



**R.P. Gogate College of Arts & Science  
and R.V. Jogalekar College of  
Commerce (Autonomous), Ratnagiri.**

**Bachelor of Science (B.Sc.) Programme  
In Microbiology**

***S.Y.B.Sc. [Sem-III & IV]***

***Course Structure***

**Under Choice Based Credit System  
(CBCS)**

**To be implemented from Academic  
Year- 2024-2025**

<b>Name of Programme</b>	<b>B.Sc. [Microbiology]</b>
<b>Level</b>	UG
<b>No of Semesters</b>	06
<b>Year of Implementation</b>	<b>2024-25</b>
<b>Programme Specific Outcomes (PSO)</b>	<ol style="list-style-type: none"> <li>1] Learner shall know the various branches of Microbiology.</li> <li>2] Learner shall know the role of microorganism in day-to-day life.</li> <li>3] Learner shall able to Understand and identify the various Microorganisms.</li> <li>4] Learner shall able to isolate and propagate various microorganisms.</li> <li>5] Learner shall able to control microbial growth.</li> <li>6] Learner shall know the fermentation of various fermented food products and industrial products by using microorganisms.</li> <li>7] Learner should know the importance of microorganisms in infectious diseases.</li> </ol>
<b>Relevance of PSOs to the local, regional, national, and global developmental needs</b>	<p>Microorganism's role in nature is indispensable. They involved in biodegradation, Fermentation, Antibiotic production, etc. Likewise some are involved in disease generation too. Therefore the understanding of microorganisms becomes essential to propagate or to control its number. As microorganism is responsible for food spoilage, food borne diseases so the maintenance of quality standard high is important from local level to global level. With respect to this learner should know the branches of microbiology. As microorganisms are ubiquitous so learner should know the role of microorganism in day to day life. There are millions of different microbes present on earth so identification of those microbes is globally important. In addition to that such identification skills have great importance in an infectious diseases control. Industrial fermentation processes requires pure culture of microbes so the knowledge of isolation of pure culture and its propagation is essential. Contamination by unwanted microbes is a worldwide problem. Learners must know the methods of microbial growth control. The various decontamination methods are not only locally important but also it is globally essential. In sterilized/controlled conditions only a good quality fermented food product can be prepared by specific microorganisms. Therefore learners should know skill and knowledge of such fermentation processes.</p> <p>Summarizing, graduates of B.Sc. Microbiology program will be informed citizens who can understand and apply basic microbiological technique at local to global level. It will be able to pursue wide range of careers including biological and life science research in higher educational institutions as well as careers in public health, clinical research, food, pharmaceutical and biotechnological industries.</p>

**B.Sc. Programme**  
Under Choice Based Credit System (CBCS)  
S.Y. B. Sc. Course Structure (Autonomous)

Major: Microbiology Minor: Chemistry

Course Code	Semester III	Credits	Course Code	Semester IV	Credits
<i>Discipline Specific Courses (DSC)</i>			<i>Discipline Specific Courses (DSC)</i>		
<i>Major</i>			<i>Major</i>		
24_USMB301	Biomolecules and Microbial taxonomy (T)	02	24_USMB401	Metabolism & Basic Analytical Techniques (T)	02
24_USMB302	Environmental Microbiology (T)	02	24_USMB402	Applied Microbiology (T)	02
24_USMB303	Introduction to Clinical Microbiology (T)	02	24_USMB403	Fermented Foods, Food Sanitation and Microbial Ecology (T)	02
24_USMB304	Microbiology Practical (P)	02	24_USMB404	Microbiology Practical (P)	02
<i>Minor</i>			<i>Minor</i>		
24_USCH305	Physical, Inorganic, Organic Chemistry I (T)	02	24_USCH405	Physical, Inorganic, Organic Chemistry II (T)	02
24_USCH306	Chemistry Minor Practical III (P)	02	24_USCH406	Chemistry Minor Practical IV (P)	02
<i>Generic / Open Elective Course (OE)</i>			<i>Generic / Open Elective Course (OE)</i>		
	Any one course from Open Elective Basket	02		Any one course from Open Elective Basket	02
	Any one course from Open Elective Basket	02			
<i>Skill Enhancement Course (SEC)</i>			<i>Skill Enhancement Course (SEC)</i>		
	Any one course from Skill Enhancement Course Basket	02		Any one course from Skill Enhancement Course Basket	02
<i>Ability Enhancement Course (AEC) Any 1</i>			<i>Ability Enhancement Course (AEC) Any 1</i>		
24_UAAEC MAR301	Marathi: Communication Skill-I (T)	02	24_UAAECM AR401	Marathi: Communication Skill-II (T)	02
24_UAAEC HIN302	Hindi: Communication Skill-I (T)		24_UAAECHI N402	Hindi: Communication Skill-II (T)	
24_UAAEC SAN303	Sanskrit: Communication Skill-I (T)		24_UAAEC SAN403	Sanskrit: Communication Skill-II (T)	
<i>Co-Curricular Course (CC)</i>			<i>Co-Curricular Course (CC)</i>		
	Any one course from the list given below of CC (P)	02		Any one course from the list given below of CC (P)	02
			<b>CEP</b>		
			24_USMBC EP408	Community Engagement and Service (CEP) (P)	02
<b>Total Credits</b>		<b>22</b>	<b>Total Credits</b>		<b>22</b>

**Table 1. Open Electives (Offered by Science & Commerce faculty)**

<i>Semester III</i>		<i>Semester IV</i>	
24_USOEMT305	Commercial Mathematics (2 credit) (T)	24_USOEMT405	Financial Mathematics (2 credit) (T)
24_USBCHOE301	Nutrition and diet management (2 credit) (T)	24_USOEMT406	Research Analyst in Stock Market (2 credit) (T)
24_USOEPH307	Physics in everyday Life I (4 credit) (T)	24_USOEPH405	Physics in everyday Life II (2 credit) (T)
24_USZOOE308	Global Environmental Issues (2 credit) (T)	24_USZOOE408	Neurobiology and behaviour (2 credit) (T)
24_USOEC305	Multimedia and Digital Marketing (2 credit) (T)	24_USOEC302	Cyber Safety (2 credit) (T)
24_USOEC306	Office Automation (2 credit) (T)	24_USOEPH406	General Physics (2 credit) (T)
24_USOEBT308	Entrepreneurship Development (2 credit) (T)	24_UCOEBE401	Business Economics (2 credit) (T)
24_USOEBT309	Research Methodology (2 credit) (T)		

