

**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-  
dpvipracollege@gmail.com**

**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			
			L	T	P		ESE	CIA	Total	
									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
		<b>Total</b>				<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>
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
		<b>Total</b>				<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>
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
		<b>Total</b>				<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>
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
		<b>Total</b>				<b>20</b>	<b>350</b>	<b>150</b>	<b>500</b>	<b>200</b>
		<b>Grand Total</b>				<b>80</b>	<b>1400</b>	<b>600</b>	<b>2000</b>	<b>800</b>

Program Code and Name	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064 - M. Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>I</b>
Course Code	<b>MMBT401</b>			Course Type	<b>T</b>
Course Title	<b>Industrial Microbiology</b>				
Total Credit	<b>4/3/2/1</b>				
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 role of microbes in industries. CO2: Understand the products which are produced by microbes. CO3: Understand the microbial processes and modifications involved in industries. CO4: Understand applied industrial process.				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	<b>Development and scope of industrial microbiology:</b> Microbes, their growth curves and production of primary and secondary metabolites. Screening of economically important cultures Preliminary and secondary screening. Preservation of stock cultures.	15
II	<b>Industrial Healthcare productions:</b> Industrial production of Antibiotics Penicillium, streptomycin and their derivatives. Production and application of large-scale production of recombinant molecules interferon, human proteins insulin, vaccines, anticancer agents and siderophores.	15
III	<b>Microbiology and production of alcoholic beverages:</b> Malt beverages, distilled beverages, wine and champagne, Commercial production of organic acids likes acetic, lactic, citric and gluconic acids. <b>Fermentation equipments:</b> General design of a fermenter, their types and applications. Characteristics of fermentation media, Raw materials, Scale up of fermentation processes, product recovery methods.	15
IV	<b>Applied Industrial Microbiology:</b> Industrial production of Amino acid (L-lysine, L-Glutamic acid), Vitamin B & C, Steroid transformation, Role of microorganisms in petroleum and mining industries, bioleaching of metals.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Nduka Okafor. Modern Industrial Microbiology and Biotechnology. 1st Edition. Science Publishers. (2007).</li> <li>Waites, M.J., Morgan, N.L., Rockey, J.S. and Hington, G. Industrial Microbiology: An introduction. Blackwell science Publishers. (2002).</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Daniel Forciniti. Industrial Bioseparation: Principles and practice. Ist edition edition, Wiley-Blackwell (2008).</li> <li>Reed. G. Prescott and Dunn's Industrial Microbiology. CBS Publishers. (1999).</li> <li>Demain, A. L. Industrial Microbiology and Biotechnology, 2nd Edition. (2001).</li> <li>EL Mansi. E.M.T., Fermentation Microbiology and Biotechnology. 2nd Edition, CRC Taylor &amp; Francis (2007).</li> <li>Waites, M.J., Morgan, N.L., Rockey, J.S. and Highton, G. Industrial Microbiology An Introduction. Blackwell Science Publishers (2002).</li> </ul>

<b>Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
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 <b>30</b> Marks
End Semester Exam (ESE)	<b>Three Section - A, B &amp; C</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064 - M. Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>II</b>
Course Code	<b>MMBT402</b>			Course Type	<b>T</b>
Course Title	<b>Enzymology</b>				
Total Credit	<b>4/3/2/1</b>				
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 Enzymes at molecular level. CO2: Understand the mechanism of Enzyme action. CO3: Application of Enzymes in daily life. CO4: To understand biosubstrate reactions.				

