



HYDERABAD (SIND)  
NATIONAL COLLEGIATE BOARD

HSNC Board's  
**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

(Affiliated to the University of Mumbai)

University College Code : 217-JD Office : T14



Estd. 1965

Principal : Dr. Manju Lalwani Pathak

Ref. No: CHM (A) AC/02/2026-27

Date: 27<sup>th</sup> June, 2026

**CIRCULAR**

The immediate attention of all concerned is invited to this Office Circular No. CHM (A) AC 11/2026 dated 19<sup>th</sup> June, 2026 regarding Choice Based and Credit Based Syllabus (CBCS), of Smt. CHM College (Autonomous), under the guidelines of University of Mumbai, as per Academic Framework of NEP 2020, for all subjects of T.Y.B.Sc in Microbiology SEM-V and SEM-VI.

This is in continuation with curriculum approved by Academic Council for all the subjects of F.Y. B.Sc in Microbiology (SEM-I), S.Y. B.Sc in Microbiology (SEM-III) and F.Y. B.Sc in Microbiology (SEM-II) & S.Y.B.Sc in Microbiology (SEM – IV) vide Circular Reference Numbers CHM (A) AC/C/01/2025 dated 18th June, 2025, CHM (A) AC/C/01A/2025 dated 21st July 2025 and CHM (A) AC/C/02/2025 dated 20th November, 2025 respectively.

It is hereby communicated that the recommendations of the curriculum designed by the Ad-hoc Board of studies in Microbiology coordinated by the Dean, Faculty of Pure Sciences in the meeting of Academic Council held on 20<sup>th</sup> June, 2026 have been approved.

In accordance, therewith, the syllabus as per the CBCS, has been brought into force with effect from the Academic Year 2026-27 for T.Y.B.Sc in Microbiology y, in continuation with syllabus of F.Y.B.Sc in Microbiology and S.Y.B.Sc in Microbiology of 2025-2026 (updated), and accordingly the same is attached for reference and is available on the College's website [www.chmcollege.in](http://www.chmcollege.in)

Ulhasnagar – 421003

27<sup>th</sup> June 2026

**Dr. Manju Lalwani Pathak**  
Principal & Chairperson, Academic Council

Copy forwarded for information to:

1. The Office of Chairperson, Academic Council
2. The Dean, Faculty of Pure Sciences
3. The Chairperson, Ad-hoc Board of Studies
4. The Controller of Examination
5. The Registrar



**HSNC Board's**  
**Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar**  
**(Autonomous)**  
**Affiliated to the University of Mumbai**

**Bachelor of Science**  
**(Microbiology)**  
**(Aided)**

**Semester – I**

**Choice Based and Credit Based syllabus**  
**as per NEP 2020 with effect from the**  
**Academic Year 2026-2027**

## **PREAMBLE**

The study of the microscopic world is known as microbiology. It is an essential component of our daily existence. The study of microorganisms with a focus on their morphology, biochemistry, and industrial uses in various domains is the focus of this scientific field. The goal of the B.Sc. (Microbiology) program is to give students a hands-on understanding of the concepts, abilities, and scope of the field in both industry and research as well as in daily life. The program's primary goals are to foster a scientific temper, enhance students' creativity, logical reasoning, and analytical thinking abilities, and foster a deeper interest in the subject so they can advance to higher education. Additionally, to develop the skill sets necessary to become autonomous researchers and industry-ready. Students who successfully complete this program will be able to apply their knowledge to interdisciplinary sciences in higher education and work well in both research labs and industry. Students can raise awareness of the value of microbiology to society both locally and globally.

## Faculty of Pure Sciences

### Programme Outcomes

Upon completion of Bachelor of Science, learner will be able to:

- PO1: Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the chosen discipline, their concepts, theories, methods, and its interdisciplinary applications
- PO2: Critical Thinking and Analytical Reasoning:** Analyse issues critically, apply logical reasoning, and develop appropriate solutions
- PO3: Problem Solving and Scientific Skills:** Apply scientific methods to investigate and solve real life problems.
- PO4: Research Competence:** Formulate research questions, design and conduct investigations, collect and interpret data, apply appropriate statistical methods and communicate research findings effectively.
- PO5: Digital literacy:** Effectively use ICT, digital resources, computational tools, bioinformatics, artificial intelligence applications, and statistical software for scientific learning, research, and decision-making.
- PO6: Communication Skills:** Communicate effectively through written reports, oral presentations, scientific publications, visual media, and interpersonal interactions with diverse audiences.
- PO7: Environmental Sustainability and Community Engagement:** Demonstrate empathy, appreciate cultural diversity, engage in community service, and promote environmental sustainability.
- PO8: Ethics and Professional Values:** Demonstrate integrity, ethical conduct, biosafety, academic honesty, respect for intellectual property, and professional responsibility in scientific practice and research.
- PO9: Leadership and Teamwork:** Work collaboratively in diverse teams, demonstrate leadership qualities, and contribute effectively to achieving common goals.
- PO10: Lifelong Education:** Engage in self-directed lifelong education for continuous personal and professional development.
- PO11: Employability and Entrepreneurship:** Apply scientific knowledge, creativity, and entrepreneurial skills for employment and entrepreneurship.

## **Programme specific outcomes (PSOs)**

**Upon completion of BSc (Microbiology) program, learner will be able to**

**PSO1.** integrate comprehensive knowledge of microbial diversity, genetics, biochemistry, immunology, medical, bioprocess technology and host–microbe interactions to explain the role of microorganisms in health, disease, industry, and the environment.

**PSO2:** well acquainted with microbiological, molecular, immunological, biochemical, and clinical diagnostic techniques for the isolation, cultivation, identification, characterization, and analysis of microorganisms using standard laboratory practices and biosafety protocols.

**PSO3:** apply principles of medical microbiology, immunology, antimicrobial therapy, and public health microbiology to investigate infectious diseases, antimicrobial resistance, and disease prevention strategies for improving community health.

**PSO4:** analyse microbiological, clinical, environmental, molecular, and biotechnological data; interpret experimental results; evaluate disease conditions, microbial processes, and environmental challenges; and propose evidence-based solutions using scientific reasoning.

**PSO5:** evaluate the role of microorganisms in environmental quality, waste management, food safety, healthcare, agriculture, and public health, and design sustainable microbiology-based solutions using microbiological, molecular, biotechnological, and computational approaches to address environmental, industrial, and health challenges

**PSO6:** integrate professional ethics, biosafety, teamwork, and scientific communication skills to contribute effectively to microbiological research, healthcare, biotechnology, and environmental management while embracing emerging technologies and developing entrepreneur skills.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- I**

**Title: Fundamentals of Microbiology**

**Vertical - 1  
Major Course**

**With effect from  
Academic Year 2026-2027**

## Title: Fundamentals of Microbiology

**Course Code: CHMMBI1**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	<p>This course provides a comprehensive introduction to the science of microbiology, emphasizing the diversity, structure, and significance of microorganisms and their impact on human life. The course traces the historical development of microbiology through the pioneering contributions of scientists such as Hooke, van Leeuwenhoek, Pasteur, Koch, and others, highlighting the foundations of modern microbiology.</p> <p>The course introduces fundamental microbiological techniques, including the principles and operation of the compound light microscope, optical components of microscopy, and the role of dyes and staining methods in microbial observation. Students gain knowledge of the physicochemical basis of staining and the functions of fixatives, mordants, and decolorizers.</p> <p>Further, the course covers the principles and methods used in the control of microorganisms, including sterilization, disinfection, antisepsis, and other microbial control measures. Physical methods such as moist heat, dry heat, radiation, and fractional sterilization, as well as chemical agents including alcohols, halogens, quaternary ammonium compounds, heavy metals, and sterilizing gases, are discussed with emphasis on their mechanisms of action and applications. The course also introduces emerging applications of artificial intelligence in microbial control and disinfection strategies, enabling students to appreciate recent technological advances in microbiology.</p> <p>Overall, the course establishes a strong foundation in the historical, theoretical, and technical aspects of microbiology and prepares students for advanced studies in microbiology and related life sciences.</p>
2	<b>Vertical 1</b>	Major
3	<b>Type</b>	Theory
	<b>Teaching method</b>	Lecture/ Presentation/ Discussion/ Industrial visit
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks

