

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Teaching and Examination scheme

&

Syllabus of

M.Sc. Microbiology

Semester IV

Effective from July 2018

GANPAT UNIVERSITY																				
FACULTY OF SCIENCE																				
TEACHING AND EXAMINATION SCHEME																				
Programme	Master of Science					Branch/Spec.	Microbiology													
Semester	IV																			
Effective from Academic Year				2018-2019					Effective for the batch Admitted in					July-2017						
Subject Code	Subject Name	Teaching scheme												Examination scheme (Marks)						
		Credit						Hours (per week)						Theory			Practical			
		Lecture(DT)			Practical(Lab.)			Lecture(DT)			Practical(Lab.)			CE	SEE	Total	CE	SEE	Total	
		L	TU	Total	P	TW	Total	L	TU	Total	P	TW	Total							
MMIC4MBG	Microbial Genetics	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--	
MMIC4MMB	Medical Microbiology	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--	
MMIC4ALS	Advanced topics in Life Sciences	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--	
MMIC4PRA	Practical Module IV	--	--	--	6	--	6	--	--	--	12	--	12	--	--	--	--	200	200	
MMIC4PRW	Project - II	8	--	8	--	--	--	8	--	8	--	--	--	--	200	200	--	--	--	
Total		20	--	20	6	--	6	20	--	20	12	--	12	120	380	500	--	200	200	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Microbiology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in			July-2017	
Subject code	MMIC4MBG	Subject Name			Microbial Genetics				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	--	--	--	04	Theory	40	60	100
Hours	04	--	--	--	04	Practical	--	--	--
Pre-requisites:									
Students should have basic understanding of bacteria, bacteriophages and fungi.									
Learning Outcome:									
The subject contains rich genetic level understanding of various processes that carries out transfer of DNA to bacteria via different mechanisms such as transformation, conjugation, and transduction. In addition, it also includes detailed understanding genetics of bacteriophages, fungi, viruses and <i>Agrobacterium</i> sp. Understanding of transposition, RM systems, viroids and prions is also included. Hence, students will be able to learn genetic level mechanisms involved in processes stated above.									
Theory syllabus									
Unit	Content								Hrs
1	<ul style="list-style-type: none"> – Recombination: Types of recombination, Models for Homologous recombination, Molecular mechanism of homologous recombination, Homologous recombination in eukaryotes, Mating type switching. Molecular mechanism for site-specific recombination, Biological roles of site-specific recombination. – Conjugation: The fertility plasmid; Mechanism of DNA transfer during conjugation in Gram negative bacteria: <i>tra</i> genes, <i>oriT</i> sequence, Male specific phages, Efficiency of transfer, Interspecies transfer of plasmids, Mobilizable plasmids; Chromosome transfer by Plasmids: Transfer of chromosomal DNA by integrated plasmids, Chromosome mobilization, Prime factors; Transfer systems of Gram positive bacteria: Plasmids attracting pheromones; Integrating conjugative elements. 								15
2	<ul style="list-style-type: none"> – Transformation: Mechanism of Natural competence and transformation in <i>Bacillus subtilis</i>, <i>Streptococcus pneumoniae</i> and <i>Haemophilus influenzae</i>. Transformation by inducing artificial competence, Gene linkage and mapping by transformation. – Transduction: Generalized transduction in P22, P1, T4, λ and Mu bacteriophages, homologous recombination with recipients chromosome, measuring transduction (cotransduction of markers, marker effects, abortive transduction, transduction of plasmids) Applications of generalized transduction. Specialized transduction in λ and its applications. 								15
3	<ul style="list-style-type: none"> – Transposition: Overview of transposition, Structure and types of bacterial transposons, Assays of transposition, Mechanism of transposition, Transposition by DDE transposons, Rolling circle transposons, Y and S transposons, General properties of transposons. – <i>Agrobacterium</i> genetics: Ti-plasmid, Inter kingdom gene transfer (Key early experiments, vir regulon, protein secretion apparatus, conjugation model of T-DNA transfer, Integration products). – Restriction-Modification systems: Role of Restriction-Modification systems, Types of 								15

