D.P VIPRA P. G. COLLEGE,
BILASPUR (C.G)

(An Autonomous College under UGC Scheme)

NAAC ACCREDITED A ISO-9001:2015 APPROVED
PH. No. 07752-424497, web- www.dpvipracollege.in, email-
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COURSE CURRICULLUM & MARKING SCHEME
POST GRADUATE COURSE IN MICROBIOOGY

(AS PER LOCF AND CHOICE BASED CREDIT SYSTEM UNDER NEP 2020)

Semester System for Affiliated College

ESTD: 1969

w. e. f SESSION 2024 -25

DEPARTMENT OF MICROBIOLOGY

M. Sc I, II, III & IV SEMESTER

Program Code DPMS06

Semester	Course Code	Course Name	Credit			Total Credit	Marks			
							ESE	CIA	Total	
			L	T	P				MAX	MIN
First	MMBT101	General Microbiology and Bacteriology	3	1	-	4	70	30	100	40
	MMBT102	Virology	3	1	-	4	70	30	100	40
	MMBT103	Phycology, Mycology and Protozoology	3	1	-	4	70	30	100	40
	MMBT104	Biochemistry	3	1	-	4	70	30	100	40
	MMBP101	LAB I	-	-	2	2	35	15	50	20
	MMBP102	LAB II	-	-	2	2	35	15	50	20
		Total				**20**	**350**	**150**	**500**	**200**
Second	MMBT201	Bioinstrumentation and Biochemical Techniques	3	1	-	4	70	30	100	40
	MMBT202	Microbial Physiology	3	1	-	4	70	30	100	40
	MMBT203	Microbial Genetics and Molecular Biology	3	1	-	4	70	30	100	40
	MMBT204	Agriculture Microbiology	3	1	-	4	70	30	100	40
	MMBP201	LAB I	-	-	2	2	35	15	50	20
	MMBP202	LAB II	-	-	2	2	35	15	50	20
		Total				**20**	**350**	**150**	**500**	**200**
Third	MMBT301	Medical and veterinary microbiology	3	1	-	4	70	30	100	40
	MMBT302	Environmental microbiology	3	1	-	4	70	30	100	40
	MMBT303	Biostatistics and bioinformatics	3	1	-	4	70	30	100	40
	MMBT304(A)	Immunology (Elective)	3	1	-	4	70	30	100	40
	MMBT304(B)	Fermentation technology (Elective)	-	-	-	-	-	-	-	-
	MMBT304(C)	Food microbiology (Elective)	-	-	-	-	-	-	-	-
	MMBP301	LAB I	-	-	2	2	35	15	50	20
	MMBP302	LAB II	-	-	2	2	35	15	50	20
		Total				**20**	**350**	**150**	**500**	**200**
Fourth	MMBT401	Industrial Microbiology	3	1	-	4	70	30	100	40
	MMBT402	Enzymology	3	1	-	4	70	30	100	40
	MMBT403	Computer Fundamentals and Research Techniques	3	1	-	4	70	30	100	40
	MMBT404(A)	Microbial Ecology (Elective)	3	1	-	4	70	30	100	40
	MMBT404(B)	Intellectual Property Rights (Elective)	-	-	-	-	-	-	-	-
	MMBT404(C)	Plant Pathology and Disease Management (Elective)	-	-	-	-	-	-	-	-
	MMBP401	LAB I	-	-	2	2	35	15	50	20
	MMBP-1D	Project work	-	-	2	2	-	-	50	20
		Total				**20**	**350**	**150**	**500**	**200**
		Grand Total				**80**	**1400**	**600**	**2000**	**800**

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**		Semester	**III**
Exam Code and Name	**2063 - M. Sc. MICROBIOLOGY THIRD SEMESTER**		Paper	**I**
Course Code	**MMBT301**		Course Type	**T**
Course Title	**Medical and veterinary microbiology**			
Total Credit	**4/3/2/1**			
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20
Prerequisites (if any)	NO			
Course Outcomes	CO1: Understand the basics of medical and veterinary microbiology. CO2: Understand the principle behind disease and causative agent. CO3: Types of responses of host against diseases. CO4: To learn basics laboratory diagnostic techniques.			