**Table 2. Skill Enhancement Courses for Science, IT, BT, CS Faculty**

<i>Skill Enhancement Courses</i>		<i>Skill Enhancement Courses</i>	
24_USCH307	Skills in Classical Methods of Analysis II (P)	24_USCH407	Industrial Organic Chemistry (P)
24_USZOSEC307	Haematological techniques (P)	24_USZOSEC407	Beekeeping (P)
24_USBOTSEC2	Propagation of Horticultural Plants -II (P)	24_USBOTSEC3	Propagation of Horticultural Plants -III (P)
24_USPHS307	Digital Computer Electronics and Microprocessor 8085- I (P)	24_USPHS407	Digital Computer Electronics and Microprocessor 8085 -II (P)
25_USMTS307	Set theory & logic (P)	25_USMTS407	Computational Geometry (P)
24_USMBS307	Microbiology Skills I (P)	24_USMBS407	Microbiology Skills II (P)
24_USBCHS307	Clinical Biochemistry (P)	24_USBCHS407	Soil and water analysis (P)
24_USCSS307	Web Designing (P)	24_USCSS407	Net Technologies (P)
24_USITS307	Computer Skills-3 practical (P)	24_USITS407	Computer Skills-4 practical (P)
24_USBTS307	Molecular Diagnostics (P)		

**Table 3: Co-curricular Course**

<b>Course Code</b>	<b>Semester III</b>	<b>Course Code</b>	<b>Semester IV</b>
25_GJCC301	National Service Scheme (NSS)	25_GJCC401	National Service Scheme (NSS)
24_GJCC302	National Cadet Corps (NCC)	24_GJCC402	National Cadet Corps (NCC)
24_GJCC303	Sports & Yoga	24_GJCC403	Sports & Yoga
24_GJCC304	Cultural	24_GJCC404	Cultural
24_GJCC305	Career Katta	24_GJCC405	Career Katta
24_GJCC306	Life Long Learning	24_GJCC406	Life Long Learning
25_GJCC307	Research Club	25_GJCC407	Research Club
24_GJCC308	Science Association	24_GJCC408	Science Association
24_GJCC309	Film Club	24_GJCC409	Film Club
24_GJCC310	Infosys Courses	24_GJCC410	Infosys Courses

**Syllabus for S. Y. B. Sc. Microbiology [Since 2024-25] as per NEP**

<b>SEMESTER III</b>			
<b>Course Code</b>	<b>Title</b>	<b>Credits</b>	<b>Hours</b>
<b>24_USMB-301</b>	<b>Biomolecules and Microbial taxonomy</b>	<b>2 credits</b>	<b>30</b>
Unit-I	Estimation of Biomolecules		10
Unit-II	Nucleic acid structure and chemistry		10
Unit-III	Microbial taxonomy		10
<b>24_USMB-302</b>	<b>Environmental Microbiology</b>	<b>2 credits</b>	<b>30</b>
Unit-I	Air Microbiology		10
Unit-II	Fresh Water and Sewage Microbiology		10
Unit-III	Soil and Geo Microbiology		10
<b>24_USMB-303</b>	<b>Introduction to Clinical Microbiology</b>	<b>2 credits</b>	<b>30</b>
Unit-I	Basic Microbiology		10
Unit-II	Common infectious diseases, Epidemiology and Public health awareness		10
Unit-III	Control of Microorganisms & Safety in Clinical Microbiology		10
<b>24_USMB-304</b>	<b>PRACTICALS</b>	<b>2 credits</b>	<b>60</b>
	Practical's based USMB-301, USMB-302 and USMB-303		

## Syllabus for S. Y. B. Sc. Microbiology Semester III

<b>Name of the Course</b>	<b>Biomolecules and Microbial taxonomy</b>
<b>Course Code</b>	24_USMB301
<b>Class</b>	S.Y.B.Sc.
<b>Semester</b>	III
<b>No of Credits</b>	02
<b>Nature</b>	Theory
<b>Type</b>	Major subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	The course inculcate the knowledge and skills like estimation of proteins, amino acids, carbohydrates, lipids and nucleic acids which is applicable in microbiological and analytical industries. Understanding of nucleic acid structure and chemistry is very important in fields like drug discovery, genomics etc. Apart from this the knowledge of microbial taxonomy, genetic analysis, phylogenetic analysis and genome sequencing will be helpful for higher studies as well as for getting jobs in fields like molecular microbiology, biotechnology and genetics.

### **Nomenclature: Biomolecules and Microbial taxonomy**

#### **Course Outcomes:**

At the end of the course students will be able

1. To understand and perform estimation of proteins, carbohydrates, lipids and nucleic acids.
2. To know nucleic acid structure and chemistry.
3. To explain microbial identification systems.

## Curriculum:

<b>24_USMB301 - Biomolecules and Microbial taxonomy</b>			
<b>Unit</b>	<b>Title</b>	<b>Learning Points</b>	<b>No of Lectures</b>
1	Estimation Of Biomolecules	1a. Macromolecular composition of a microbial cell. 1b. Estimation of Proteins and amino acids Proteins by Biuret method (Direct and indirect) Amino acids by Ninhydrin method 1c. Estimation of Carbohydrates. Total carbohydrates by Anthrone method Reducing Sugars (maltose) by DNSA method 1d. Estimation of Nucleic acids General principles and extraction of nucleic acids DNA by DP method RNA by Orcinol method	10
2	Nucleic acid structure and chemistry	2a. Nucleic Acid Structure DNA stores genetic information DNA molecules have distinctive base composition DNA is a double helix DNA can occur in different 3D forms DNA sequences adopt unusual structures Many RNAs complex 3D structures 2b. Nucleic acid chemistry Denaturation of double helical DNA and RNA Nucleic acid from different species can form hybrids DNA methylation 2c. Structures of chromosomes of eukaryotic cell	10
3	Microbial Taxonomy	3a. Introduction to microbial taxonomy Systems of classification (Cavalier Smith 6 kingdom) Bergey's manual The three domain concept based on phylogeny Nomenclature 3b. Methods of analysis used in classification: Phenotypic analysis (Morphological characteristics, Physiological and metabolic characteristics, Biochemical characteristics, Ecological characteristics) 3c. Genetic analysis: DNA-DNA hybridization DNA Profiling G+C ratio 3d. Amino acid sequencing 3e. Phylogenetic analysis: Nucleic Acid sequencing Multilocus gene sequence analysis	10