7	<p><b>Course Objectives:</b></p> <p><b>CO(A)1:</b> To introduce students to the fundamental concepts, scope, and historical development of microbiology and the contributions of eminent scientists to the field.</p> <p><b>CO(A) 2:</b> To provide knowledge of microbial cells and their significance in human health, environment, and industry.</p> <p><b>CO(A)3:</b> To familiarize students with the principles and operation of the compound light microscope and the basic concepts of microbial staining.</p> <p><b>CO(A)4:</b> To impart understanding of various dyes, staining reagents, and the physicochemical basis of staining techniques used in microbiology.</p> <p><b>CO(A)5:</b> To explain the principles, mechanisms, and applications of physical and chemical methods employed in the control of microorganisms.</p> <p><b>CO(A)6:</b> To expose students to contemporary developments, including the application of artificial intelligence in microbial control and disinfection strategies.</p>
8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> understand the emergence of microbiology as a science</p> <p><b>CO2</b> decipher the science of microorganisms and their significance.</p> <p><b>CO3</b> implement the principles of control of microorganisms</p> <p><b>CO4</b> compare different types of control methods for their suitable application, and also learn about different types of eukaryotic and prokaryotic cells</p> <p><b>CO5</b> evaluate the various sterilization and disinfection methods and grasp application-based study of microorganisms.</p>

## Syllabus

### UNIT I: Introduction and History of Microbiology

- The Science of Microbiology
- Microbial Cells
- The Impact of Microorganisms on Humans
- The Historical Roots of Microbiology: Hooke, Van Leeuwenhoek, and Cohn
- Pasteur and the Defeat of Spontaneous Generation
- Koch, Infectious Disease, and Pure Culture Microbiology
- Contributions of other scientists to the field of Microbiology

### UNIT II: Basic Techniques in Microbiology

#### Study of bright field microscopy (Compound light microscope):

- Principle of microscopy
- Optical spectrum, lenses and mirrors
- Parts of a microscope

#### Introduction to dyes and stains:

- Types of dyes- Basic, acidic, neutral, fluorescent
- Physicochemical basis of staining
- Fixatives, Mordants, Decolorizer- Function, examples

#### Control of Micro-organism

Terms in control of micro-organisms: Sterilization, disinfection, antiseptics, sanitation, pasteurization, asepsis, fumigation, decontamination, germicide, bactericide, fungicide, virucide, antiseptic, disinfectant, antimicrobial agent, contamination.

#### Physical methods of microbial control (Principle, working and Mode of action):

- Autoclave
- Hot air oven
- Fractional sterilization
- UV sterilization

#### Chemical methods of microbial control (Types, Mode of action, effective concentration)

- Halogens, Alcohols
- Quaternary ammonium compounds
- Sterilizing gases
- Surfactants/detergents
- Heavy metals
- Case study on use of AI in control of micro-organisms using chemical method

10

**Scheme of Examination and Assessment Pattern  
Paper – 50 Marks**

**A. External Examination: Semester End External - 30 marks Time: 1:00 hours  
Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/ Assignment)	15
2.	Overall conduct as a responsible student attentiveness and attendance	5
		<b>Total 20</b>

11

**REFERENCES:**

1. Prescott, Hurley Klein-Microbiology, 7<sup>th</sup> edition, International edition, McGraw Hill
2. Michael T. Madigan & J. M. Martinko, D. Stahl, D. Clark Brock Biology of Microorganisms 13<sup>th</sup> ed. International Edition 2012, Pearson Prentice Hall
3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5th Edition

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- I**

**Title: Practical Techniques: Cultivation and  
Staining of Microorganisms**

**Vertical - 1  
Major Course**

**With effect from  
Academic Year 2026-2027**

**Title of the course: Practical Techniques: Cultivation and Staining of microorganisms**  
**Course Code: CHMMBI2**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	<p>This practical course introduces students to the fundamental techniques and practices employed in a microbiology laboratory. The course emphasizes laboratory safety, proper handling of microbial cultures, and the operation of basic microbiological equipment. Students gain hands-on experience in the preparation of culture media, aseptic techniques, inoculation methods, and cultivation of microorganisms.</p> <p>The course covers the preparation of liquid and solid media, transfer and maintenance of microbial cultures, and the observation of bacterial growth and colony characteristics. Students investigate the influence of environmental factors such as temperature, pH, and salt concentration on microbial growth and compare microbial growth under static and shaking conditions.</p> <p>The practical training also includes the study and operation of the compound microscope, preparation of microbial smears, and application of staining techniques for the visualization of microorganisms. Simple staining methods and Gram staining are performed to examine microbial morphology and differentiate bacterial groups.</p> <p>Overall, the course develops essential laboratory skills, promotes safe microbiological practices, and provides a strong foundation in basic microbiological techniques required for advanced studies and research in microbiology and related life sciences.</p>
2	<b>Vertical 1</b>	Major
3	<b>Type</b>	Practical
	<b>Teaching Methods</b>	Lecture/ Practical/ Demonstration/ Industrial visits
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To introduce students to the microbiology laboratory environment, laboratory equipment, and essential safety practices required for handling microorganisms.</p> <p><b>CO(A)2:</b> To provide knowledge of the composition, preparation, and sterilization of commonly</p>

	<p>used liquid and solid culture media.</p> <p><b>CO(A)3:</b> To familiarize students with aseptic techniques, inoculation methods, and procedures for the cultivation and maintenance of microbial cultures.</p> <p><b>CO(A)4:</b> To enable students to study microbial growth characteristics and evaluate the effects of environmental factors such as temperature, pH, and salt concentration on microbial growth.</p> <p><b>CO(A)5:</b> To impart practical skills in the operation of the compound microscope, preparation of microbial smears, and microscopic examination of microorganisms.</p> <p><b>CO(A)6:</b> To train students in staining techniques, including simple staining and Gram staining, for the observation, differentiation, and identification of bacteria.</p>
8	<p><b>Course Outcomes:</b> Upon completion of the course, student will be able to:</p> <p><b>CO1</b> gain knowledge of microbiology laboratory organization, safety regulations, and good laboratory practices.</p> <p><b>CO2</b> prepare and sterilize various liquid and solid culture media required for the cultivation of microorganisms.</p> <p><b>CO3</b> apply aseptic techniques for the handling, inoculation, cultivation, and maintenance of microbial cultures.</p> <p><b>CO4</b> evaluate the effects of environmental factors such as temperature, pH, and salt concentration on microbial growth.</p> <p><b>CO5</b> operate a compound microscope and perform basic staining techniques, including simple and negative staining, for the observation of microbial morphology.</p> <p><b>CO6</b> perform differential staining techniques, and interpret staining results for the identification and characterization of microorganisms.</p>