Contents of Course		
Unit	Contents	No. of Period
I	<b>Basic concepts of enzymes:</b> Nomenclature, classification, methods for determination of enzyme activity. Isolation and purification of enzymes. Enzyme kinetics: Michaelis-Menten equation, effect of pH, substrate concentration, temperature and inhibitors. Iso-enzymes and allosteric enzymes. Enzyme inhibition competitive and non-competitive inhibition. Mechanism based inhibitors antibiotics as inhibitors.	15
II	<b>Mechanism of enzyme action:</b> Action of ribonuclease, chymotrypsin, and trypsin. Coenzyme catalysis. Mechanism of action of thiamine pyrophosphate enzyme. Control and regulation of enzyme activity and feedback mechanisms. Metabolic compartmentalization in relation to enzyme, enzymes and secondary metabolites. <b>Microbial growth kinetics:</b> Batch kinetics Monod's model (single substrate), deviations from Monod's model, dual substrates-sequential utilization, multiple Substrates simultaneous utilization, substrate inhibition, toxic inhibition.	15
III	<b>Bisubstrate reactions:</b> Types of bi reactions (sequential ordered and random, ping pong reactions). Differentiating bi substrate mechanisms (diagnostic plots, isotope exchange). Regulation of enzyme activity: Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition (aspartate transcarbamoylase), reversible covalent modification phosphorylation (glycogen phosphorylase). Proteolytic cleavage zymogen. Multienzyme complex as regulatory enzymes. Occurrence and isolation, phylogenetic distribution and properties (pyruvate dehydrogenase, fatty acyl synthase) Isoenzymes properties and physiological significance (lactate dehydrogenase).	15
IV	<b>Enzyme engineering &amp; applications of microbial enzymes:</b> Chemical modification and site-directed mutagenesis structure & function, relationship of industrially important enzymes. Microbial enzymes in textile, leather, wood and detergents industries. Enzyme sensors for clinical processes and environmental analysis. Enzymes as therapeutic agents.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Biochemistry by Lehninger.</li> <li>Principles of Biochemistry and molecular biology: Wilson &amp; Walker</li> <li>Biochemistry of Nucleic acids by Davidson.</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L., and Cox, M.M., W.H.Freeman and Company (New York), ISBN: 13: 978-1-4641-0962-1/ISBN: 10:1-4292-3414-8.</li> <li>Physical Biochemistry (2009) 2nd ed., Sheehan, D., Wiley-Blackwell (West Sussex), ISBN: 9780470856024/ISBN: 9780470856031.</li> <li>Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley &amp; Sons Asia Pvt. Ltd. (New Jersey), ISBN: 978-1180-25024.</li> </ul>

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)	<b>Three Section - A, B &amp; C</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064 - M. Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>III</b>
Course Code	<b>MMBT403</b>			Course Type	<b>T</b>
Course Title	<b>Computer Fundamental and Research Techniques</b>				
Total Credit	<b>4/3/2/1</b>				
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 basics of computer. CO2: Role of computers in Biology. CO3: Understand basic techniques used in Research. CO4: To learn tools and techniques of computer.				

Contents of Course		
Unit	Contents	No. of Period
I	<b>Basic Concepts of Computer and computer application in Biology:</b> History of Computer, Concept of Computer hardware, Concept Computer languages, Concept of Computer Software. Computer applications in Biology Spreadsheet tools: Introduction to spreadsheet applications, features, using formulas and functions; Data storing, Features for Statistical data analysis, Generating charts/graph and other features.	15
II	<b>Advanced Tools Microsoft Excel or similar:</b> Presentation tools: Introduction, features and functions, Power Point Presentation, Customizing presentation. Web Search: Introduction to Internet, Use of Internet, WWW; Use of search engines, biological data bases. <b>Biostatistics and Quantitative Techniques:</b> Measures of Central tendency and Dispersion. Probability distribution: Binomial, Poisson and Normal. Parametric and Nonparametric statistics, Confidence Interval, Errors. Quantitative Techniques: Levels of significance, Regression and Correlation, Use of Statistics in Biosciences, Use of Computers in Quantitative analysis.	15
III	<b>Scientific Writing:</b> An Insight into Research: Definition and basic concept, objectives, significance and techniques of research, finding research materials literature survey, compiling records. Definition and kinds of scientific documents - research paper, review paper, book reviews, theses, conference and project reports (for the scientific community and for funding agencies). Components of a research paper- the IMRAD system, title, authors and addresses, abstract, acknowledgements, references, tables and illustrations.	15
IV	<b>Research Techniques:</b> Enzyme assay, enzyme activity and specific activity determination. Cell disintegration and extraction V techniques, separation of proteins by fractionation (ammonium sulphate, organic solvents). Ion exchange chromatography, molecular sieve chromatography, affinity chromatography, paper chromatography, thin layer chromatography, ultra filtration, Ultracentrifugation. Gel electrophoresis, Isoelectric focusing and immune-electrophoresis, capillary electrophoresis, pulse field electrophoresis. Microscopy, HPLC, HPTLC, GC-MS, FTIR, SEM/TEM, NMR, AAS	15
	Total no. of Lectures	60