## Learning Resources recommended:

1. Methods in Microbiology, Vol.5B, Ed. Norris & Ribbon, Academic Press
2. A handbook book of Organic analysis: qualitative and quantitative 4th edition, Hans Thacher Clarke, CBS publishers & distributors, New Delhi.
3. Laboratory Manual in Biochemistry, J. Jayaraman, (2003) New Age International 11 Publishers
4. Lehninger: Principles of Biochemistry, 4th Ed., D. Nelson & M. Cox, W.H.Freeman & Co., (LPE)
5. Prescott's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, (2011) 8th edition, McGraw-Hill International edition
6. Prescott, Harley and Klein's Microbiology, Willey, Sherwood, Woolverton (2008) 7th edition, McGraw-Hill International edition
7. Brock Biology of Microorganisms, Madigan, Martinko, Dunlap and Clark (2009) 12th edition, Pearson Education
8. Peter J. Russell (2006), "Genetics-A molecular approach", 2nd ed. 2

## Evaluation Pattern

### A. Internal Evaluation

Method	Marks
Class Test	10
Assignment	05
Attendance & Class performance	05
<b>Total</b>	<b>20</b>

### B. Semester End Evaluation (Paper Pattern)

Question No	Unit	Marks
1	Unit 1	10
2	Unit 1	10
3	Unit 2	10
<b>Total</b>		<b>30</b>

**Nomenclature:** Environmental Microbiology

<b>Name of the Course</b>	<b>Environmental Microbiology</b>
<b>Course Code</b>	24_USMB302
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	III
<b>No of Credits</b>	02
<b>Nature</b>	Theory
<b>Type</b>	Major subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	<p>The course will be primarily oriented towards imparting skills and knowledge on environmental microbiology. Air, Water and Soil sampling, sample preparation, processing and analysis. The course aims at providing hands on training on various instrumental methods according to specified protocols.</p> <p>Students will improve skills in handling microorganisms and studying their morphological, physiological and biochemical characteristics. The expertise in analysis of air, water and soil samples will be beneficial to students to get placed in pollution control board, water testing agency and environmental monitoring industries. Skills like understanding of sewage treatment processes and soil bioremediation are useful for industries related to waste water treatment and bioremediation.</p>

### **Course Outcomes:**

At the end of the course students will be able

1. To understand the aeromicrobiology and its implications in human life.
2. To understand microbiology of water and explain modern waste water treatment.
3. To explain the role of soil microorganisms in bioremediation and biogeochemical cycles and its impact on environment.

### **Curriculum:**

<b>24_USMB302 - Environmental Microbiology</b>
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Unit	Title	Learning Points	No of Lectures
1	Air Microbiology	<p>1a. Aeromicrobiology: Important airborne pathogens and toxins, Aerosols, nature of bioaerosols, aeromicrobiological pathway, microbial survival in the air, extramural aeromicrobiology, intramural aeromicrobiology</p> <p>1b. Sampling Devices for the Collection of Air Samples, Detection of microorganisms on fomites</p> <p>1c. Air Sanitation</p>	10
2	Fresh Water and Sewage Microbiology	<p>2a. Fresh water environments and microorganisms found in Springs, rivers and streams, Lakes, marshes and bogs</p> <p>2b. Potable water: Definition, water purification, water quality standards and pathogens transmitted through water</p> <p>2c. Microbiological analysis of water: Indicator organisms and their detection in water Total Coliforms, Fecal Coliforms and <i>E. coli</i></p> <p>2d. Modern Waste Water treatment: Primary, Secondary and Tertiary Treatment.</p> <p>2e. The nature of wastewater and Monitoring of waste water treatment processes (BOD,COD)</p> <p>2f. Removal of Pathogens by Sewage treatment Processes</p>	10
3	Soil and Geo Microbiology	<p>3a. Terrestrial Environment Soil- Definition, Composition, function, Textural triangle, Types of soil microorganisms and their activities</p> <p>3b. Methods of studying soil microorganisms: Sampling, Cultural methods, Physiological methods, Radioisotope techniques</p> <p>3c. Biogeochemical Cycles: Carbon cycle, Nitrogen cycle, Sulphur cycle, Phosphorus Cycle, Iron cycle</p> <p>3d. Soil Bioremediation</p>	10

**Learning Resources recommended:**

1. Environmental Microbiology, 2nd Edition; Raina M. Maier, Ian L. Pepper, Charles P. Gerba, 2010 Academic Press
2. Fundamental Principles of Bacteriology, 7th Edition; A.J. Salle, Tata McGraw Hill Publishing Company
3. Air Quality Standards- NAAQS Manual, Volume I
4. Prescott's Microbiology, 8th Edition; Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton, 2011, McGraw Hill International Edition
5. Fundamentals of Microbiology, 9th Edition, Frobisher, Hinsdill, Crabtree, Goodheart, 1974, Saunders College Publishing
6. Introduction to Environmental Microbiology – Barbara Kolwzan, Waldemar Adamiak (E Book)
7. Soil Microbiology-4th Edition, N.S Subba Rao, 2000, Oxford and IBH Publishing Co. Pvt Ltd

## Evaluation Pattern

### A. Internal Evaluation

Method	Marks
Class Test	10
Assignment	05
Attendance & Class performance	05
<b>Total</b>	<b>20</b>

### B. Semester End Evaluation (Paper Pattern)

Question No	Unit	Marks
1	Unit 1	10
2	Unit 1	10
3	Unit 2	10
<b>Total</b>		<b>30</b>

<b>Name of the Course</b>	<b>Introduction to Clinical Microbiology</b>
<b>Course Code</b>	24_USMB303
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	III
<b>No of Credits</b>	02
<b>Nature</b>	Theory
<b>Type</b>	Major subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	<p>The course gives knowledge and skill required for becoming a competent medical clinical laboratory scientist through lectures and hands on work experience. The course will train the students in all sections of clinical laboratory to the point of being able to do the job independently in hospitals and pathology laboratories. Typical tasks of this course will include identifying fungal, parasitic, viral and bacterial infections. Testing the strength and virulence of microbes. Using a variety of biochemical and molecular methods to determine organisms that cause infection. Undertaking work aimed at helping to prevent the spread of infections within hospitals.</p> <p>Safety in clinical microbiology and control of microorganisms is important task in order to prevent the spread of infection. The knowledge about common infectious diseases, epidemiology and public health awareness along with safety in clinical microbiology enhance the employability in medical, paramedical and diagnostic industries.</p>

**Nomenclature:** Introduction to Clinical Microbiology

**Course Outcomes:**

At the end of the course students will be able

1. To know physiology of bacteria and their cultivation methods.
2. To explain different infectious diseases and their epidemiology.
3. To know and apply knowledge of sterilization and disinfection in clinical microbiology.