Contents of Course		
Unit	**Contents**	**No. of Period**
I	**Introduction of Medical Microbiology:**History ,Contribution of eminent scientists, koch and River's postulates, role of microbiology in medicine medically important microbes; normal microbial flora of human body; role of resident flora. **Infection:** Definition, types, stages of infection, process of infection. Mechanism of bacterial adhesion, colonization and invasion of mucous membranes of respiratory enteric and urogenital tracts, role of aggressions, depolymerizing enzymes, organo-tropism , variation and virulence.	15
II	**Clinical bacteriology:** Pathogenic bacteria: morphological characteristics, pathogenesis and laboratory diagnosis including rapid methods of following pathogenic bacteria; Staphylococcus aureus, Group A streptococci, Pneumococci, Neisseria; members of the family Enterobacteriaceae, vibrio, corynebacterium, clostridia. Mycobacterium tuberculosis, atypical Mycobacterium. New emerging infections: streptococcus suis; community associated methicillin resistant staphylococcus aureus (MRSA), clostridium difficile, multi drug resistant tuberculosis.	15
III	**Clinical Mycology:** Superficial, subcutaneous, cutaneous and systemic mycoses. General description of mycotic pathogens, diagnosis and prevention. Pathogenic fungi morphological characteristics, pathogenesis and laboratory diagnosis including rapid method of following pathogenic fungi microsporum, trichophyton, histoplasma capsulatum, blastomyces dermatitidis. Candida albicans, Cryptococcus neoformans.	15
IV	**Veterinary Microbiology:** General concept of veterinary microbiology, impact of diseases on poultry industry, mechanism of disease transmission. Fowl cholera, gangrenous dermatitis, avian pox, avian influenza, swine fever, mycoplasmosis, anthrax, coccidiosis, foot and mouth disease, their prevention and control**.**	15
	Total no. of Lectures	60

Text books	• Clinics in laboratory medicine, Emerging Infections and their causative agents. September 2004 vol. 24 no. • Textbook of Microbiology 8th edition 2009-Ananthnarayan & Paniker-University Press. • Concerned Website and latest literature,
Reference books :	• Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication • Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE): 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30** Marks
End Semester Exam (ESE)	**Three Section - A, B & C** Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**		Semester	**III**
Exam Code and Name	**2063 - M. Sc. MICROBIOLOGY THIRD SEMESTER**		Paper	**II**
Course Code	**MMBT302**		Course Type	**T**
Course Title	**Environmental microbiology**			
Total Credit	**4/3/2/1**			
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20
Prerequisites (if any)	NO			
Course Outcomes	CO1: Understand the components of environment. CO2: Understand role of microbes in maintaining balance. CO3: Understand the beneficial effects of microbes in environment. CO4: To understand bio-waste management.			

Contents of Course		
Unit	**Contents**	**No. of Period**
I	**Aeromicrobiology:** Bioaerosol, Droplet Nuclei. Phylloplane and Phyllosphere microflora. Air borne microorganisms and their significance in human health and plant disease development. Techniques for analysis of air borne microorganisms- The settling plate technique, slit type sampler, liquid impinger, sieve sampler, Anderson's sampler, cascade sampler; Filtration methods. Control of air borne microbes.	15
II	**Soil Microbiology:** Classification of soil physical and chemical characteristics, Soil as a habitat for Microbial Growth. Microbial Interactions. Rhizosphere, Rhizoplane. Role of Microorganisms in mineral cycling and soil fertility. Biodegradation of organic compounds in soil.	15
III	**Aquatic Microbiology:** Microbiology of Fresh water (pond and lakes) and Marine water (estuaries, deep sea, hydrothermal vents) Ecosystem. Potability of water, Microbial assesstment of water quality. Methods of Purification of water. Waste water (sewage) treatment.	15
IV	**Biowaste Management and Treatment:** Treatment of dairy and Industrial effluent. Solid waste treatment and management. Use of waste for production of food (Mushroom), Biofertilizer (Compost) and biofuel (biogas and ethanol). Biodegradation of xenobiotics, Plastic, oil spills, and oil refinery waste. **Microbial activities:**Biodeterioration of paper, pulp textile and paints, Biomagnification, Bioaugmentation, Biomining and bioleaching, Biodiesel production from Jatropa, Biomonitoring.	15
	Total no. of Lectures	60

Text books	• Alexander, M John. Microbial ecology. Wiley & Sons, Inc., New York. • Alexander, M John. Introduction to soil microbiology. Wiley & Sons Inc., New York.
Reference books :	• Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. Qu edition. McGraw Hill Higher Education. • Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition. • Madigan MT. Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition.