	RM systems, Modification, Restriction and Regulation.	
4	<ul style="list-style-type: none"> – Genetics of Bacteriophages: Single stranded DNA bacteriophages (M-13, ϕ X 174); RNA containing phages (MS2); Double stranded DNA phages (T-4, Lambda); Lytic and lysogenic regulation of bacteriophage lambda; Complementation of rII mutants of T4. – Fungal genetics: Tetrad analysis and parasexual cycle. – Viroids and Prions 	15
Reference Books		
1	Watson et al., Molecular Biology of the Gene, Cold Spring Harbor Laboratory Press.	
2	Streips and Yasbin, Modern Microbial Genetics, John Wiley & Sons Ltd.	
3	Snyder and Champness, Molecular Genetics of Bacteria, ASM Press, Washington D.C.	
4	Shrivastava Sheela, Genetics of Bacteria, Springer.	
5	Birge Edward, Bacterial and Bacteriophage Genetics, Springer.	
6	Dale and Park, Molecular Genetics of Bacteria, John Wiley & Sons Ltd.	
7	Stent and Calendar, Molecular Genetics: An Introductory Narrative, W. H. Freeman & Co. Ltd.	
8	Snustad and Simmons, Principles of Genetics, John Wiley & Sons Ltd.	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Microbiology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in			July-2017	
Subject code	MMIC4MMB	Subject Name			Medical Microbiology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	--	--	--	04	Theory	40	60	100
Hours	04	--	--	--	04	Practical	--	--	--
Pre-requisites:									
Students should have basic knowledge of bacteriology, virology and mycology.									
Learning Outcome:									
The course will help students to understand the importance of microbiology in relation with bacteriology, virology, mycology and parasitology.									
Theory syllabus									
Unit	Content								Hrs
1	<ul style="list-style-type: none"> – Normal Microbiota: The etiology of infectious diseases, Classifying infectious diseases, Patterns of disease, The spread of infection, Nosocomial (hospital-acquired) infections, Emerging infectious diseases, Epidemiology. – Microbial mechanisms of pathogenicity: Entry of microorganisms into host, Penetration of pathogens to host defenses, Damage to host cells by bacteria. Pathogenic properties of viruses, fungi, protozoa, helminths, and algae. Portals of exit. 								15
2	<ul style="list-style-type: none"> – Diagnosis of microbial diseases: Collection, transport and preliminary processing of clinical samples. Clinical, microbiological, immunological and molecular diagnosis of microbial diseases. Modern methods of microbial diagnosis. – Parasitology - Medical importance of <i>Entamoeba</i>, <i>Giardia</i>, <i>Plasmodium</i>, <i>Taenia</i>, <i>Ascaris</i>, <i>Wucherhiria</i>. Laboratory techniques in parasitology. 								15
3	<ul style="list-style-type: none"> – Medical Bacteriology: Characteristics, classification, pathogenesis, pathology, diagnosis, treatment, prevention and control of diseases caused by <i>Staphylococci</i>, <i>Streptococci</i>, <i>Bacillus</i>, <i>Clostridium</i>, <i>Corynebacterium</i>, <i>Escherichia</i>, <i>Salmonella</i>, <i>Shigella</i>, <i>Klebsiella</i>, <i>Proteus</i>, <i>Vibrio</i>, <i>Pseudomonas</i>, <i>Mycobacteria</i>, <i>Spirochaetes</i>, <i>Rickettsia</i>. 								15
4	<ul style="list-style-type: none"> – Virology - Structure, multiplication, classification and medical importance of DNA viruses - Pox, Herpes, Hepatitis, Adeno; RNA viruses - Picorna, Orthomyxo, Paramyxo, Rabdo and HIV virus. Viral vaccines and antiviral agents. – Mycology - Human mycotic infections caused by Dermatophytes, Histoplasma, <i>Cryptococcus</i>, <i>Candida</i>, opportunistic mycoses. Mycotoxins. 								15
Reference Books									
1	Jawitz, Melnick and Adelberg, Review of Medical Microbiology, McGraw-Hill.								
2	Topley & Wilson's. (1990) Principles of Bacteriology, Virology and Immunity, VIII edition, Vol. III Bacterial Diseases, Edward Arnold, London.								
3	Collee, JG. Duguid JP, Fraser AG, Marimon BP. Mackie and Mc Cartney Practical Medical Microbiology, Churchill Livingstone.								
4	Cruckshank et al., Medical Microbiology Vol I & II, Churchill Livingstone.								