Text books	<ul style="list-style-type: none"> <li>Biostatistics: A foundation for Analysis in the Health Sciences 7/E Wayne W. Daniel, Wiley Series in Probability and Statistics.</li> <li>Methods of Protein and Nucleic acid Research, Osterman Vol I-III</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Research Methodology - Methods and Techniques (2004) 2nd ed., Kothari C.R., New Age International Publishers.</li> <li>Computer Fundamentals architecture and organization by B.Ram and Sanjay Kumar, New Age International Publisher.</li> </ul>

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)	<b>Three Section - A, B &amp; C</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064 - M. Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>IV</b>
Course Code	<b>MMBT404 (A)</b>			Course Type	<b>T(E)</b>
Course Title	<b>Microbial Ecology</b>				
Total Credit	<b>4/3/2/1</b>				
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20	
Prerequisites (if any)	NO				
Course Outcomes	CO1: To understand concepts in ecology. CO2: The different features of ecology. CO3: Role of microbes in ecology. CO4: To understand biogeochemical cycles.				

Contents of Course		
Unit	Contents	No. of Period
I	<b>History, significance and developments in the field of microbial ecology:</b> Contributions of Beijerinck, Winogradsky, Kluver, Van Niel, Martin Alexander, Selman A. Waksman. Atmosphere: Stratification of the Atmosphere, Environmental chemistry. Microbes in different strata of Atmosphere, Atmospheric pollutants, Types of wastes, Organization of life. Ecosystems and microorganisms.	15
II	<b>Microorganisms &amp; their natural habitats and biogeochemical cycles:</b> Terrestrial Environment: Soil characteristics, Soil profile, Soil formation, Soil as a natural habitat of microbes, Soil micro-flora. Aquatic Environment: Stratification & Micro-flora of Freshwater & Marine habitats. Aero-micro-flora, Dispersal of Microbes. Animal Environment: Microbes in/on human body (Micro-biomics) & animal (ruminants) body. Extreme Habitats: Extremophiles, Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels. Biogeochemical cycles.	15
III	<b>Biological Interactions and Forest Microbiology:</b> Microbe-Microbe Interactions; Mutualism, Synergism, Commensalism, Competition, Amensalism, Parasitism, Predation. Microbe Plant Interactions; Symbiotic and non- symbiotic (Roots, Aerial Plant surfaces). Microbe-Animal Interactions. Role of Microbes in Ruminants, Nematophagus fungi. Luminescent bacteria as symbiont <b>Forest Microbiology:</b> Forest Microbiology History, scope and significance. Microorganisms in various forest ecosystems. Isolation and enrichment methods. Factors affecting microbial population forest soil. Microbial decomposition of organic matter. Compositing, methane and methanogenesis.	15
IV	<b>Nitrogen fixation and bio-fertilizers Technology:</b> Nitrogen fixation; nitrification and denitrification, symbiotic, non-symbiotic or free-living N-fixation, associative types; Rhizobium tree legume symbiosis, Frankia non legume symbiosis. Microbial transformation of phosphorus, mycorrhizae; ecto and endomycorrhizae, Role of Mycorrhizae in mobilization of macro and micronutrients and in afforestation of waste land. Microbial transformation of iron and sulphur. Role of biofertilizers in afforestation, types of biofertilizers; bacterial biofertilizers, fungal biofertilizers and quality control.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.</li> <li>Hattori, T. 1973. Microbial life in the soil. Marcel Dekker Inc. New York.</li> <li>Lynch, J.M. 1983, Soil Biotechnology. Blackwell Scientific publications, London.</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Wiley JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology 9th edition. McGraw Hill Higher Education.</li> <li>Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.</li> </ul>

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)	<b>Three Section - A, B &amp; C</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064 - M. Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>IV</b>
Course Code	<b>MMBT404 (B)</b>			Course Type	<b>T(E)</b>
Course Title	<b>Intellectual Property Right</b>				
Total Credit	<b>4/3/2/1</b>				
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 intellectual property right. CO2: Understand types of intellectual property right. CO3: Understand the process of all types.				