**Curriculum:**

<b>24_USMB303 - Introduction to Clinical Microbiology</b>			
<b>Unit</b>	<b>Title</b>	<b>Learning Points</b>	<b>No of Lectures</b>
1	Basic Microbiology	1a. Microbial World & you: Microbes in our lives Types of Microorganisms 1b. Morphology and Physiology of Bacteria: Microscopy Staining - monochrome, differential and cytological Shape of Bacteria Bacterial Anatomy- Structure &function Growth and Multiplication of Bacteria Bacterial Growth Curve 1c. Culture Methods Methods of Isolating Pure Cultures Anaerobic Culture Methods (Anaerobic blood agar, Cooked meat media, Thioglycollate medium) 1d. Culture Media and Bacterial Growth Types of Media and examples of media like Nutrient agar, Sabouraud's agar, MacConkeys agar Study of morphological & cultural characteristics.	10
2	Common infectious diseases, Epidemiology and public health awareness	2a. Skin Infections: Study of structure and functions of skin Study of skin infections caused by Pseudomonas, Acne & Measles 2b. Infections of Nervous system Study of structure and functions of nervous system Study of Rabies 2c. Infections of Respiratory systems Study of structure and function of respiratory system Study of pharyngitis, laryngitis, Sinusitis, Diphtheria 2d. Infections of Digestive systems Study of structure and function of digestive system Study of typhoid fever, Hepatitis A 2e. The Epidemiology of Infectious Diseases and Their Control Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, hyper endemic diseases, epidemic diseases, Index Case, Pandemic Disease, Outbreak 2f. Transmission of Disease- Contact transmission, Vehicle Transmission and vectors	10

		2g. Public Health Measures for Control of Disease: Control directed against reservoir, Transmission of the pathogens	
3	Control of Microorganisms & Safety in Clinical Microbiology	3a. Sterilization and disinfection Methods of sterilization: Dry heat: Hot air sterilizers Moist heat: Steaming at 100°C, Autoclave. Gas Sterilization: Ethylene oxide sterilizer, Gasplasma Sterilizing filters Sterilization by radiation 3b. Disinfectants: Disinfection of surfaces and spillages Disinfection of safety cabinets Discard jars Disinfection of rooms Disinfection of skin Testing of disinfectants 3c. Safety in Clinical Microbiology Chemical safety Fire safety Electrical safety Handling of compressed gases Exposure control plan Employee education and orientation Disposal of hazardous waste Standard precautions	10

### Learning Resources recommended:

1. Microbiology, An Introduction by Tortora, Funke & Case 9th and 11th edition, Pearson education.
2. Bailey and Scott's Diagnostic Microbiology, 11th edition Publ: Mosby
3. Anantnarayan & Paniker's Textbook of Microbiology, 8th Ed.
4. Mackie and McCartney Practical medical microbiology 14th edition.
5. Brock biology of microorganism by Michael T Madigan. & John M Martinco.

### Evaluation Pattern

#### A. Internal Evaluation

Method	Marks
Class Test	10
Assignment	05
Attendance & Class performance	05
<b>Total</b>	<b>20</b>

#### B. Semester End Evaluation (Paper Pattern)

Question No	Unit	Marks
1	Unit 1	10
2	Unit 1	10

3	Unit 2	10
<b>Total</b>		<b>30</b>

**Nomenclature:** Microbiology practical

<b>Name of the Course</b>	<b>Microbiology Practical</b>
<b>Course Code</b>	24_USMB304
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	III
<b>No of Credits</b>	02
<b>Nature</b>	Practical
<b>Type</b>	Major subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	<p>The course inculcate the knowledge and skills like estimation of proteins, amino acids, carbohydrates, lipids and nucleic acids which is applicable in microbiological and analytical industries. Understanding of nucleic acid structure and chemistry is very important in fields like drug discovery, genomics etc.</p> <p>The course will be primarily oriented towards imparting skills and knowledge on environmental microbiology. Air, Water and Soil sampling, sample preparation, processing and analysis. The course aims at providing hands on training on various instrumental methods according to specified protocols.</p> <p>Students will improve skills in handling microorganisms and studying their morphological, physiological and biochemical characteristics. The expertise in analysis of air, water and soil samples will be beneficial to students to get placed in pollution control board, water testing agency and environmental monitoring industries.</p> <p>The course gives knowledge and skill required for becoming a competent medical clinical laboratory scientist through lectures and hands on work experience.</p> <p>The course will train the students in all sections of clinical laboratory to the point of being able to do the job independently in hospitals and pathology laboratories.</p> <p>Typical tasks of this course will include identifying fungal, parasitic, viral and bacterial infections. Using a variety of biochemical and molecular methods to determine organisms that cause infection. Undertaking work aimed at helping to prevent the spread of infections within hospitals.</p>

	The knowledge about common infectious diseases, epidemiology and public health awareness along with safety in clinical microbiology enhance the employability in medical, paramedical and diagnostic industries.
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### Course Outcomes:

At the end of the course learner will be able

1. To estimate various biomolecules such as protein, lipid, carbohydrate, nucleic acids.
2. To perform routine analysis of water and waste water.
3. To understand and perform laboratory techniques related to clinical microbiology.

