	4	Un
CO-3	Appreciate the production of biogas technology	4	An
CO-4	Grasp the fundamental knowledge about mushroom cultivation	4	Un
CO-5	Acquire basic knowledge about *spirullina* production	2	Ap
CO-6	Gets knowledge about biodegradation.	4,2	Un

COURSE CODE: 21PMIC43 **COURSE NAME: Applied Microbiology**

	PO									PSO								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**AVG.**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**AVG.**
CO-1	3	2	2	3	3	2	3	3	**2.6**	3	2	3	3	2	3	2	3	**2.6**
CO-2	3	3	2	3	2	2	3	3	**2.6**	3	3	3	2	2	3	3	3	**2.8**
CO-3	3	3	2	2	3	3	2	3	**2.6**	3	2	2	3	3	3	3	2	**2.6**
CO-4	2	3	3	2	2	3	3	2	**2.5**	2	3	3	3	3	2	2	3	**2.6**
CO-5	3	2	3	2	3	2	2	3	**2.5**	3	3	2	3	3	2	3	2	**2.6**
CO-6	2	3	3	3	2	3	3	2	**2.6**	3	3	3	2	2	3	3	3	**2.8**
Ave.	**2.7**	**2.7**	**2.5**	**2.5**	**2.5**	**2.5**	**2.7**	**2.7**		**2.8**	**2.7**	**2.7**	**2.7**	**2.5**	**2.7**	**2.7**	**2.7**	
PO Mean									**2.6**	**PSO Mean**								**2.7**
Strength of PO Correlation					**Strong**					**Strength of PSO Correlation**				**Strong**				