

**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>I</b>
Exam Code and Name	<b>2061 - M. Sc. MICROBIOLOGY FIRST SEMESTER</b>			Paper	<b>I</b>
Course Code	<b>MMBT101</b>			Course Type	<b>T</b>
Course Title	<b>General Microbiology and Bacteriology</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 Selection of Microbes for particular use. CO2: Isolate and culture desired microbes. CO3: Understand the application of general microbiology in day-to-day life. CO4: Understand the nutritional requirements and growth of bacteria.				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	<b>Introduction, History and Scope of Microbiology:</b> Microorganism, their general characteristics and composition of microbial world, and microbial evolution including the origin of life. Scope of Microbiology, Contributions of eminent scientists (Antony Von Leeuwenhoek, Edward Jenner, Louis Pasteur, A. Fleming, Robert Koch).	15
II	<b>Bacterial Taxonomy:</b> Haeckel's, Whittaker's and Carl Woese's concepts of Bacterial classification. Modern trends in the classification of microbial world. Introduction to the Bergey's Manual of Determinative and Systematic classification of Bacteria.	15
III	<b>General characters of major groups of Eubacteria &amp; Archaeobacteria:</b> Morphology of Eubacteria and Archaeobacteria, ultra structure, L-form structure. <b>Bacterial Morphology:</b> Morphology of Eubacteria and Archaeobacteria, ultra structure, L-form structure, cell wall and cell membrane. Structure and function of capsule, flagella, fimbriae, mesosome and cytoplasmic inclusions (polyhydroxy butyrate, polyphosphate granules, oil droplets, cyanophycin granules). Endospore - structure, development and germination.	15
IV	<b>Bacterial Nutrition and Cultivation:</b> Nutritional and physical requirements, growth media complex, synthetic, differential and selective media and relevant bacterial characteristics. Cultivation of bacteria - aerobic & anaerobic; batch, continuous and synchronous culture. Bacterial growth - growth kinetics, growth curve, measurement of growth and environmental factors affecting growth	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>• Brock, T. D.; Madigan M. T. Biology of Microorganisms. Prentice Hall Int. Inc. (Latest Edn.).</li> <li>• Aneja, K.R. Experiments in Microbiology, Plant pathology and Biotechnology, Fourth edition, NewAge International publishers.</li> <li>• Dubey, R.C. and Maheshwary, D.K. Text book of Microbiology. S. Chand and company (1999).</li> </ul>
Reference Books	<ul style="list-style-type: none"> <li>• Prescott, M.J., Harley. and Klein, D.A. Microbiology. 5<sup>th</sup> Edition WCB Mc Graw Hill, New York, (2002).</li> <li>• Alcom, I.E. Fundamentals of Microbiology. VI Edition,</li> </ul>