### Curriculum:

24_USMB304 - Microbiology Practical			
Paper	Title	Learning Points	No of hours
1	Biomolecules and Microbial taxonomy	<ol style="list-style-type: none"> <li>1. Estimation of total sugar by Anthrone method</li> <li>2. Estimation of reducing sugar by DNSA method</li> <li>3. Estimation of protein Biuret method (indirect and direct)</li> <li>4. Isolation and detection of DNA from onion</li> <li>5. Estimation of DNA by DPA method</li> <li>6. Estimation of RNA by Orcinol method</li> </ol>	20
2	Environmental Microbiology	<ol style="list-style-type: none"> <li>1. Standard Plate Count of water</li> <li>2. Waste water analysis:               <ol style="list-style-type: none"> <li>a. Study of microbial flora in raw and treated sewage</li> <li>b. Determination of total solids in wastewater</li> <li>c. Determination of BOD and COD of wastewater</li> </ol> </li> <li>3. Total viable count of soil microflora</li> <li>4. Isolation of bacteria, Actinomycetes and fungi from soil</li> <li>5. Enrichment and isolation of, Cellulose degraders and Phosphate solubilisers from soil.</li> </ol>	20
3	Introduction to Clinical Microbiology	<ol style="list-style-type: none"> <li>1. To study the growth of yeast on the Sabouraud agar</li> <li>2. To study the growth of lactose fermentor and nonlactose fermentors on the MacConkey's agar</li> <li>3. Isolation of <i>Pseudomonas</i>, <i>Escherichia coli</i> and <i>S. typhi</i></li> <li>4. AST-Kirby method</li> <li>5. Effect of UV.</li> </ol>	20

## Evaluation Pattern

### A. Internal Evaluation

<b>Method</b>	<b>Marks</b>
Journal	05
Viva	05
Experiment	10
<b>Total</b>	<b>20</b>

### B. Semester End Evaluation (Practical Exam)

<b>Question No</b>	<b>Marks</b>
1	10
2	10
3	10
<b>Total</b>	<b>30</b>

**Syllabus for S. Y. B. Sc. Microbiology [Since 2024-25] as per NEP**

<b>SEMESTER IV</b>			
<b>Course Code</b>	<b>Title</b>	<b>Credits</b>	<b>Lectures</b>
<b>24_USMB-401</b>	<b>Metabolism &amp; Basic Analytical Techniques</b>	<b>2 credits</b>	<b>30</b>
Unit-I	Introduction to Metabolism & Bioenergetics		10
Unit-II	Enzyme Kinetics		10
Unit-III	Analytical techniques		10
<b>24_USMB-402</b>	<b>Applied Microbiology</b>	<b>2 credits</b>	<b>30</b>
Unit-I	Host defense and public health (Epidemiology of infectious diseases)		10
Unit-II	Food Microbiology		10
Unit-III	Dairy Microbiology		10
<b>24_USMB-403</b>	<b>Fermented Foods, Food Sanitation and Microbial Ecology</b>	<b>2 credits</b>	<b>30</b>
Unit-I	Fermented foods		10
Unit-II	Food sanitation		10
Unit-III	Microbial evolution and ecology		10
<b>24_USMB-404</b>	<b>PRACTICALS</b>	<b>2 credits</b>	<b>60</b>
	Practical's based 24_USMB-401, 24_USMB-402 and 24_USMB-403		

## Syllabus for S. Y. B. Sc. Microbiology Semester IV

<b>Name of the Course</b>	<b>Metabolism &amp; Basic Analytical Techniques</b>
<b>Course Code</b>	24_USMB401
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	IV
<b>No of Credits</b>	02
<b>Nature</b>	Theory
<b>Type</b>	Major subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	This course introduces students to metabolism: the collection of chemical processes by which the cells drive energy from their surroundings and use this energy to make the building blocks of life. The major metabolic pathways involved in the synthesis and breakdown of important biological molecules are explored, along with the mechanisms of regulating these pathways in the body. The skills developed during the course are paper chromatography, thin layer chromatography, HPTLC, column chromatography, preparative centrifugation, analytical centrifugation and electrophoresis. These skills will enhance the employability of students in various industries- pharmaceutical, chemical and cosmetic industries.

### **Nomenclature:** Metabolism & Basic Analytical Techniques

### **Course Outcomes:**

At the end of the course students will be able

1. To understand metabolic pathways and thermodynamics of life.
2. To explain properties of enzymes and enzyme kinetics.
3. To learn instrumentation and analytical techniques, this will help them in their professional career.

**Curriculum:**

<b>24_USMB401 - Metabolism &amp; Basic Analytical Techniques</b>			
<b>Unit</b>	<b>Title</b>	<b>Learning Points</b>	<b>No of Lectures</b>
1	Introduction To Metabolism & Bioenergetics	1a. Introduction to metabolism, Metabolic pathways 1b. Organic reaction mechanism 1c. Experimental approaches to study metabolism 1d. Thermodynamics of Phosphate compounds 1e. Oxidation-reduction reactions	10
2	Enzyme Kinetics	2a. Introduction of Enzymes: General properties of enzymes, How do enzymes accelerate reaction Rate Law for a simple catalyzed reaction, Michaelis-Menten equation and its derivation Lineweaver Burke plot. Classification of enzymes 2b. Overview of Coenzyme: Coenzymes: Different types and reactions catalyzed by coenzymes (in tabular form) 2c. Enzyme Kinetics: Saturation kinetics Effect of temperature and pH Effect of Inhibitors- Reversible and irreversible, competitive, Non competitive and uncompetitive inhibitors	10
3	Analytical techniques	3a. Chromatography Introduction to chromatography, types of chromatography Paper chromatography: Principle, circular, ascending and descending Paper Chromatography. Thin layer chromatography: principle, preparation of TLC plates, procedure for TLC, HPTLC- Separation of amino acids and sugars by TLC. Column chromatography: Introduction & principle Exclusion chromatography 3b. Centrifugation Introduction: basic principles of sedimentation Types, care and safety aspects of centrifuges, types of rotors, care and maintenance, safety & centrifugation 3c. Electrophoresis General principles, support media – agarose gels, polyacrylamide gels	10

## Learning Resources recommended:

1. Principles of Biochemistry- G. Zubay, W.W. Parson, D.E.Vance. C.Brown Publishers
2. Fundamentals of Biochemistry. D. Voet and J. Voet Publisher Wiley plus Edition 5th.
3. Lehninger- Principles of Biochemistry- David Nelson, Michael Cox. 4th edition W.H. Freeman &Company[Low price edition- for sale in India, Pakistan, Sri Lanka, Bangladesh, Nepal & Bhutan]
4. Instrumental Methods of chemical analysis, V.K. Ahluwalia,Ane Books Pvt.Ltd; 2015.
5. Principles & techniques of Biochemistry &Mol biology 6th ed, Keith Wilson & John Walker, Cambridge University press, 2006
6. Laboratory manual in Biochemistry- J. Jayaraman

## Evaluation Pattern

### A. Internal Evaluation

Method	Marks
Class Test	10
Assignment	05
Attendance &Class performance	05
<b>Total</b>	<b>20</b>