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE): 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30** Marks
End Semester Exam (ESE)	**Three Section - A, B & C** Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**		Semester	**III**
Exam Code and Name	**2063 - M. Sc. MICROBIOLOGY THIRD SEMESTER**		Paper	**III**
Course Code	**MMBT303**		Course Type	**T**
Course Title	**Biostatistics and Bioinformatics**			
Total Credit	**4/3/2/1**			
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20
Prerequisites (if any)	NO			
Course Outcomes	CO1: Understand the significance of statistics in biology CO2: Will learn to apply statistical tests on biological data. CO3: Will learn to use bioinformatics as a tool for study of various molecules. CO4: Understand the hypothesis testing			

Contents of Course		
Unit	**Contents**	**No. of Period**
I	**Fundamentals of Biostatistics:** Nature and Scope of statistical methods and their limitations-Collection, Classification, Tabulation of Statistical data-uses of frequency table -Diagrammatic and Graphical Representation of Statistical data. Measure of Central Tendency-Mean, Median, Mode, and their Merits and Demerits.	15
II	**Measurement of Dispersion:** Range, Mean Deviation, Quartile Deviation, Standard Deviation, Co-Efficient of Variation Skewness Karl Pearson's and Bowley's Coefficient of Skewness. Test of Significance Chi square test, t-test and f-test. **Probability and Correlation:** Events and Sets Sample Space Concept of Probability Addition and Multiplication Theorem on Conditional Probability - Independence of Events.	15
III	**Correlation and Variance:** Analysis of Variance (ANOVA), Bivariate Frequency Table and its Uses - Correlation Analysis-Scatter diagram, Karl Pearson's Correlation Coefficient Spearman's Rank Correlation Regression Analysis Regression lines Fitting of Straight-line using Method of Least Squares.	15
IV	**Bioinformatics:** An overview, introduction and scope of bioinformatics, Information molecules, DNA sequencing, protein structure, functions, protein folding and characterization, Biological Database: Types of databases (Entrez, SRS or sequence retrieval system).	15
	Total no. of Lectures	60

Text books	• Bansi 1. 1968, Mathematics of probability of statistics, Chand & Co. Delhi. • Snedeor G. W. & Cochram W. G. 1968. Statistical Methods, Oxford &IBH, Delhi. White R.2000. Gralla P. 2000. How the internet work, Tech, Media.
Reference Book	• Bailey N. T. J. 2000. Statistical Methods in Biology, English Univ. Press. • Campbell R. C. 1974. Statistics for Biologist, Cambridge University Press UK. • Shina P. K. 2002. Fundamentals of Computers, BPB Publication, New Delhi.

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE): 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30** Marks
End Semester Exam (ESE)	**Three Section - A, B & C** Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**		Semester	**III**
Exam Code and Name	**2063 - M. Sc. MICROBIOLOGY THIRD SEMESTER**		Paper	**IV**
Course Code	**MMBT304(A)**		Course Type	**T(E)**
Course Title	**Immunology**			
Total Credit	**4/3/2/1**			
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20
Prerequisites (if any)	NO			
Course Outcomes	CO1: Understand concept of Ag and Ab. CO2: Understand the Principle behind disease and causative agent. CO3: Types of responses of Host against diseases. CO4: learn the basics of immune system.			