<b>Assessment and Evaluation</b>		
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 <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>I</b>
Exam Code and Name	<b>2061 - M. Sc. MICROBIOLOGY FIRST SEMESTER</b>			Paper	<b>II</b>
Course Code	<b>MMBT102</b>			Course Type	<b>T</b>
Course Title	<b>Virology</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 features of Viruses. CO2: Advantages and Disadvantages of viruses. CO3: Develop understanding about viral diseases and their control. CO4: Understand virus- host infections.				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	<b>History of Virology, Contribution Eminent:</b> Scientists in discovery of important Plant, Animal and Bacterial Viruses six example (TMC, Cauliflower Mosaic Virus, Pox Virus, Corona Virus, $\lambda$ virus, T <sub>4</sub> Virus), Viral related agents Viroids, Virions and Prions.	15
II	<b>Structure and Morphology of Viruses:</b> General properties of viruses, morphology and ultra-structure of viruses, capsid and their arrangements, types of envelopes and their composition. Viral genome, their types and structure, viral related agents-viroids, virions and prions. Bacterial Viruses: Classification, morphology and ultra-structure. One step growth curve (latent period, eclipse period and burst of size). Lytic and lysogenic life cycle, Cyanophages, general account of M13, T3, T4 and Lambda P1.	15
III	<b>Plant Viruses:</b> Plant viruses- recent advances in classification of plant viruses; Structure, pathogenicity and its transmission with/without vectors. Biochemical changes induced by virus in plant cell. Common viral diseases of Tobacco, Paddy. Tomato, Bhindi & Sugarcane.	15
IV	<b>Animal Viruses:</b> Nomenclature and classification. Retroviruses and Oncogenic viruses (oncogenes and oncoprotein. DNA virus oncogenesis, multistep oncogenesis. Important human diseases: Small pox, AIDS, influenza, acute hepatitis, Pneumonia, Chickenpox, Pharyngoconjunctival fever.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Medical Virology- by Morag C and Timbury M. C; X Edt. Churchill Livingstone, London.</li> <li>Introduction to Modern Virology-by Dimmock and Primrose (1994), IV Edt. Blackwell Scientific Publications, Oxford.</li> <li>Functional of Plant Virology- by Mathews, R. E. (1992), Academic press, San Diego.</li> </ul>
Reference Books:	<ul style="list-style-type: none"> <li>A Text Book of Microbiology:R.P. Singh</li> <li>Stainier R.V., Ingraham, J.L., Wheelis, M.L. and Painter P.R. The Microbial World. Printice-Hall of India (Pvt.) Ltd., New Delhi.</li> </ul>

<b>Assessment and Evaluation</b>		
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 <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>I</b>
Exam Code and Name	<b>2061 - M. Sc. MICROBIOLOGY FIRST SEMESTER</b>			Paper	<b>III</b>
Course Code	<b>MMBT103</b>			Course Type	<b>T</b>
Course Title	<b>Phycology, Mycology and Protozoology</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 about fungi and their application. CO2: Understand about algae and their application. CO3: Understand about Protozoa and their application. CO4: Understand disease and control measures.				

<b>Contents of Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>No. of Period</b>
I	<b>Fundamentals of Phycology:</b> General concept of Phycology, thallus organization of micro-algae. General account of Cyanobacteria; Dinoflagellateae, Euglenoids and Diatoms. Algal blooms. Economic importance of algae, as a food, bio-fertilizer. Role of Cyanobacteria in soil fertility.	15
II	<b>General concept of Mycology:</b> Basic classification and cellular organization of fungi. General features, structure, nutrition, reproduction. Heterothallism and Para- sexuality. Sex hormones in fungi, physiological specialization, phylogeny of fungi. General account and importance of lichen. All features, taxonomic status and evolutionary significance economic importance of important genera Mucor, Saccharomyces, Neurospora, Agaricus, Fusarium, Alternaria, Curvularia and Cladosporium	15
III	<b>Common Fungal Diseases:</b> Important plant diseases caused by fungi- symptom, disease cycles and control (Late & Early blight, Black rust, Smut, Wilt and Red rot). Superficial and Deep Mycoses.	15
IV	<b>Basic concepts of Protozoans:</b> Basic classification of protozoa. Occurrence, habitat, morphology and reproduction of Protozoa. Structure and reproduction of important Protozoans - Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma and Plasmodium. <b>Common Protozoa Diseases:</b> Important human diseases caused by Protozoans-their serology, disease symptoms, cycles, prevention measures and their control (Amoebiasis, Malaria, Kala-azar, Sleeping sickness, Giardiasis and Filariasis).	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Nester E.W, Anderson D. G. and Nester M.T. Microbiology: A human perspective, McGraw-Hill (Latest Ed.)</li> <li>Atlas R. M. Principles of microbiology II Ed., McGraw Hill (Latest Ed.).</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Talaro K. P. &amp;Talaro A. Foundations of microbiology (6<sup>th</sup> Ed.), McGraw-Hill college Dimensi (Latest Ed.).</li> <li>Wiley J., Sherwood L. and Woolverton C. Prescott/Harley/Klein's Microbiology, McGraw Hill (Latest Ed.</li> </ul>

<b>Assessment and Evaluation</b>		
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>I</b>
Exam Code and Name	<b>2061 - M. Sc. MICROBIOLOGY FIRST SEMESTER</b>			Paper	<b>IV</b>
Course Code	<b>MMBT104</b>			Course Type	<b>T</b>
Course Title	<b>Biochemistry</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 about basic types of molecules in the cell. CO2: Understand the interplay of molecule to support the reaction for sustaining life. CO3: Understand role of each Biomolecule. CO4: Understand the enzymes and its regulations.				