### B. Semester End Evaluation (Paper Pattern)

Question No	Unit	Marks
1	Unit 1	10
2	Unit 1	10
3	Unit 2	10
<b>Total</b>		<b>30</b>

<b>Name of the Course</b>	<b>Applied Microbiology</b>
<b>Course Code</b>	24_USMB402
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	IV
<b>No of Credits</b>	02
<b>Nature</b>	Theory
<b>Type</b>	Major Subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	The course will train the students conducting microbiological analyses on samples collected from food processing facilities to determine potential causes of contamination. Students will be able to consult food manufacturers to determine the bacteria that may present in their food product and the microorganisms may affect the product's shelf life. During the course the student will understand and practices different types of tests of milk and practice to test microbiological quality of milk by MBRT and SFC test. The skills related to public health & epidemiology of infectious diseases will be useful in diagnostic & medical microbiology industries. Understanding of food microbiology, food spoilage, principles of food preservation microbial examinations of foods and dairy microbiology is required to work in food processing and dairy industries.

### **Nomenclature: Applied Microbiology**

### **Course Outcomes:**

At the end of the course students will be able

1. To understand immune system components and their role in control of infection.
2. To understand and apply basic knowledge of food microbiology, food preservation, food analysis and food safety.
3. To analyze quality of milk and milk product

**Curriculum:**

<b>24_USMB402 - Applied Microbiology</b>			
<b>Unit</b>	<b>Title</b>	<b>Learning Points</b>	<b>No of Hrs</b>
1	Host defense and public health (Epidemiology of infectious diseases)	<p>1a. Classification of immune system (innate immunity &amp; acquired immunity)</p> <p>1b. Physical barriers in nonspecific innate resistance revision. Chemical barriers (Complement: principle &amp; significance (no pathway), Cytokines: interferon, antimicrobial peptides, bacteriocins)</p> <p>1c. Cells of Immune system: Haematopoiesis, lymphocytes, monocytes &amp; macrophages, granulocytes, mast cells, dendritic cells &amp; NK cells</p> <p>1d. Phagocytosis &amp; Inflammation</p> <p>1e. Tools of epidemiology, recognition of an infectious disease in a population.</p> <p>1f.. Nosocomial infections: Microorganism in hospital, compromised host.</p>	10
2	Food Microbiology	<p>2a. Introduction, Food as a substrate for microorganism a. pH, aw, O-R potential b. Nutrient Content</p> <p>2b. Food Control Enforcement &amp; Control Agency: International agencies, Federal agencies (FDA, USDA), FSSAI[website], Introduction to HACCP</p> <p>2c. Important Microorganisms in Food Microbiology: Food-borne Illness associated Microorganisms: Classification of Food-borne diseases (Schematic). Bacteria responsible for food -borne intoxication and infections-overview/tabulation. Examples of nonbacterial food-borne pathogens Details of: a) Staphylococcus food intoxication (organism, enterotoxin, incidence, foods involved, prevention of outbreaks)</p> <p>2d. Food Spoilage, General Principles of spoilage of: a. Fruits and vegetables b. Meat (including spoilage under aerobic &amp; anaerobic conditions- exclude spoilage of different kinds of meats) c. Canned foods</p> <p>2e. General Principles of Food Preservation: a. Preservation using High temperature : TDT, principle of canning b. Low temperature c. Drying d. Food preservatives (organic acids &amp; their salts, Sugar &amp; salt) e. Ionizing radiations</p> <p>2f. Methods of microbial examination of foods: a. Homogenization of food samples b. Methods- SPC, surface examination-swab rinse &amp; contact plate methods.</p>	10

3	Dairy Microbiology	3a. Raw and fluid milk products Pasteurization & Ultra-pasteurization 3b. Concentrated and dry milk, whey 3c. Microbiology of butter 3d. Fermented milk: Yogurt, cultured buttermilk and fermented milk in India 3e. Cheese: Cheddar, Cottage 3f. Microbiological Quality of Milk & Milk Products: SPC, coliform count, LPC, RPT (RRT, MBRT, DMC)	10
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### Learning Resources recommended:

1. Prescott, Harley Klein. McGraw international edition, 7th Ed
2. Anantnarayan & Paniker's ed 8th. University press
3. Food Microbiology by Frazier 5th ed
4. Modern Food Microbiology by James Jay 6th ed
5. Applied Dairy Microbiology by Martha & Steele
6. BIS standards, FSSAI
7. Outlines of Biochemistry. E.E. Conn & P.K. Stumpf, G. Bruening, R.N. 5th Edition, John Wiley and sons

### Evaluation Pattern

#### A. Internal Evaluation

Method	Marks
Class Test	10
Assignment	05
Attendance & Class performance	05
<b>Total</b>	<b>20</b>

#### B. Semester End Evaluation (Paper Pattern)

Question No	Unit	Marks
1	Unit 1	10
2	Unit 1	10
3	Unit 2	10
<b>Total</b>		<b>30</b>

<b>Name of the Course</b>	<b>Fermented Foods, Food Sanitation and Microbial Ecology</b>
<b>Course Code</b>	24_USMB403
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	IV
<b>No of Credits</b>	02
<b>Nature</b>	Theory
<b>Type</b>	Major Subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	The course will guide the students to study the harmful organisms to understand how to prevent their growth in food. It may also be useful in work in technologies and innovations to enhance food safety for human consumption. The course typically aims to understand the use of microorganisms in fermented foods. These microbiologists may work in quality control & quality assurance industries or product development for food manufacturers, research institutes or the government bodies. The course encompasses skills required for jobs like sanitary inspector, food inspectors etc.

**Nomenclature:** Fermented Foods, Food Sanitation and Microbial Ecology

**Course Outcomes:**

At the end of the course students will be able

1. To explain food fermentation techniques and microbiology of fermented food
2. To know and apply food sanitation and hygiene measures.
3. To understand how life has evolved on earth.