## Syllabus

### 1. Introductory Lab Visit

- Introduction to microbiology laboratory and their operating principle
- Safety rules of microbiology lab

### 2. Components of culture media - peptone, meat extract, yeast extract, salts, growth factors, agar etc.

### 3. Preparation of Culture Media:

- Liquid media (Nutrient broth, Sabouraud's broth)
- Solid Media (Nutrient agar, Sabouraud's agar)

### 4. Aseptic Techniques

- Preparation of slant, butts and plates
- Inoculation techniques and study of growth
- Inoculation of liquid medium
- Inoculation of solid media (Slants, butts and plates)
- Study of colony characteristics of bacteria

### 5. Effect of environmental factors on growth of organisms

- Effect of temperature
- Effect of pH
- Effect of salt concentration

### 6. Microbial growth under static and shaker condition

### 7. Parts of Compound Microscope

### 8. Basic steps of staining

- Preparation of suspension
- Preparation of a smear
- Staining procedure

### 9. Simple staining techniques

- Positive (monochrome) staining
- Negative staining

### 10. Differential staining technique: Gram Staining

<b>10</b>	<b>Scheme of Examination and Assessment Pattern Paper – 50 Marks</b>		
	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination:  60% (30 Marks)</b>	<b>Duration for End semester examination</b>
	Minor experiment /Viva/ objective question test / Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>11</b>	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. Prescott, Hurley Klein-Microbiology, 7<sup>th</sup> edition, International edition, McGraw Hill</li> <li>2. Michael T. Madigan &amp; J. M. Martinko, D. Stahl, D. Clark Brock Biology of Microorganisms 13<sup>th</sup> ed. International Edition 2012, Pearson Prentice Hall</li> <li>3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5th Edition</li> </ol>		

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- I**

**Not Applicable**

**Vertical - 2  
Minor Course**

**With effect from  
Academic Year 2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- I**

**Title: Basics of Nutrition-1**

**Vertical - 3  
Open Elective**

**With effect from  
Academic Year 2026-2027**

## Title: Basics of Nutrition-1

**Course Code: CHMMBI3**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course offers a thorough introduction to the fundamental concepts of nutrition and their significance across different stages of the human life cycle. It covers essential topics such as food, nutrients, health, balanced diets, food groups, Recommended Dietary Allowances (RDA), and nutritional status. The course focuses on meal planning principles, nutritional needs of various age groups, and dietary considerations during pregnancy, lactation, infancy, childhood, adolescence, adulthood, and old age. It also examines macronutrients and micronutrients, including their sources, functions, digestion, absorption, utilization, and the health consequences of deficiencies and excess intake. Furthermore, the course highlights methods for preserving nutrients in foods and emphasizes the role of proper nutrition in promoting health
2	<b>Vertical 3</b>	Open Elective (OE)
3	<b>Type</b> <b>Teaching Methods</b>	Theory + Practicum Lecture/ Presentation/ Discussion/ Case studies
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>  <b>CO(A)1:</b> To develop an understanding of the fundamental concepts, terminology, and principles of nutrition, health, food, nutrients, and balanced diets.  <b>CO(A)2:</b> To provide knowledge of nutritional requirements and dietary recommendations across different stages of the human life cycle.  <b>CO(A)3:</b> To explain the sources, functions, digestion, absorption, utilization, and metabolism of macronutrients and micronutrients.	

	<p><b>CO(A)4:</b> To develop skills in planning balanced diets and meal plans for various age groups and physiological conditions.</p> <p><b>CO(A)5:</b> To promote awareness of nutrient retention practices and the role of nutrition in maintaining health and preventing nutritional disorders</p>
<p><b>8</b></p>	<p><b>Course Outcomes:</b>  Upon completion of the course, student will be able to:</p> <p><b>CO1</b> demonstrate an understanding of key concepts in nutrition science, including food, nutrients, health, balanced diets, food groups, RDA, nutritional status, and malnutrition.</p> <p><b>CO2</b> apply principles of meal planning to prepare balanced diets for infants, children, adolescents, adults, pregnant women, lactating mothers, and the elderly.</p> <p><b>CO3</b> explain the digestion, absorption, metabolism, functions, food sources, and dietary recommendations of carbohydrates, proteins, fats, vitamins, minerals, and water.</p> <p><b>CO4</b> assess the effects of nutrient deficiencies and excesses on health, including malnutrition, obesity, and selected non-communicable diseases.</p> <p><b>CO5</b> apply appropriate food preparation and nutrient retention techniques to improve the nutritional quality of meals and support healthy dietary practices.</p>

**Syllabus****UNIT I: Principles of Nutrition and Dietary Planning****Terms in Nutrition Science**

Food, Nutrition, Health, Energy, Nutrients, Macronutrients, Micronutrients, Balanced Diet, Food groups, Food Pyramid, My Plate, RDA, Nutritional Status, Malnutrition

**Nutrition Through Life Cycle- (Basics)**

- Meal Planning-Meaning, Factors affecting and steps of meal planning
- Recommended Dietary Intakes (RDI) for different age groups.

Planning balanced diet for different groups-Points to be considered, -RDAs, Sample menus, examples of recipes

- Diet for Adults
- Diet for pregnant women and Lactating mothers
- Diet for children- 0-6 years -Infants, Toddlers, Pre-schoolers
- Diet for Adolescent boys & girls
- Diet for Elderly

**UNIT II: Macro and micronutrients****Macronutrients in Food**

Types, Food Sources, Digestion, Absorption and utilization, Function, RDA, Effects of Deficiencies Or Excess- Overweight/ Obesity, NCDs –in brief

- Carbohydrates (Dietary Fibre)
- Proteins
- Fats

**Micronutrients in Food**

Types, Food Sources, Digestion, Absorption and utilization, Function, RDA, Effects of Deficiencies or Excess

- Vitamins-Water Soluble (B complex & C) & Fat Soluble (A, D, E and K).
- Minerals- Calcium, Phosphorus, Sodium, Chloride, Magnesium, Iron, Iodine, Zinc and Potassium
- Water –Functions, Sources, Water Balance

**Golden rules for retention of nutrients in food**

10	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b></p> <p><b>A. External Examination: Semester End External - 30 marks Time: 1:00 hours</b> <b>Format of Question Paper</b></p> <p><b>Attempt all questions.</b> <b>Note:</b> 1. Equal Weightage is to be given to all the Units.</p> <table border="1"> <thead> <tr> <th>Question No</th> <th>Nature of Questions</th> <th>Marks</th> </tr> </thead> <tbody> <tr> <td>Q1</td> <td>Attempt any three questions out of six (5 marks each) based on Unit 1</td> <td>15</td> </tr> <tr> <td>Q2</td> <td>Attempt any three questions out of six (5 marks each) based on Unit 2</td> <td>15</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total 30</b></td> <td></td> </tr> </tbody> </table> <p><b>B. Internal Examination: Continuous Evaluation - 20 marks</b></p> <table border="1"> <thead> <tr> <th></th> <th>Assessment / evaluation</th> <th>Marks</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/ Assignment)</td> <td>15</td> </tr> <tr> <td>2.</td> <td>Overall conduct as a responsible student, attentiveness and attendance</td> <td>5</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total 20</b></td> <td></td> </tr> </tbody> </table>	Question No	Nature of Questions	Marks	Q1	Attempt any three questions out of six (5 marks each) based on Unit 1	15	Q2	Attempt any three questions out of six (5 marks each) based on Unit 2	15	<b>Total 30</b>				Assessment / evaluation	Marks	1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/ Assignment)	15	2.	Overall conduct as a responsible student, attentiveness and attendance	5	<b>Total 20</b>		
Question No	Nature of Questions	Marks																							
Q1	Attempt any three questions out of six (5 marks each) based on Unit 1	15																							
Q2	Attempt any three questions out of six (5 marks each) based on Unit 2	15																							
<b>Total 30</b>																									
	Assessment / evaluation	Marks																							
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/ Assignment)	15																							
2.	Overall conduct as a responsible student, attentiveness and attendance	5																							
<b>Total 20</b>																									
11	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Handbook of Food and Nutrition (2007). M. Swaminathan. Bangalore Press.</li> <li>2. Nutritive Value of Indian Foods (2012). C. Gopalan, B. V. Ramasastri, &amp; S. C. Balasubramanian. Indian Council of Medical Research.</li> <li>3. Fundamentals of Foods, Nutrition and Diet Therapy (2012). S. R. Mudambi &amp; M. V. Rajagopal. New Age International Publishers.</li> <li>4. Nutrition Science (2018). B. Srilakshmi. New Age International Publishers.</li> <li>5. Indian Food Composition Tables (2017, 1st ed.). National Institute of Nutrition</li> </ol>																								