5	Gopal Reddy et al., Laboratory experiments in microbiology, Himalaya Publishing House, New Delhi.								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Microbiology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in			July-2017	
Subject code	MMIC4ALS		Subject Name		Advanced Topics in Life Sciences				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	--	--	--	04	Theory	40	60	100
Hours	04	--	--	--	04	Practical	--	--	--
Pre-requisites:									
Students should have basic concept of central dogma, bioinformatics and microbial genetics.									
Learning Outcome:									
The course will help students to understand various advanced topics related to life sciences.									
Theory syllabus									
Unit	Content								Hrs
1	<p>Genomics: Comparative Genomics of bacteria, organelles and eukaryotes. Pharmacogenomics.</p> <p>Proteomics: Separation and identification of proteins, Protein expression profiling, Protein microarrays, Protein-protein interaction mapping.</p> <p>Functional Genomics and Proteomics: DNA microarray technology, Serial analysis of gene expression; Protein and peptide microarray-based technology; PCR-directed protein in situ arrays; Structural proteomics.</p>								15
2	<p>Transcriptomics: Complete transcript cataloguing and gene discovery- sequencing based approach, Microarray based technologies and computation based technologies. RNA secondary structure prediction.</p> <p>Metagenomics and Metabolomics.</p> <p>Drug Discovery: Strategic Issues of Drug Targets and Screening Procedures, Preclinical and clinical Development of drug, Rational Drug Designing.</p>								15
3	<p>Quorum sensing: HSL based signaling, LuxI and LuxR type proteins, Modulation of quorum sensing mechanism.</p> <p>Probiotics, Prebiotics and Synbiotics.</p> <p>Bacteriocins: Introduction, Classification, Production, Characteristics, Mode of action and Applications of Bacteriocins.</p>								15
4	<p>Microbial reserve compounds: Carbon, Phosphate and Lipid reserves.</p> <p>Intellectual Property Rights: Forms of Protection (Patent, Trademark, Trade secret and Copyright), WIPO, Significance of patent in India.</p> <p>Space Microbiology: Aims and objectives of Space research; Life detection methods (Evidence of metabolism, Evidence of photosynthesis, ATP production, Phosphate uptake, Sulphur uptake. Martian environment (atmosphere, climate and other details).</p>								15
Reference Books									
1	Primrose et al., Principles of Gene Manipulation and Genomics, Blackwell Publishing.								
2	Brown TA, Genomes 3, Garland Science.								
3	Glick et al., Molecular Biotechnology: Principles and Applications of Recombinant DNA, ASM Press, Washington D.C.								
4	Clark and Pazdernik, Biotechnology, Elsevier.								

5	Streips and Yasbin, Modern Microbial Genetics, John Wiley & Sons Ltd.
6	Sharoud, Bacterial physiology: A molecular approach, Springer.

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Microbiology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in			July-2017	
Subject code	MMIC4PRA	Subject Name			Practical Module IV				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	--	--	06	--	06	Theory	--	--	--
Hours	--	--	12	--	12	Practical	00	200	200
Sr No	Content								
1	Microbial production of poly β hydroxybutyrate.								
2	Microbial production of extra-cellular polysaccharide.								
3	To perform Conjugation in <i>E. coli</i> .								
4	Induction of competency in <i>E. coli</i> and Transformation.								
5	Isolation and titration of bacteriophage. Determination of burst size.								
6	Study of Agrobacterium mediated transformation.								
7	SDS Page.								
8	Isolation of bacteriocin producing bacteria.								
9	Study of skin Micro flora								
10	Total count of RBC.								
11	Total count of WBC.								
12	Differential count of WBC.								
13	WIDAL test.								
14	VDRL test.								
15	Latex agglutination.								
16	Isolation and identification of bacteria belonging to <i>Enterobacteriaceae</i> .								
17	Study of permanent slides of: Protozoa and Algae.								