Contents of Course		
Unit	Contents	No. of Period
I	<b>Concepts and scope:</b> Overview of Intellectual Property and property rights (IPR), TRIP (Trade related aspects of IPR), and General on tariffs and trade and Post GATT scenario.	15
II	<b>Patents:</b> Patentable inventions and discoveries, claims patent terms Product patents, process patents, Industrial patents, biological patents, Patent acts.	15
III	<b>Trademarks and Copyrights:</b> Geographical Indicators, Trade Secrets and Unfair Competition, Bio piracy Copyright and Related Rights, Protection of Intellectual property at the National Level.	15
IV	<b>Ethical and legal issues:</b> Filing and issuing of patents, Enforcement of Intellectual property Rights, Contemporary Intellectual Property Issues, and Legal provisions related to IPR. <b>Repository and regulatory bodies:</b> GMO patents, microbial repositories, gene banks, Indian scenario and regulatory bodies.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>IPR, Biosafety and biotechnology Management. Senthil Kumar Sand Mohammed Jaabir,-Jasen Publications.</li> <li>Intellectual Property Law, Lionel Bently &amp; Brad Sherman, OUP.</li> <li>IPR, Biosafety and Bioethics, Goel D &amp; Prashar S-Pearson</li> <li>Parekh U and Rao T.P. 1978-Personal efficiency in developing Entrepreneurship learning system New Delhi</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>B. S. Rathore &amp; J. S. Saini, B. R. Gurjan - Entrepreneurial opportunities in modernizing economy, Abhishek Publications (Chandigarh).</li> <li>Indian entrepreneurship theory practice D. D.Sharma, S. K. Dhameha Abhishek Publication New Delhi</li> </ul>

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)	<b>Three Section - A, B &amp; C</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064 - M. Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>IV</b>
Course Code	<b>MMBT404 (C)</b>			Course Type	<b>T(E)</b>
Course Title	<b>Plant Pathology and Disease Management</b>				
Total Credit	<b>4/3/2/1</b>				
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 plants and their pathogens. CO2: Understand host parasite relationship. CO3: Understand Mechanism of control of plant pathogens.				

Contents of Course		
Unit	Contents	No. of Period
I	<b>Introduction and History of plant pathology:</b> Concept of plant disease- definitions of disease, Classification of Plant diseases, Symptomatology, disease cycle and concern terminology, disease description and diagnosis, Modern concept of Plant pathology. Importance of plant diseases, Contributions of eminent Indian plant pathologists.	15
II	<b>Defence mechanism:</b> Host defences Structural and Chemical. Systemic acquired resistance. Host resistance, Gene-for-gene concept, Host resistance, Principle of plant disease control. <b>Pathogenesis:</b> Pathogens. Life strategies of plant pathogens Infection processes. Incubation and disease development. Role of Enzymes and Toxins in plant disease development. Host-Parasite interaction/relationship, Disease dynamics.	15
III	<b>Important plant diseases:</b> Fungal diseases Downy mildew of Pea, Powdery mildew of Apple, Bunt of Rice, Rust of Beans, Early Blight of Potato. Bacterial diseases -Brown Rot of Potato, Tundu disease of Wheat, Fire blight of Apples, Black arm of cotton, Leaf Blight of Paddy. Viral diseases -Bean Mosaic, Vein clearing of Bhindi, Tomato Spotted Wilt, Bunchy Top of Banana. Mycoplasmal disease-Grassy shoot of Sugarcane, Little leaf of Brinjal, Sesamum Phyllody, Bunchy Top of Papaya, Sandal Spike.	15
IV	<b>Diseases management &amp; control:</b> Disease assessment, Disease epidemiology: temporal and spatial processes Biological control of diseases, Virus diseases and virus vectors, Life of a Virus, Transgenic viral resistance. Chemical Control of plant disease, Certification and Regulation Cultural management, Protection, Eradication, review and evaluation.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Plant Pathology: Agrios G. N. (2006). 5th edition; Academic press, San Diego,</li> <li>Plant Pathology and Plant Pathogens; Lucas JA. (1998); 3rd edition. Blackwell Science, Oxford.</li> <li>Plant Pathology; Mehrotra R. S. (1994); Tata McGraw-Hill Limited.</li> <li>Diseases of Crop Plants in India; Rangaswami G. (2005); 4th edition. Prentice Hall of India Pvt. Ltd., New Delhi.</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Plant Diseases Management; Singh RS. (1998); 7th edition; Oxford &amp; IBH, New Delhi</li> <li>Laboratory Manual Of Microbiology And Biotechnology, Medtech; 1st edition, 2017</li> </ul>