Contents of Course		
Unit	Contents	No. of Period
I	<b>Fundamentals of Biochemistry:</b> General concept of biomolecules, chemical bonds, water molecules, stabilizing interactions (Vander Waals, electrostatic, hydrogen bonding, hydrophobic interaction), essential microelements. Biochemistry of carbohydrates: Structure of different types of carbohydrates, anabolism of monosaccharide, catabolism of mono, oligosaccharides and polysaccharides.	15
II	<b>Biochemistry of Proteins &amp; Lipids, Vitamins:</b> Structure of different types of protein, Ramchandran plots, catabolism of protein. Structure and types of lipids; Metabolism synthesis of fat, catabolism of fat ( $\alpha$ , $\beta$ and $\omega$ oxidation). Vitamins-structure and function- types and their application.	15
III	<b>Enzymes as biocatalysts:</b> Enzyme classification, specificity, active site, isoenzymes. Enzymes kinetics, Michalis-Menton Equation for simple enzymes. (Determination of kinetic parameter, multistep reactions and rate limiting steps, enzyme inhibition, allosterism, kinetic analysis of Allosteric enzymes, principles of Allosteric regulation.	15
IV	<b>Biochemistry of Nucleic acids:</b> Nucleic acids- Types of Nucleic acids, DNA – Watson and crick model, Forms of DNA- A, B, Z, RNA – Types (mRNA, rRNA, tRNA), Structure and Functions. <b>Bioenergetics and strategy of metabolism:</b> Basic concept of Law of Thermodynamics. Basic concepts of acid, base pH and buffers, oxidation-reduction coupled reaction and group transfer, ATP production, structural features of bio membranes, transport, free energy.	15
Total no. of Lectures		60

Text books	<ul style="list-style-type: none"> <li>Biochemistry, Stryer 6<sup>th</sup> edition W. H. Freeman 20012. Principles of Biochemistry Lehninger 3 Edition by Nelson and Cox (Worth) 2000.</li> <li>Voet, D. &amp; Voet, J. G. 2005. Biochemistry, John Wiley and sons. Inc. 3. Berg J. M., Tymoczko J. L. &amp; Stryer, L. 2007. Biochemistry, 6 Ed. W. H. Freeman and Company, N.Y.</li> </ul>
Reference books	<ul style="list-style-type: none"> <li>Potter G. W. H &amp; Potter, Geoffrey W. 1995. Analysis of Biological Molecules</li> <li>Wiley J., Sherwood L. And Woowerton C.2007.Prescott / Harley / Klein's Microbiology. McGraw Hill.</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 <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>I</b>
Exam Code and Name	<b>2061 - M. Sc. MICROBIOLOGY FIRST SEMESTER</b>			Paper	<b>I</b>
Course Code	<b>MMBP101</b>			Course Type	<b>P</b>
Course Title	<b>LAB I-General Microbiology, Bacteriology and Virology</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: Isolate desired microorganism. CO2: Cultivate desired microorganism. CO3: Able to identify unknown microbes. CO4: Able to preserve the important culture.				