## Curriculum:

<b>24_USMB403 - Fermented Foods, Food Sanitation and Microbial Ecology</b>			
<b>Unit</b>	<b>Title</b>	<b>Learning Points</b>	<b>No of Lectures</b>
1	Fermented Foods	1a. Microorganisms used in food fermentations: yeasts, molds and lactic acid bacteria 1b. Microbiology of fermented food: cheese, butter, yogurt, soy products, tea, coffee and cocoa 1c. Fermented beverages: beer, wine 1d. Food ingredients of microbial origin: SCP, amino acids, vitamins, colors, nutraceuticals and flavors	10
2	Food Sanitation	2a. Food Sanitation & Hygiene: Water, potable water, Sources of contamination of water, treatment of water, pesticide residue 2b. Food, Food Handling, Food contamination, equipment, Control of insects & Rodents, Practical rules for good sanitation. 2c. Food borne diseases 2d. Toxins from plants, toxins from animals, Mycotoxins, Toxic Agricultural Residues, Poisoning by chemicals, Food poisoning by bacteria, Food infections 2.e Food adulteration	10
3	Microbial evolution and ecology	3a. Microbial evolution: formation and early history of earth, origin of cellular life, microbial diversification, endosymbiotic origin of eukaryotes 3b. Microbial ecosystems: Principles of Microbialecolgy, the microbial habitats, fresh water,soil and plant microbial ecosystems, marine microbial ecosystems	10

## Learning Resources recommended:

1. Fundamental Food Microbiology by Bibek Ray, ArunBhunia (2007),4th edition CRC Press
2. Food Microbiology – An Introduction by Montville and Mathews,(2008), ASM Press
3. Industrial Microbiology by Waites and Morgan, Blackwell Science
4. Modern Industrial Microbiology and Biotechnology by NdukaOkafor, (2007), Science Publishers.

5. Food Science by Sumati R. Mudambi, Shalini Rao, M.V. Rajagopal, revised 2nd edition, (2006), New Age international publications.
6. Prescott's Microbiology by J.M. Willey, L.M. Sherwood, C.J. Woolverton, (2011) 8th edition, McGraw-Hill International edition
7. Prescott, Harley and Klein's Microbiology by Willey, Sherwood, Woolverton, (2008) 7th edition, McGraw-Hill International edition
8. Brock Biology of Microorganisms by Madigan, Martinko, Dunlap and Clark (2009) 12th edition, Pearson Education.

## Evaluation Pattern

### A. Internal Evaluation

Method	Marks
Class Test	10
Assignment	05
Attendance & Class performance	05
<b>Total</b>	<b>20</b>

### B. Semester End Evaluation (Paper Pattern)

Question No	Unit	Marks
1	Unit 1	10
2	Unit 1	10
3	Unit 2	10
<b>Total</b>		<b>30</b>

<b>Name of the Course</b>	<b>Microbiology Practical</b>
<b>Course Code</b>	24_USMB404
<b>Class</b>	S. Y. B. Sc.
<b>Semester</b>	IV
<b>No of Credits</b>	02
<b>Nature</b>	Practical
<b>Type</b>	Major Subject
<b>Highlight revision specific to employability/ entrepreneurship/ skill development</b>	<p>This course introduces students to metabolism: the collection of chemical processes by which the cells drive energy from their surroundings and use this energy to make the building blocks of life. The major metabolic pathways involved in the synthesis and breakdown of important biological molecules are explored, along with the mechanisms of regulating these pathways in the body. The skills developed during the course are paper chromatography and electrophoresis.</p> <p>The course will train the students conducting microbiological analyses on samples collected from food processing facilities to determine potential causes of contamination. During the course the student will understand and practices different types of tests of milk and practice to test microbiological quality of milk by MBRT and SFC test. The skills related to public health &amp; epidemiology of infectious diseases will be useful in diagnostic &amp; medical microbiology industries.</p> <p>It may also be useful in work in technologies and innovations to enhance food safety for human consumption. The course typically aims to understand the use of microorganisms in fermented foods. These microbiologists may work in quality control &amp; quality assurance industries or product development for food manufacturers, research institutes or the government bodies. The course encompasses skills required for jobs like sanitary inspector, food inspectors etc.</p>

## Nomenclature: Microbiology Practical

### Course Outcomes:

At the end of the course learner will be able

1. To perform practical of enzymology
2. To perform techniques related to food and dairy microbiology.
3. To prepare and analyze fermented food.

### Curriculum:

Paper	Title	Learning Points	No of Hours
1	Metabolism & Basic Analytical Techniques	<ol style="list-style-type: none"><li>1. Isolation of amylase, protease, lipase producers.</li><li>2. Effect of pH on activity of invertase</li><li>3. Effect on temperature on activity of invertase.</li><li>4. Effect of substrate concentration on activity of invertase.</li><li>5. Separation and identification of amino acids and sugars by ascending paper chromatography.</li><li>6. Electrophoresis</li></ol>	20
2	Applied Microbiology	<ol style="list-style-type: none"><li>1. Isolation of organism from fomites.</li><li>2. Determination of TDT and TDP</li><li>3. Determination of Salt and sugar tolerance</li><li>4. Determination of MIC of a Chemical preservative.</li><li>5. RPT of Milk– RRT, MBRT, DMC (Demo).</li><li>6. Microbiological Quality Control of Milk as per BIS/FSSSAI (Group experiment)</li></ol>	20
3	Fermented Foods, Food Sanitation and Microbial Ecology	<ol style="list-style-type: none"><li>1. Wine and Bread making</li><li>2. Isolation of lactic acid bacteria from fermented food-e.g. Idli, curd.</li><li>3. Isolation of <i>Staphylococcus aureus</i> from sweets and demonstrating its virulence.</li><li>4. Food adulteration</li></ol>	20

## Evaluation Pattern

### A. Internal Evaluation

<b>Method</b>	<b>Marks</b>
Journal	05
Viva	05
Experiment	10
<b>Total</b>	<b>20</b>

### B. Semester End Evaluation (Practical Exam)

<b>Question No</b>	<b>Marks</b>
1	10
2	10
3	10
<b>Total</b>	<b>30</b>

**R.E. SOCIETY'S  
R. P. GOGATE COLLEGE OF ARTS AND SCIENCE  
&  
R. V. JOGALEKAR COLLEGE OF COMMERCE (AUTONOMOUS),  
RATNAGIRI**

**Guidelines for Community Engagement Programme (CEP)**

**Introduction:**

Community engagement program (CEP) is included in undergraduate programme to increase community participation, foster collaboration, address community concerns, drive positive change by encouraging collective decision-making, often through building trust, gathering feedback, and empowering residents to actively shape their community's future.

This course requires learners to participate in community -based learning generally under the supervision of faculty. It will involve activities that expose learners to the socio-economic issues in the society.