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- I**

**Title: Estimation of Biomolecules and  
Preservation of Microbes**

**Vertical - 4  
Vocational Skill Course (VSC)  
Practical Based**

**With effect from  
Academic Year 2026-2027**

**Title: Estimation of Biomolecules and Preservation of Microbes****Course Code: CHMMBI4**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course:</b>	A microbiology student must possess supplementary skills in medium design, inoculation techniques, and analytical methodologies. These are essential in food and water testing facilities where the quality of both must be upheld for the advancement of humanity. The microbiology student, equipped with their knowledge, can enhance the chemical analysis of food and water. Upon acquiring these skills, the student will be qualified to secure a position as a microbiologist in laboratories focused on the isolation and cultivation of microorganisms from pathological and natural materials, including soil and water. Furthermore, they may find employment prospects in government and private laboratories. The acquisition of knowledge from these courses can facilitate the execution of experiments pertinent to research and development in these domains. Small and large-scale enterprises, including media production, quality control and assurance laboratories, pharmaceuticals, food manufacturing and processing, environmental testing laboratories, and culture collection centres, can provide employment opportunities for these trainees. Microbiologists will assist public health authorities in the management of public health.
<b>2</b>	<b>Vertical 4</b>	Vocational Skill Course (VSC)
<b>3</b>	<b>Type</b> <b>Teaching Methods</b>	Practical Hands-on experiments/ Presentation/ Discussion/ Demonstration/ Industrial visit
<b>4</b>	<b>Credit</b>	2 Credits
<b>5</b>	<b>Hours allotted</b>	60 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks

7	<p><b>Course Objectives:</b></p> <p><b>CO(A)1:</b> To explain the principles, components, and applications of colorimetry, including Beer’s and Lambert’s laws and the determination of <math>\lambda_{max}</math> of colored compounds.</p> <p><b>CO(A)2:</b> To demonstrate qualitative methods for the identification and analysis of important biomolecules such as carbohydrates, proteins, amino acids, DNA, and RNA.</p> <p><b>CO(A)3:</b> To develop students' practical skills in the extraction of proteins from microbial cells and the quantitative estimation of proteins using the Biuret method.</p> <p><b>CO(A)4:</b> To apply spectrophotometric and biochemical techniques for the analysis and interpretation of experimental data related to biomolecules.</p> <p><b>CO(A)5:</b> To analyze various methods employed for the preservation of microbial cultures and evaluate their suitability for short-term and long-term storage.</p> <p><b>CO(A)6:</b> To familiarize students with modern culture preservation techniques, virtual laboratory approaches, and microbial culture collections used in research and industrial microbiology.</p>
8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> explain the principles and applications of colorimetry, including Beer’s and Lambert’s laws, and determine the wavelength of maximum absorption (<math>\lambda_{max}</math>) of colored compounds.</p> <p><b>CO2</b> perform qualitative tests for the identification of carbohydrates, proteins, amino acids, DNA, and RNA.</p> <p><b>CO3</b> extract proteins from microbial cells and quantitatively estimate protein concentration using the Biuret method.</p> <p><b>CO4</b> analyze and interpret experimental data obtained from colorimetric and biochemical assays.</p> <p><b>CO5</b> compare and evaluate different methods of microbial culture preservation for short-term and long-term storage.</p> <p><b>CO6</b> demonstrate knowledge of advanced culture preservation techniques and the role of microbial culture collections in research and industrial applications.</p>

## Syllabus

### Colorimeter

- Study of colorimeter
- Verification of Beer's and Lambert's Law
- Determination of Lambda max of colored solution of compound

### Qualitative Estimation of Biomolecules

- Qualitative estimation of carbohydrates
- Qualitative estimation of Proteins
- Qualitative estimation of Amino acids
- Qualitative estimation of DNA
- Qualitative estimation of RNA

### Extraction and Estimation of Protein

- Extraction of protein from microbial cells
- Quantitative estimation of Protein by Biuret method

### Concepts and Techniques of Preservation of Cultures

- Periodic transfer
- Soil stock
- Glycerol stock
- Paraffin oil overlaying
- Lyophilization, storage in liquid nitrogen (Virtual labs)
- Culture collections (tabulation)

<b>10</b>	<b>Scheme of Examination and Assessment Pattern Paper – 50 Marks</b>		
	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination:  60% (30 Marks)</b>	<b>Duration for End semester examination</b>
	Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>11</b>	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. Prescott, Hurley, Klein Microbiology, 10<sup>th</sup> edition, International edition, McGraw Hill.</li> <li>2. Tortora, Funke &amp; Case Microbiology, an Introduction 9<sup>th</sup> and 11<sup>th</sup> edition, Pearson education</li> <li>3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5<sup>th</sup> Edition</li> <li>4. Varghese N., Joy P. P. Microbiology Laboratory Manual, (2014) 1<sup>st</sup> ed, Aromatic and Medicinal Plants Research Station, Ernakulam, Kerala, India</li> <li>5. Biochemical Methods by S. S. Desai.</li> <li>6. Biochemistry Laboratory Manual by Rodney F. Boyer.</li> </ol>		

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- I**

**Title: Microbes in Human Welfare**

**Vertical - 4  
Skill Enhancement Course (SEC) Practical Based**

**With effect from  
Academic Year 2026-2027**

## Title: Microbes in Human Welfare

Course Code: CHMMBI5

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	<p>This course provides practical exposure to beneficial microorganisms associated with agriculture, food, and industrial applications. It introduces students to the diversity and significance of soil microorganisms and their contributions to human welfare through nutrient cycling, biofertilization, and biodegradation. Students acquire hands-on experience in the isolation, enrichment, and characterization of agriculturally important microorganisms.</p> <p>The course further explores the occurrence and importance of lactic acid bacteria in traditional and modern fermented foods. Students learn techniques for the isolation and characterization of lactic acid bacteria and examine the microbial diversity associated with Indian fermented foods such as idli batter and pickles. The isolation of probiotic bacteria from commercial products provides insight into the applications of beneficial microorganisms in food and health.</p> <p>In addition, the course emphasizes the production and industrial significance of microbial enzymes. Practical exercises include the isolation and screening of lipase-, protease-, and amylase-producing microorganisms and the study of their applications in textile, detergent, and tanning industries.</p> <p>The course also introduces the microbiology of fermented foods and beverages through the production of alcohol and wine. Overall, the course develops laboratory skills in microbial isolation, screening, characterization, and fermentation techniques while highlighting the applications of microorganisms in agriculture, food, industry, and human welfare.</p>
2	<b>Vertical 4</b>	Skill Enhancement Course (SEC)
3	<b>Type</b>  <b>Teaching Methods</b>	Practical  Hands-on experiments/ Presentation/ Discussion/ Demonstration/ Industrial visit
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours

6	<b>Marks allotted</b>	50 Marks
7	<p><b>Course Objectives:</b></p> <p><b>CO(A)1:</b> To introduce students to the diversity and significance of beneficial microorganisms associated with soil, food, and industrial environments.</p> <p><b>CO(A)2:</b> To provide practical knowledge and skills for the isolation, enrichment, and characterization of agriculturally important microorganisms.</p> <p><b>CO(A)3:</b> To familiarize students with the occurrence, isolation, and characterization of lactic acid bacteria and probiotic microorganisms from traditional and commercial food products.</p> <p><b>CO(A)4:</b> To develop students' ability to isolate, screen, and detect industrially important enzyme-producing microorganisms.</p> <p><b>CO(A)5:</b> To explain the industrial applications of microbial enzymes in textile, detergent, and tanning industries and their significance in biotechnology.</p> <p><b>CO(A)6:</b> To impart practical knowledge of fermentation processes involved in the production of alcoholic beverages and fermented products and their industrial relevance.</p>	
8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> enlist the microbes from various sources which are useful and harmful to mankind in different ways</p> <p><b>CO2</b> understand the benefits of microbes from soil, fermented foods, commercial probiotic products and enzymes obtained from them.</p> <p><b>CO3</b> perform experiments to isolate and detect beneficial and pathogenic microbes from various samples.</p> <p><b>CO4</b> analyze the benefits of soil microbes as bio-fertilizers, antibiotic producers, enzyme producers as well as food microbes beneficial for human health.</p> <p><b>CO5</b> design experiments to study growth patterns and detect virulence factors of selected pathogens.</p>	

## Syllabus

### **Overview of Soil microbes and their products in human welfare**

- Isolation of Rhizobium
- Isolation of Phosphate solubilizers
- Enrichment and isolation of Azotobacter
- Isolation of Potassium solubilizers
- Enrichment and isolation of cellulase producers

### **Overview of Study of lactic acid bacteria from traditional and modern foods**

- Isolation of lactic acid bacteria
- Characterization of lactic acid bacteria.
- Study of Indian fermented foods - Idli batter/Pickles.
- Isolation of probiotic bacteria from different commercial products

### **Overview of microbial enzymes and their applications**

- Isolation and detection of lipase producers
- Isolation and detection of protease producers
- Isolation and detection of amylases producers
- Application of the enzymes in textile/ detergents/ tanning

### **Overview of beverages and fermented Foods**

- Production of alcohol from jaggery
- Production of wine

<b>10</b>	<b>Scheme of Examination and Assessment Pattern Paper – 50 Marks</b>		
	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination:  60% (30 Marks)</b>	<b>Duration for End semester examination</b>
	Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>11</b>	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. Soil Microbiology by Subbarao N.S. 3rd Ed.</li> <li>2. A Handbook of Elementary Microbiology, 2014 by H.A. Modi</li> <li>3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5<sup>th</sup> Edition</li> <li>4. Practical Microbiology by Maheshwari D.K. (Author), 2010</li> </ol>		



**HSNC Board's**  
**Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar**  
**(Autonomous)**  
**Affiliated to the University of Mumbai**

**Bachelor of Commerce/  
Arts/Science/ SFC  
(Sindhi)**  
**(AEC – Ability Enhancement Course)**  
**(Aided Course)**

**Semester – I**

**Choice Based and Credit Based syllabus**  
**as per NEP 2020 with effect from the**  
**Academic Year 2025-2026**

## **PREAMBLE**

The Bachelor of Commerce (B.Com.) in Sindhi is a comprehensive program designed to develop Sindhi language. Language is the soul of Literature. Sindhi is medium of Communication, Education and Cultural exchange. Curriculum is designed specially in digital age.

Language enriches literature. This curriculum is prepared according to Social, Cultural and Academic needs. The B.Com. Sindhi subject offers students a unique opportunity to explore and widened Sindhi Culture through a wide range of literary programs. The curriculum not only emphasizes literary appreciation and analysis but also fosters ethical awareness, intercultural sensitivity and social responsibility.

The program is committed to developing critical thinking, ethical reasoning and inclusive perspectives. It encourages students to reflect and engage with communication in Sindhi, expertise in Business and Employment Creative work, meditation and listening, use of visual tails, expertise of asking questions, knowledge of different languages through communication.

Language allows us to share our ideas, thoughts, feelings and emotions with others through communication. There is a special contribution of the ideal citizen in nation building. It plays crucial role in creating civilized society.

## **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

**PSO-1** Students will understand the communication skills and role of language in communication.

**PSO-2** Students will be able to talk effectively in Sindhi language with friends, relatives and Business customers.

**PSO-3** Students will understand aspects of language.

**PSO-4** Students will be able to understand the Importance of communication, and they will communicate in different ways i.e. verbal, non-verbal, written and Digital methods.

**Smt**  
**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**First Year**

**Semester- I**

**Title: Communication Skills in Sindhi**

**Vertical - 5**  
**Ability Enhancement Course**  
**2 Credit**

**with effect from**  
**Academic Year 2025-2026**

**Title: Communication Skills in Sindhi**  
**COURSE CODE: CHMSINIAEC**

Sr. No.	Heading	Particulars
<b>1</b>	<b>Description the Course:</b>	Communication is the core component of commerce and trade. In communication, language plays very significant role. If a student has mastered the skills of language, undoubtedly, he or she would be able to communicate in the best manner. In this course basic part of Sindhi language would be taught based on the NEP 2020. Innovative approaches like critical thinking, creative mind, and use of technology will lead to communicating and participating with different groups. The vocabulary section would be given prominence. The course would be in the Devanagari script so that it can attract majority of the students. Even non-Sindhi students shall have opportunity to adopt this course.
<b>2</b>	<b>Vertical 1</b>	AEC – Ability Enhancement Course
<b>3</b>	<b>Type</b>	Theory + Practicum (Teaching Method: Lecture/ Discussion/Reading)
<b>4</b>	<b>Credit</b>	2 credits (1 credit = 15 hours for theory or 30 hours of Practical work in a semester)
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50Marks
<b>7</b>	<b>Course Objectives:</b> After successful completion of this course: <b>CO(A) 1:</b> The learner will get understanding of communication skills. <b>CO(A) 2:</b> The learner will understand how to accurate the pronunciation of special words in Sindhi <b>CO(A) 3:</b> The learner will improve the conversation skill in Sindhi. <b>CO(A) 4:</b> The learner will become best communicator in Sindhi language	
<b>8</b>	<b>Course Outcomes:</b> Student will be able to <b>CO1:</b> Know the basic special features of Sindhi language. <b>CO2:</b> Understand communication skills. <b>CO3:</b> Knowing the conversation with businessmen and customers <b>CO4:</b> Know the etiquettes with parents, relatives, friends and others in effective way	

## Syllabus

### UNIT I: Fundamental of Sindhi Communication

- Introduction of Communication skills through Pictorial Presentation
- Importance of Language
- Basic aspects of language:
  - i) Types of Language, ii) Role of Language, iii) Changes in Language iv) Non-violent aspects of language v) Language & New generation vi) Language & Modern technology
- New Education Policy (NEP) & Importance of language
- Sindhi language: (Special features of spoken Sindhi language with pronunciation through audio visual presentation)