Contents of Course		
Unit	**Contents**	**No. of Period**
I	**Immune system**: History of immunology, cells and organs involved in Immune system; virulence and host resistance; immunity innate immunity and acquired immunity; immunohematology-blood groups, blood transfusion and Rh-incompatibilities.	15
II	**Antigens and Immunohematology**: Antigen's structure and properties, types iso and allo- antigen; haptens and adjuvants, processing and specificity. MHC class-I and class-II Molecules, Immune response Pathway for Intracellular antigen and EC antigen. **Antigens Structure and types**: Immunoglobulin structure, heterogenicity, types and sub-types, properties (physico-chemical and biological); Immunoglobulin gene arrangement, Theories of antibody formation; monoclonal antibodies and their applications.	15
III	**Antigen and antibodies reactions**: In-vitro techniques: agglutination, precipitation, complement fixation, immune-fluorescence, ELISA and radio- immune assay. In vivo technique: skin tests and immune complex demonstration. Applications of above methods in diagnosis of clinical diseases caused by microorganisms	15
IV	**Hypersensitivity and complement**: Immediate and delayed; antibody mediated Type-I (anaphylaxis), Type-II (Antibody dependent cell cytotoxicity), Type-III(immune-complex mediated reactions) and Type-IV,(cell mediated hypersensitivity reactions); respective diseases. immunological methods for their diagnosis, complement components pathways and complement deficiencies.	15
	Total no. of Lectures	60

Text books	• Immunology Janis Kuby • Cellular and Molecular Immunology Abul K.Abbas, Andrew H.Lichtman and JordanS • Immunology: An Introduction lan R. Tizar
Reference books:	• Fundamentals of Microbiology and Immunology: Ajit Kr. Banerjee, Nirmalya Banerjee -New Central Book Agency (P) Ltd., Kolkata. • Immunology: J. Kubey et al. 7th edition.

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE): 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30** Marks
End Semester Exam (ESE)	**Three Section - A, B & C** Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**		Semester	**III**
Exam Code and Name	**2063 - M.Sc. MICROBIOLOGY THIRD SEMESTER**		Paper	**IV**
Course Code	**MMBT304(C)**		Course Type	**T(E)/P**
Course Title	**Food Microbiology**			
Total Credit	**4/3/2/1**			
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20
Prerequisites (if any)	NO			
Course Outcomes	CO1: Will understand the reason of food spoilage. CO2: Will understand the principles of Food Preservation. CO3: Role of microbes in Food Spoilage and their control. CO4: To learn about food borne infections.			

Contents of Course		
Unit	**Contents**	**No. of Period**
I	**Foods as a substrate for microorganisms**: Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general. Microbial spoilage of various foods. Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned foods	15
II	**Principles and methods of food preservation:** Principles, physical methods of food preservation: temperature (low, high, canning, and drying), irradiation, Hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO2, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins in food preservation.	15
III	**Fermented foods:** Fermented food and its importance. Fermented food in India Traditional and modern. Dairy starter cultures fermented dairy products: yogurt, acidophilus milk, kumises, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tempeh and probiotics.	15
IV	**Food borne diseases and food sanitation:** Causative agents, foods involved, symptoms and preventive measures. Food intoxications: Staphylococcus aureus, Clostridium botulinum and mycotoxins. **Food borne infections:** Bacillus cereus, Vibrio parahaemolyticus, Escherichia coli, Salmonellosis, Shigellosis, Yersinia enterocolitica, Listeria monocytogenes and Campylobacter jejuni. Food sanitation and control. HACCP, Indices of food sanitary quality and sanitizers.	15
	Total no. of Lectures	60

Text books	1.**Recommended Text Books:** • Adams MR and Moss MO. (1995). Food Microbiology, 4th edition, New Age International (P) Limited Publishers, New Delhi, India. • Banwart JM. (1987) Basic Food Microbiology. I edition. CBS Publishers and Distributors, Delhi, India. • Davidson PM and Brannen A.L. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
Reference books :	• Basic Food Microbiology by Banwart, GJ (1989) CBS Publishers and Distributors, Delhi. • Food poisoning and Food Hygiene by Hobbs BC and Roberts D. Edward Amold (A division of Hodder and Stoughton) London.

Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30 Marks	End Semester Exam (ESE): 70 Marks
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 Assignment / Seminar: 10 Total Marks: 30	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30** Marks
End Semester Exam (ESE)	**Three Section - A, B & C** Section A: Q1. Objective- 10 x 1 = 10 Mark; Section B: Long Answer type questions 1 out of 2 from each unit- 4 x 5 = 20 Marks; Section C: Descriptive answer type questions 1 out of 2 from each unit- 4 x 10 = 40 Marks;	

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**		Semester	**III**
Exam Code and Name	**2063 - M.Sc. MICROBIOLOGY THIRDSEMESTER**		Paper	**I**
Course Code	**MMBP301**		Course Type	**P**
Course Title	**LAB I- MEDICAL & VETERINARY MICROBIOLOGY & ENVIROMENTAL MICROBIOLOGY**			
Total Credit	**4/3/2/1**			
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20
Prerequisites (if any)	**NO**			
Course Outcomes	CO1: Learn the basics of biological analysis of microflora CO2: Learn the practicals on isolation of pathogens and its management CO3: Learn about basics of Medical, Veterinary and environmental microbiology and its management.			

Contents of Course	
List of Experiments	**No. of Period**
1. Evaluation of alcohol as skin disinfectant. Filter paper disc method for evaluation of antiseptics. 2. Different Staining techniques- Acid Fast staining, Geimsa staining and Leishmann staining. Special staining methods to demonstrate granules, capsule, and spore. 3. Isolation of pathogen from Clinical samples-pus, blood, urine etc. 4. Antibiotic sensitivity test by disc diffusion method. Determination of minimum inhibitory concentration (MIC) of an antibiotic. 5. Determination of susceptibility to dental caries by Snyder test 6. Isolation and identification of following pathogenic bacteria and fungi: Bacteria: 7. Staphylococcus aureus, Escherichia coli, Proteus vulgaris, Proteus mirabilis, Salmonellatyphi, Salmonella paratyphi, Shigella dysenteriae and Shigella felexneri. Fungi: Candida albicans, Microsporum and Trichophyton 8. Isolation of Microflora from different habitats of air and water 9. Water potability Test (MPN and H2S) 10. Physical, Chemical and Microbial analysis of water: colour, pH, COD , BOD, total and dissolved solids. 11. Study of indoor and outdoor microflora of air sampling devices. 12. Study of microflora from industrial wastes and effluents.	60Periods / 40Hours
Total no. of Lectures	60

Textbooks	• Adams MR and Moss MO. (1995). Food Microbiology, 4th edition, New Age International (P) Limited Publishers, New Delhi, India. • Banwart JM. (1987) Basic Food Microbiology. I edition. CBS Publishers and Distributors, Delhi, India.
Reference books	• Basic Food Microbiology by Banwart, GJ (1989) CBS Publishers and Distributors, Delhi. • Food poisoning and Food Hygiene by Hobbs BC and Roberts D. Edward Arnold (A division of Hodder and Stoughton) London. • Dairy Microbiology by Robinson R.K. Elsevier Applied Sciences. London. Food Microbiology

Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30/15 Marks	End Semester Exam (ESE) : 70/35 Marks	
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 / 10 & 10 Assignment / Seminar + Attendance: 10 / 5 Total Marks: 30 / 15	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30 / 15** Marks	
End Semester Exam (ESE)	**Laboratory / Field Skill Performance:** On spot Assessment A: Performed the Task based on lab - 20 Marks /40 Marks B: Spotting based on tools & technology (written) - 10 Marks / 20 Marks Viva-voce (based on principle/technology) - 5 Marks / 10 Marks		Managed by Course teacher as per lab. status

Program Code and Name	**DPMS06, M.Sc. (MICROBIOLOGY)**			Semester	**III**
Exam Code and Name	**2063 - M.Sc. MICROBIOLOGY THIRD SEMESTER**			Paper	**I**
Course Code	**MMBP302**			Course Type	**P**
Course Title	**LAB II – Immunology, Food microbiology, fermentation Technology.**				
Total Credit	**4/3/2/1**				
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20	
Prerequisites (if any)	**NO**				
Course Outcomes	CO1: Understand on fundamentals of bioinformatics. CO2: Understand the concept of databases and sequence alignments. CO3: Understand about genome and proteome.				