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)	<b>Three Section - A, B &amp; C</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064-M.Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>I</b>
Course Code	<b>MMBP 401</b>			Course Type	<b>P</b>
Course Title	<b>LAB I- Industrial Microbiology, Enzymology, Computer Fundamental &amp; Research Technique. , Microbial Ecology</b>				
Total Credit	<b>4/3/2/1</b>				
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20	
Prerequisites (if any)	<b>NO</b>				
Course Outcomes	CO1: Understand on fundamentals of enzymes, enzyme action and metabolic reaction. CO2: Understand the concept of secondary metabolites and Fermentation process. CO3: Understand the types of Bio-reactors and its application CO4: Analyze research related information. CO5: Use different tools useful for research work.				

<b>Contents of Course</b>	
<b>List of Experiments</b>	<b>No. of Period</b>
1. To isolate industrially important enzyme producer from soil 2. Qualitative and quantitative assay of the selected enzyme. 3. Optimization of the enzyme production 4. Scaling of the enzyme production in lab fermenter 5. Analysis of substrate utilization and product formation. 6. Ammonium sulphate precipitation for enzyme concentration. 7. Column chromatography for purification. 8. SDS PAGE for enzyme purification. 9. Qualitative detection of dehydrogenase, silylase, urease, cellulase, caseinase, catalase . 10. Determination of kinetic constant of amylase activity, Vmax, Km. 11. Effect of pH and temperature on amylase activity. 12. Production of protease by microorganism 13. Demonstration of ethanol production by yeast 14. Immobilization of cells and enzyme using sodium alginate and egg albumen and measurement of enzyme activity. 15. Creating files, folders and directories 16. Applications of computer biology and working with MS Word, Excel and PowerPoint. 17. Writing a review paper.	60Periods/ 40Hours

<b>Assessment and Evaluation</b>			
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 <b>30 / 15</b> Marks	
End Semester Exam (ESE)	<b>Laboratory / Field Skill Performance:</b> 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	<b>DPMS06, M.Sc. (MICROBIOLOGY)</b>			Semester	<b>IV</b>
Exam Code and Name	<b>2064-M.Sc. MICROBIOLOGY FOURTH SEMESTER</b>			Paper	<b>I</b>
Course Code	<b>MMBP-1D</b>			Course Type	<b>P</b>
Course Title	<b>Dissertation</b>				
Total Credit	<b>4/3/2/1</b>				
Total Marks	CIA: 30/15	ESE: 70/35	Max Marks: 100/50	Min. Pass. Marks: 40/20	
Prerequisites (if any)	<b>NO</b>				
Course Outcomes	CO1: Understand on research project: CO2: Understand on research writing. CO3: Understand on the activities research.				

<b>Contents of Course</b>	
<b>List of Experiments</b>	<b>No. of hours</b>
This paper would focus on the project work/dissertation to be carried out by the students in the supervision of the teachers in the colleges. The topic of the project would be selected by each student in consultation with the teacher (Supervisor/Advisor). This would train the student to retrieve the literature and collate the information sufficient to make a presentation; the collated literature would also prepare the base for initiating the research. The student would carry out experiments to achieve the planned objectives, collation and analysis of data, presentation of the result in the form of a Dissertation. The grading would be based on continuous evaluation that would include punctuality, hard work, record keeping, intellectual inputs, data presentation, interpretation etc.	60Periods/ 40Hours
Total no. of Lectures	
60	

<b>Assessment and Evaluation</b>		
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 <b>30 / 15</b> Marks
End Semester Exam (ESE)	<b>Laboratory / Field Skill Performance:</b> 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

Evaluation of project: **Evaluation of the project work of semester system of all the candidates of college will be held at EXAMINATION CENTER**