**Course Structure:**

<b>Name of the Course</b>	Community Engagement Programme (CEP)
<b>Course Code</b>	24_USMBCEP408
<b>Class</b>	S.Y.B.Sc.
<b>Semester</b>	IV
<b>No of Credits</b>	02
<b>Nature</b>	Practical
<b>Type</b>	CEP

**Course Objectives:**

After completing this program, the learners will be able to;

1. Appreciate the culture and life-style of the society
2. Sensitize to the needs and challenges of the community
3. Identify causes for social problems faced by community and explore solutions for the same.

**Course Outcomes:**

The Community engagement program should attempt to provide opportunities for learners to;

CO1- Expose to socio-economic issues in society so that the theoretical learnings can be supplemented by actual life experiences to generate solutions to real-life problems.

CO2- Gain an understanding of local community life, Indian culture and social realities.

CO3- Develop a sense of social responsibility and civic engagement.

CO4- Develop a sense of empathy and bonds of mutuality with local community.

CO5 -Empower to become active participants in decision-making processes by building leadership skills.

CO6 - Implement community-driven program that address identified local needs and contribute to positive social change.

#### **General Guidelines for CEP:**

1. Learners are expected to complete this program in their fourth semester.
2. 2 credits will be allocated for the CEP.
3. Learners are expected to complete 60 hours of participation.
4. CEP must be separate from regular programs such as NSS, NCC and similar activities.

#### **Implementation Mechanism of CEP:**

1. The implementation mechanism of the CEP course will be decided by concerned department
2. The concerned department will appoint a mentor, who will be a faculty member.
3. Each learner should keep a separate fieldwork diary to record their fieldwork experiences. Planning and preparation for CEP as well as working hours should be recorded in a diary.
4. Each learner must submit their CEP work report to the concerned department.
5. The work diary must be verified and signed by the assigned mentor.
6. Internal Viva - Voce will be conducted by the concerned department.

#### **Evaluation Pattern: (20:30)**

Evaluate each learner for 50 marks per semester at department level.

Sr. No.	Evaluation Pattern	Distribution of Marks
1	<b>Internal Evaluation</b> : Presentation / Viva-Voce	20
2	<b>External Evaluation:</b> Actual work and work report	30

#### **Report Structure of CEP:**

The students will be required to submit a comprehensive report at the end of the CEP.

Report should be of minimum **5- 6 pages** or as per the guidelines of the concerned department.

A report has to be brief in content and must include the following aspects:

1. **Title Page:**

Name of the student, programme, institution, month and year.

2. **Certificate of Completion:**

A certificate issued by the mentor appointed from the department confirming the successful completion of the CEP.

3. **Acknowledgments:**

Recognizing individuals or organizations that provided support, guidance during the CEP.

4. **CEP Work Experience:**

Detailed description of work experience in CEP including CEP activity name and location, dates, and work experience. Photographs or visual aids to support work experience.

5. **Conclusion & Summary:**

Reflections on the overall experience and learning during the CEP activity.

**Appendix:**

- CEP work Dairy must be attached along with the report.
- CEP Events Photographs

**COMMUNITY ENGAGEMENT PROGRAM REPORT**

A Report Submitted

To

**R. P. Gogate college of Arts & Science and  
R.V. Jogalekar College of Commerce (Autonomous), Ratnagiri**

Under

**University of Mumbai**

For partial completion of the degree

of

Bachelor of Science

Under the Faculty of Science

S.Y. B. Sc.

Semester – IV

BY

(Name of the Student)

Under the Supervision

of

(Name of the Supervisor)

Month and Year

R. P. Gogate College of Arts and Science and  
R. V. Jogalekar College of Commerce (Autonomous), Ratnagiri

CERTIFICATE OF COMPLETION

This is to certify that Mr./ Ms. \_\_\_\_\_ [Student's Roll Number] of S.Y. B.Sc. (Sem IV) class bearing examination seat no. \_\_\_\_\_ has satisfactorily carried out Community Engagement Program (CEP) under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University. It is her/his own work and facts reported by her/his personal findings and investigations.

His /Her bonafide work has been completed for the duration from \_\_\_\_\_ to \_\_\_\_\_ for 60 hours.

**Date:**  
**CEP Mentor**  
**Place:**

**Name and Signature of**

**R.E. Society's  
R. P. Gogate College of Arts and Science  
&  
R. V. Jogalekar College of Commerce (Autonomous), Ratnagiri**

**Work Diary of CEP**

**Academic Year:**

**Semester: IV**

**Faculty:**

**Name of Learner:**

**Class:**

**Roll No:**

**Name of CEP activity:**

**Name of community engaged:**

**Duration of the CEP activity:**

**Name of CEP Collaborating Organization:**

Daily work record - Proposed schedule of Work (Minimum Mandatory- 60 Hours)

Sr.No.	Date of CEP activity	Brief description of daily activity	Place of CEP	Duration (hours)	Sign.of Mentor
<b>Total No. of Hours :</b>					

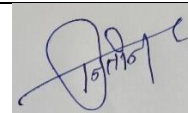
Name & Sign.of Student  
(HoD)

Name & Sign. of CEP Mentor

Sign. of concerned authority

**Suggested list for CEP Activities:**

<b>Sr. No.</b>	<b><i>Activities for Community Engagement Program.</i></b>
1.	Anti- Drug Awareness campaign
2.	Organization of Blood Donation camp
3.	Save Girl Child Awareness program
4.	Collaborate with Police department as Special <i>Police force / Police Mitra</i>
5.	Collaborate with <i>Sarpa Mitra</i> for safety awareness
6.	Legal awareness for women.
7.	Financial Literacy Awareness Programme
8.	Digital Literacy Awareness Programme
9.	Cleanliness drive college campus and community
10.	Cyber security Awareness program
11.	Organize awareness programmes, health camps, Disability camps and cleanliness camps
12.	Working with NGOs for older people
13.	Health / Fitness Awareness program
14.	Conduct workshops on mental health awareness in schools and communities
15.	Organize orientation programmes for farmers regarding organic farming.
16.	Participate in Gram Sabha meetings, and study community participation
17.	Partner with local NGOs to support women's empowerment initiatives in rural and urban areas.
18.	Conduct workshops on digital literacy and technology skills for community members.
19.	Conduct workshops on financial literacy
20.	Conduct awareness campaigns on human rights and social justice issues.
21.	Organizing awareness programs regarding government schemes.
22.	Any other subjects of your choice and get it approved by the CEP mentor.



**Chairperson,  
(Dr. Nitin Potdar)  
BoS, Microbiology**