Contents of Course	
List of Experiments	**No. of Period**
A	
1. Determination of Statistical Averages/Central Tendencies: a) Arithmetic mean b) Median c) Mode. 2. Determination of measures of dispersion. a) Mean deviation b) Standard Deviation c) Standard Error d) Coefficient of Variation. 3. Representation of Statistical data by-a) histogram b) ogive curves c) pie diagrams. 4. Testing of significance Application of a) Chi-Square test b) T-test c) ANOVA. 5. Search of nucleic acid sequence database (GenBank/DDBJ). 6. Conducting BLAST analysis for identification of nucleic acids and proteins. 7. Alignment Construction of phylogenetic tree. 8. Modelling of 3D stricture of proteins using primary sequence. 9. Designing ligands from plant resources. 10. Docking and virtual screening of compounds for microbial diseases.. 11. Conduct of Protein Protein interaction studies using Sting. 12. Analysis of systems mechanisms using KEGG. 13. Characterization studies of genes and protien using EMBOSS online servers.	60Periods/ 40Hours
B.	
Note: Any one choice of MMBP302 (A)/ MMBP302 (B)/ MMBP302 (C) as per chosen elective **MMBP302 (A): Immunology** 1. Determination of blood group and Rh typing. 2. Study of Ag-Ab reaction by immunodiffusion. 3. Detection of specific Antigen by using ELISA test. 4. Separation and characterization lymphocyte population. 5. WIDAL (Slide) test for Typhoid by antigen-antibody reaction. 6. Rheumatoid Arthritis (RA) by Ag-Ab Reaction. 7. RPR-Rapid Plasma Reagin test for Syphilis. **MICP302 (B): Food Microbiology** 1. Detection of number of bacteria in milk by SPC. 2. Determination of quality of raw milk by MBRT. 3. Phosphatase test of milk to check efficacy of pasteurization. 4. Production of fermented milk by Lactobacillus acidophillus. 5. Production and estimation of lactic acid by Lactobacillus sp. Or Streptococcus sp. 6. Role of yeast in bread making. 7. Isolation of food poisoning bacteria from contaminated food and dairy products. 8. Preservation of potato /onion by UV radiation. 9. Extraction and detection of afla toxin for infected foods. 10. Isolation of Microorganism from various spoiled food materials. 11. Preparation of various fermented food.	60Periods/ 40Hours
MICP302 (C): Fermentation Technology 1. Basic parts of fermenter. 2. Sterilization of lab fermenter. 3. Loss of CO2 during fermentation. 4. Fermentation of fruit juice. 5. Isolation of penicillin producing organism. 6. Thermal death point (TDP) and thermal death time of an organism (TDT) of an organism. 7. Demonstration of wine production using Grape juice **8.** Demonstration of acetic acid oxidation (vinegar production) in lab	

Text books	1. Gupta, S.P. QSAR and Molecular Modeling, Springer Anamaya Publishers, 2008. 2. Rastogi S.C., Mendiratta N. and Rastogi P. Bioinformatics: methods and applications, genomics, proteomics and drugdiscovery, Prentice Hall India Publication 3. Primrose and Twyman. Principles of Genome Analysis &Genomics. Blackwell 4. Biostatistics: A Foundation for Analysis in the Health Sciences (2009) 9th ed., Daniel W.W., John Wiley and Sons Inc.
Reference books	1. Saxena Sanjay (2003) A First Course in Computers, Vikas Publishing House 2. Pradeep and Sinha Preeti (2007) Foundations of Computing, 4th ed., BPB Publications 3. Lesk M.A. (2008) Introduction to Bioinformatics. Oxford Publication, 3rd International Student Edition 4. Statistics at the Bench: A Step-by-Step Handbook for Biologists (2010) Bremer, M. And Doerge, R.W., Cold Spring Harbor Laboratory Press (New York), ISBN: 978-0-879698-57 7.

Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks: 100 Marks	Continuous Internal Assessment (CIA): 30/15 Marks	End Semester Exam (ESE) : 70/35 Marks	
Continuous Internal Assessment (CIA)	Internal Test/Quiz- (2): 20 & 20 / 10 & 10 Assignment / Seminar + Attendance: 10 / 5 Total Marks: 30 / 15	Better marks out of the two Test / Quiz + obtained marks is Assignment shall be considered against **30 / 15** Marks	
End Semester Exam (ESE)	**Laboratory / Field Skill Performance:** On spot Assessment A: Performed the Task based on lab - 20 Marks /40 Marks B: Spotting based on tools & technology (written) - 10 Marks / 20 Marks Viva-voce (based on principle/technology)- 5 Marks / 10 Marks		Managed by Course teacher as per lab. status