<b>Contents of Course</b>	
<b>List of Experiments</b>	<b>No. of Period</b>
<ol style="list-style-type: none"> <li>1. Lab safety rules and handling basic instruments of Microbiology laboratory (Hot Air Oven, Autoclave, Laminar Air Flow, Water Bath, Colony Counter)</li> <li>2. Preparation of Glassware: Various techniques of cleaning (Decontamination, Discarding and washing) and sterilization of Glassware for various microbial techniques.</li> <li>3. Preparation of basic media like PDA and nutrient Agar.</li> <li>4. Isolation techniques: Streaking types, Pour Plate Technique, Dilution Plate Technique, Spread Plate Technique, Point Inoculation, Slant Preparation, Stab Culture. Well making with Cork Borer.</li> <li>5. Isolation, identification and Characterization of Bacteria: Cultural characteristics of bacteria (autotrophic and heterotrophic) using Selective and Differential Media, growth on Nutrient Agar, Blood Agar, Chocolate Agar, DCA, MacConkey's Agar, EMB and Sabouraud Agar. Study of nutritional needs of bacterial growth (growth in the presence of different Carbon Source, N source)</li> <li>6. Parts of Compound Microscope and its handling.</li> <li>7. Staining: Preparation of Bacterial Suspension, Preparation of Smear, Fixation. Simple Staining, Gram Staining, Negative Staining, Acid Fast Staining, Endospore and Capsule Staining. Hanging Drop Technique.</li> <li>8. Biochemical Tests for the Identification of Bacteria: Amylase test, Catalase, Cellulase, Oxidase, Gelatinase test, Urease, IMViC, Mannitol Motility Test, TSI test, Coagulase test, Nitrate Reduction test. Production of acid and gas from glucose, arabinose, inositol, lactose, maltose, mannitol, rhamnose, sucrose, xylose, fructose, Starch hydrolysis, Casein hydrolysis, Assessment of effect of metals on Microbial Growth.</li> <li>9. Determination of Growth of Bacteria: Growth Curve and Generation time.</li> <li>10. Pathological examination: Plant diseases caused by Viruses as mentioned in the course (a case study of any one disease.).\</li> </ol>	15
Total no. of Lectures	
60	

<b>Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
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 Marks</b>
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>I</b>
Exam Code and Name	<b>2061-M. Sc. MICROBIOLOGY FIRST SEMESTER</b>			Paper	<b>II</b>
Course Code	<b>MMBP102</b>			Course Type	<b>P</b>
Course Title	<b>LAB II-Phycology, Mycology, Protozoology and Biochemistry</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 different tests available for Biochemical identification. CO2: Identify the nature of Biochemical molecules. CO3: Isolate culture and identify algae, fungi and Protozoa.				

<b>Contents of Course</b>		
<b>List of Experiments</b>		<b>No. of Period</b>
1. Isolation and Identification of algae from soil and water: Isolation and Identification of Cyanobacteria, extraction and separation of algal pigments.		60Periods/ 40Hours
2. Isolation and Identification of fungi from different substrate (Saprophytic, Parasitic, Coprophilous, Keratinophilic)		
3. Study of environmental requirements of fungi (pH, temperature) by linear growth and biomass.		
4. Assessment of the effect antifungal agents (antibiotics/chemicals/plant extracts) on isolated fungal samples		
5. Extraction and Separation of amino acid and mycotoxin (aflatoxin) by paper chromatography.		
6. Identification and characterization of protozoans as mentioned in course (a case study of anyone disease).		
7. Pathological examination: Human disease caused by protozoans as mentioned in course (a case study of anyone disease).		
8. Safety and First aid measures in biochemistry lab. Standardization of Glassware.		
9. Qualitative and Quantitative (Anthrone test, Folinwu, Nelson Somogyi, Liebermann buccard, Folin Lowry etc) estimation of Carbohydrate, Protein, Amino Acids and Lipids. Colorimetric or spectrophotometric estimations of pigments, DNA and RNA.		
10. Study of Enzyme activity and enzyme kinetics: Isolation of amylase producing microorganisms from the environment, effect of pH, temperature, incubation time, substrate concentration. Estimation of amylase activity and determining its Km and Vmax and also effect of environmental conditions on the activity of amylase.		
12. Estimation of enzyme activity: Phosphatase and Catalase.		
13. Separation of isolated Phospholipids by thin layer chromatography and haemoglobin by gel filtration.		
Total no. of Lectures		

<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