### UNIT II: Functional Communication

- Importance of Communication
- Types of Communication (Presentation through video clips):
  - i) Verbal, ii) non-verbal, iii) Written iv) Digital Communication
- Characteristics of Communication
- Obstacles in Communication of Sindhi Language
- Methods of Best Communication through role plays
- Spoken Sindhi in Business
- Conversation with customers and proprietors

\*\*\*\*\*

## Syllabus

### यूनित १: सिंधी राबते जो बुनियाद

- संचारी भाषा: वाक्फियत
- भाषा जी अहमियत
- भाषा जा बुनियादी पहलू  
१) किस्म, २) भाषा जो किरदार, ३) भाषा मे तबदीलियूं, ४) भाषा जा अहिसासाती पहलू ५) बोली ऐ नई पीड़ी  
६) बोली ऐ जदीद टेकनालाजी
- नई तैलीमी नीति ऐं बोलियुन जी अहमियत
- असां जी सिंधी बोली

### यूनित २: अमली राबतो (असराइतो गालाइण जो तरीको)

- राबते जी अहमियत
- राबते जा किस्म  
१) जिबानी राबतो, २) गैर जिबानी राबतो, ३) लिख्त राबतो ४) डिजीटल राबतो राबते मां फायदा
- राबते में रंडकुं
- बेहतर राबते जा तरीका
- ग्राहकन सां सिंधी बोलीअ मे गुफ्तगू
- कारोबार में सिंधी गालाइण

\*\*\*\*\*

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00 hour**

Format of Question Paper

<b>Question No</b>	<b>Nature of Questions</b>	<b>Marks</b>
Q1.A)	Objective Type Questions (Unit- I)	05
Q1.B)	Attempt ANY 2 out of 4- (5 marks each) (Unit-I)	10
Q2.A)	Objective Type Questions (Unit- II)	05
Q2.B)	Attempt ANY 2 out of 4- (5 marks each) (Unit-II)	10
<b>Total</b>		<b>30</b>
<b>Internal Examination: Continuous Evolution - 20 marks</b>		<b>Total 30</b>

	<b>Assessment / evaluation</b>	<b>Marks</b>
1.	<b>Written assignment on any one of the following topics</b> 1) Draft a Notice and Report writing in Sindhi 2) Simulate dialogues such as interview, daily conversation and public speaking in Sindhi (Students are required to use AI assistance in the preparation of their drafts. Eg: Microsoft Copilot, Google Gemini, Google voice Typing tool)	15
2.	Class Attendance and Participation	05
<b>Total</b>		<b>20</b>

**11****REFERENCE BOOKS:**

1. Sanchari Basha – By Dr. Pushpa Kodwani
2. Sindhi Pahakaa – Dr. Jetly M.K.
3. Sindhi Muhavahra – By Hardwani Lachhman
4. Sindhi Adhyat mak Shabdhkesh – By Hardwani Lachhman
5. Acho Sindhi Sikhu – By Hardwani Lachhman

**Syllabus Committee:**

<b>Sr No</b>	<b>Name of the Faculty</b>	<b>Designation and College</b>	<b>Signature</b>
<b>1.</b>	Mrs. Kajal Ramchandani	<b>H.O.D. of Jai Hind College</b>	
<b>2.</b>	Mrs. Komal Totani	<b>Assistant Teacher, Smt. CHM College</b>	

**Name & Signature of the BoS Chairperson: (Mrs. Kajal Ramchandani)**\_\_\_\_\_

**Name & Signature of the Dean: (Dr. Nitin Arekar)**\_\_\_\_\_

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B.Sc.**

**Semester- I**

**Vertical – 5**

**Ability Enhancement Course (English)  
2 Credits**

**with effect from  
Academic Year 2026-2027**

**Title: Introduction to Communication Skills in English**  
**Course Code: CHMBSCAECI**

Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	<p>Effective communication is the cornerstone of academic and professional success. This course introduces learners to foundational skills in English communication, with a focus on both oral and written competencies essential in academic, social, and workplace contexts. It aims to equip learners with the ability to read critically, write precisely, speak confidently, and listen actively. Emphasis is placed on building clarity, coherence, and conciseness in communication, along with an understanding of audience, purpose, and tone.</p> <p>The course integrates grammar reinforcement, vocabulary building, reading comprehension, and practice-oriented modules such as email etiquette, group discussion, and formal writing. Through dynamic classroom interactions and practical assessments, learners will gain confidence in using English effectively and purposefully.</p>
2	<b>Vertical 4</b>	Ability Enhancement Course
3	<b>Type</b> Teaching Methods:	Theory+ Practicum (Lecture/ Discussion/ Presentation/ Reading sessions/ Worksheets/ etc.)
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>1. To introduce learners to the fundamentals of effective communication and its components.</li> <li>2. To enhance learners' reading comprehension through exposure to multiple genres and contexts.</li> <li>3. To develop grammatical accuracy and lexical resourcefulness for academic and professional communication.</li> <li>4. To strengthen verbal and non-verbal presentation skills and promote interactive speaking abilities.</li> </ol>	

	5. To build competence in real-world writing tasks such as email drafting, bio-data preparation, and descriptive writing.
<b>8</b>	<b>Learning Outcomes:</b> Student will be able to LO-1: Understand and apply key principles of effective communication in varied contexts. LO-2: Comprehend and analyze written texts using appropriate reading strategies. LO-3: Recognize and correct common grammatical and lexical errors. LO-4: Engage in clear, confident, and context-appropriate spoken interactions. LO-5: Produce structured, coherent, and grammatically correct written content for academic and workplace use.

## Syllabus

### UNIT I: Foundations of English Communication

#### A) Core Concepts of Communication

- Principles of Effective Communication: The 7 Cs
- Verbal and Non-verbal Communication with Examples
- Cross-cultural Communication in the Globalized World
- Technology in Communication: Email, Messaging, Video Conferencing
- Listening for Detail and Intent: Barriers to Listening and Strategies

#### B) Reading Comprehension

- Understanding the Main Idea and Supporting Details
- Interpreting Tone, Purpose, and Bias
- Using Context Clues for Vocabulary Building
- Reading Visual Texts: Graphs, Charts, and Infographics  
*Sample readings will include excerpts from news articles, reports, editorials, and educational essays (200–250 words).*

#### C) Grammar and Vocabulary

- Subject-Verb Agreement
- Sentence Structures
- Punctuation and Capitalization
- Commonly Confused Words
- Editing and Proofreading Practice

*A remedial and functional approach will be followed with contextual exercises.*

### UNIT II: Applied Communication Skills

#### A) Speaking and Listening Skills

- Introducing Oneself in Academic/Professional Settings
- Participating in Group Discussions and Expressing Opinions
- Delivering a Short Speech (2–3 minutes) on Familiar Topics
- Understanding and Responding to Instructions
- Listening Comprehension Practice through Audio/Video Clips

#### B) Functional Writing Skills

- Formal Email Writing with Subject and Tone Sensitivity
- Descriptive Paragraph Writing (People, Places, Processes)
- Bio-data and Resume Writing
- Drafting Job Applications (Solicited and Unsolicited)
- Writing a Statement of Purpose

10

**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00 hour**

Format of Question Paper

Question No	Nature of Questions	Marks
Q. 1	<b>Short Notes</b> (Attempt any 3 out of 5) - <b>Unit 1</b> <b>OR</b> <b>Essay-Type Question</b> (Attempt any 1 out of 2)- <b>Unit 1</b>	15
Q. 2	<b>Short Notes</b> (Attempt any 3 out of 5) - <b>Unit 2</b> <b>OR</b> <b>Essay-Type Question</b> (Attempt any 1 out of 2)- <b>Unit 2</b>	15
	<b>Total</b>	<b>30</b>

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Students are required to draft a job application letter along with a resume using the following AI assistance: Canva Resume Builder, Resume.oi, Zety, Novopresume, Rezi etc <b>OR</b> Draft an SoP with the help of the following AI assistance: Quillbot, Yocket, Writesonic, Jasper AI	15
2.		05
	<b>Total</b>	<b>20</b>


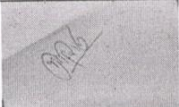
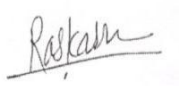
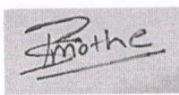
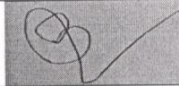
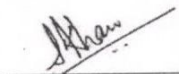
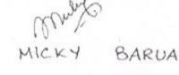

11

**REFERENCES:**

1. Adler, Ronald B., et al. *Understanding Human Communication*. 15th ed., Oxford UP, 2021.
2. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. 5th ed., Routledge, 2018.
3. Barrass, Robert. *Students Must Write: A Guide to Better Writing in Coursework and Examinations*. Routledge, 2005.
4. Brown, Gillian, and George Yule. *Teaching the Spoken Language: An Approach Based on the Analysis of Conversational English*. Cambridge UP, 1983.
5. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*. Pocket Books, 2006.
6. Chaney, Lillian, and Jeanette Martin. *Intercultural Business Communication*. 6th ed., Pearson, 2014.
7. Cullen, Pauline, et al. *English Grammar in Use Supplementary Exercises*. Cambridge UP, 2019.
8. Eastwood, John. *Oxford Guide to English Grammar*. Oxford UP, 2005.

9. Gerson, Sharon J., and Steven M. Gerson. *Technical Communication: Process and Product*. 9th ed., Pearson, 2021.
10. Hewings, Martin. *Advanced Grammar in Use: A Self-study Reference and Practice Book for Advanced Learners of English*. 3rd ed., Cambridge UP, 2013.
11. Jones, Leo. *Functions of English: Communication Practice in English*. Cambridge UP, 1981.
12. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. 2nd ed., Oxford UP, 2018.
13. Lynch, Tony. *Listening in Language Learning*. Longman, 1988.
14. McCarthy, Michael, and Felicity O'Dell. *Academic Vocabulary in Use*. Cambridge UP, 2008.
15. Nordquist, Richard. *The Essentials of English Grammar*. McGraw-Hill Education, 2016.
16. Quirk, Randolph, et al. *A Comprehensive Grammar of the English Language*. Longman, 1985.
17. Seely, John. *The Oxford Guide to Writing and Speaking*. Oxford UP, 2005.
18. Straus, Jane, et al. *The Blue Book of Grammar and Punctuation*. 12th ed., Jossey-Bass, 2021.
19. Wallace, Catherine. *Reading*. Oxford UP, 1992.
20. Zinsser, William. *On Writing Well: The Classic Guide to Writing Nonfiction*. Harper Perennial, 2016.

### Syllabus Committee:

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Prof. (Dr.) Kailas Aute	Professor & Head, Dept. of English, Smt. CHM College	
2.	Prof. (Dr.) B. R. Hiramani,	(VC Nominee, University of Mumbai) Pancham Khemraj College, Sawantwadi	
3.	Prof. (Dr.) Vikas Raskar	(Subject Expert outside University) Hutatma Rajguru Mahavidyalay, Rajguru Nagar, Khed, (Affiliated to Savitribai Phule University)	
4.	Prof. (Dr.) Prashant Mothe	(Subject Expert outside University) Aadarsh Mahavidyalay, Umerga, Dharashiv, (Affiliated to Dr. Baba Saheb Ambedkar Marathwada University)	
5.	Mr. Ananda Pandhare	Asst. Professor, Dept. of English, Smt. CHM College	
6.	Ms. Sana Khan	Asst. Professor, Dept. of English, Smt. CHM College	
7.	Dr. Micky Barua	Faculty Vidyalkar Institute of technology, Alumni Member	 MICKY BARUA
8.	Ms. Sofy Verghese	Accenture, Industry Representative	

Name & Signature of the Ad-hoc BoS Chairperson: Prof. (Dr). Kailas Aute



Name & Signature of the Dean: Prof. (Dr). Nitin Arekar



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year**

**Semester - I**

**Title: Indian Knowledge System**

**Vertical - 5  
IKS Subject - 2 Credits**

**With effect from  
Academic Year 2025-2026**

**Title: Indian Knowledge System**  
**Course Code: CHMIKSI**

Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	This course introduces students to the Indian Knowledge System (IKS), emphasizing its historical depth, cultural relevance, and interdisciplinary value. Rooted in the context of Indian civilization, it explores the holistic development of knowledge from ancient to pre-modern times, including contributions in medicine, mathematics, logic, linguistics, governance, arts, and sciences. By revisiting the traditional education systems and intellectual heritage of India, the course encourages learners to connect ancient insights with contemporary disciplines. It aims to enhance awareness, foster appreciation of indigenous wisdom, and reveal the interconnectedness of various streams of knowledge, aligning with the goals of the NEP 2020.
2	<b>Vertical 5</b>	IKS
3	<b>Type &amp; Teaching Methods</b>	Theory + Practicum Lectures/Discussions/Presentations/Case Studies, etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b> <b>CO(A)1:</b> To sensitize the students about context in which they are embedded i.e. Indian culture and civilization including its Knowledge System and Tradition. <b>CO(A)2:</b> To help student to understand the knowledge, art and creative practices, skills and values in ancient Indian system. <b>CO(A)3:</b> To help to study the enriched scientific Indian heritage. <b>CO(A)4:</b> To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.	
8	<b>Course Outcomes:</b> Student will be able to <b>CO1:</b> Understand and appreciate the rich Indian Knowledge Tradition. <b>CO2:</b> Understand the contribution of Indians in various fields. <b>CO3:</b> Experience increase subject-awareness and self-esteem. <b>CO4:</b> Develop a comprehensive understanding of how all knowledge is ultimately intertwined.	

## Syllabus

### UNIT I: Introduction

- **Introduction to IKS** (What is knowledge System, Characteristic Features of Indian Knowledge System)
- **Why IKS?** (Macaulay's Education Policy and its impact, Need of revisiting Ancient Indian Traditions)
- **Scope of IKS** (The Universality of IKS (from Micro to Macro), development form Earliest times to 18th Century CE)
- **Tradition of IKS** (Ancient Indian Education System: Home, Gurukul, Pathashala, Universities and ancient educational centres)
- **Relevant sites in the vicinity of the Institute** (Water Management System at Kanheri, Temple Management of Ambernath, etc.)

### UNIT II

- Medicine (Ayurveda)
- Alchemy
- Mathematics
- Logic
- Art of Governance (Arthashastra)

### UNIT III (Select Any FIVE out of the following)

- Aesthetics
- Town Planning
- Strategic Studies
- Krishi Shastra
- Vyakaran & Lexicography
- Natyashastra
- Ancient Sports
- Astronomy
- Yoga and Wellbeing
- Linguistics
- Chitrasutra
- Architecture
- Taxation
- Banking
- Trade and Commerce

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any two out of five	06
Q2	Attempt any three out of five	12
Q3	Attempt any three out of fifteen	12
<b>TOTAL</b>		<b>30</b>


**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class test during lectures (MCQ / Short notes / Match the pairs / Puzzles)	10
2.	Participation in Workshop / Conference / Seminar / Case Study / Field Visit / Certificate Course / Project presentation / Viva	10
<b>TOTAL</b>		<b>20</b>

**11****REFERENCES:**

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banarasidas, Delhi 1958.
3. History of Chemistry in Ancient India & Medieval India, P. Ray- Indian Chemicals Society, Calcutta 1956.
4. Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of India, New Delhi 1965.
5. MacDonnell A.A- History of Sanskrit literature.
6. Winternitz M- History of Indian Literature Vol. I, II.
7. Dasgupta S.N & De S.K- History of Sanskrit literature Vol' I.
8. Ramkrishna Mission- cultural heritage of India Vol' I, II.
9. Majumdar R. C & Pushalkar A.D- History & culture of the Indian people, Vol. I, II & III.
10. Keith A.B- History of Sanskrit literature.

Name & Signature of the Dean & Adhoc BoS Chairperson (Interdisciplinary):

  
(Dr. Nitin Arekar)



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year**

**Semester- I**

**Title: Cocurricular Course I**

**Vertical - 6  
Cocurricular Course - 2 Credits**

**with effect from  
Academic Year 2025-2026**

**Title: Cocurricular Course - I**

**Course Code: CHMCCI6**

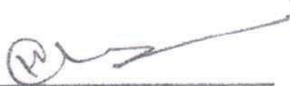
Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	<p>This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year.</p> <p>Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting.</p> <p>This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.</p>
2	<b>Vertical 6</b>	Cocurricular Course (Mandatory)
3	<b>Type Teaching Methods</b>	Non Theory Participation, Report Writing, Presentation etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<ol style="list-style-type: none"> <li>1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities.</li> <li>2. To enhance personal and interpersonal skills through real-life experiences and teamwork.</li> <li>3. To foster a sense of responsibility, leadership, and community engagement among students.</li> <li>4. To develop self-confidence and emotional well-being through creative expression and collaboration.</li> <li>5. To integrate classroom learning with experiential learning for holistic growth.</li> </ol>
8	<b>Learning Outcomes:</b>	<p>By the end of the course, students will be able to:</p> <p><b>LO1:</b> Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences.</p> <p><b>LO2:</b> Demonstrate improved communication, leadership, and teamwork skills.</p> <p><b>LO3:</b> Exhibit increased awareness of social responsibility and civic engagement.</p> <p><b>LO4:</b> Build confidence through creative, cultural, and intellectual expressions.</p> <p><b>LO5:</b> Maintain a portfolio or activity log to track participation and personal development.</p>

9	<b>Syllabus</b>																											
	<b>Unit I - Suggested Areas of Participation in the activities:</b> <ul style="list-style-type: none"> <li>• <b>Cultural Events:</b> Drama, dance, music, literary events, debates, etc.</li> <li>• <b>Social Outreach:</b> Blood donation, awareness campaigns, cleanliness drives.</li> <li>• <b>Clubs &amp; Societies:</b> Photography, quiz, environment club, shram club, etc.</li> <li>• <b>Sports &amp; Fitness:</b> College tournaments, yoga, marathons, fitness challenges.</li> <li>• <b>Institutional Events:</b> Foundation Day, Annual Day, College Festivals, Intercollegiate events.</li> <li>• <b>National Festivals:</b> Independence Day, Republic Day etc.</li> </ul> <b>Unit II - Program Specific Topics</b> <ul style="list-style-type: none"> <li>• <b>Workshops/Seminars:</b> Report Writing, Personality Development, Soft Skills, Leadership Talks.</li> <li>• <b>Speak, Show, Shine:</b> Presentation / Poster Presentation / Viva and Learning Experience</li> </ul> <b>Mode of Evaluation:</b> <ul style="list-style-type: none"> <li>• <b>Faculty Coordinator:</b> To guide and evaluate student progress.</li> <li>• <b>Participation Proof:</b> Certificates, photos, attendance records.</li> <li>• <b>Reflective Journal:</b> Minimum 2-3 pages summarizing experiences, learning, and growth.</li> <li>• <b>Final Viva/Presentation:</b> 5-minute talk on poster presentation and on overall learning.</li> </ul>																											
10	<b>Scheme of Examination and Assessment Pattern</b> <b>Based on 3 approved Activities</b> <b>Semester End External - 30 marks</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Activity No</th> <th style="width: 65%;">Nature of Activities</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Title of Approved Activity - 1</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Title of Approved Activity - 2</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Title of Approved Activity - 3</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table> <b>Internal Examination: Continuous Evaluation – 20 marks</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 85%;">Assessment / Evaluation</th> <th style="width: 10%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Reflective journal</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Presentation/ poster presentation/viva</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </tbody> </table>	Activity No	Nature of Activities	Marks	1.	Title of Approved Activity - 1	10	2.	Title of Approved Activity - 2	10	3.	Title of Approved Activity - 3	10	<b>Total</b>		<b>30</b>		Assessment / Evaluation	Marks	1.	Reflective journal	10	2.	Presentation/ poster presentation/viva	10	<b>Total</b>		<b>20</b>
Activity No	Nature of Activities	Marks																										
1.	Title of Approved Activity - 1	10																										
2.	Title of Approved Activity - 2	10																										
3.	Title of Approved Activity - 3	10																										
<b>Total</b>		<b>30</b>																										
	Assessment / Evaluation	Marks																										
1.	Reflective journal	10																										
2.	Presentation/ poster presentation/viva	10																										
<b>Total</b>		<b>20</b>																										

**Suggested Readings:**

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

**Name & Signature of the Principal & Chairperson, Academic Council:**

  
**Dr. Manju Lalwani Pathak**





**HSNC Board's**  
**Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar**  
**(Autonomous)**  
**Affiliated to the University of Mumbai**

**Bachelor of Science**  
**(Microbiology)**  
**(Aided)**

**Semester – II**

**Choice Based and Credit Based syllabus**  
**as per NEP 2020 with effect from the**  
**Academic Year 2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- II**

**Title: Prokaryotic Architecture and Microbial  
Taxonomy**

**Vertical - 1  
Major Course**

**With effect from  
Academic Year 2026-2027**

## Title: Prokaryotic Architecture and Microbial Taxonomy

**Course Code: CHMMBII1**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This syllabus offers a comprehensive exploration of microbial life, emphasizing both structural biology and microbial diversity. It covers an in-depth study of prokaryotic cell morphology, including variations in size, shape, and arrangement. Key cellular components such as the plasma membrane, cytoplasmic inclusions, and the complex architecture of the cell wall are examined, with special attention to the differences between Gram-positive and Gram-negative bacteria. The course also covers external structures like capsules, slime layers, flagella, fimbriae, and pili, along with the formation and significance of bacterial endospores. A comparative overview of prokaryotic and eukaryotic cells provides a foundational context for understanding microbial complexity. Expanding beyond bacteria, the syllabus introduces various microbial groups, including viruses, archaea, actinomycetes, protozoa, algae, and atypical bacteria such as Rickettsia, Coxiella, Chlamydia, and Mycoplasma. Each group is studied for its structural features, general properties, and biological significance, offering students a broad perspective on the diversity and roles of microorganisms in nature and human health.
2	<b>Vertical 1</b>	Major
3	<b>Type</b>	Theory
	<b>Teaching method</b>	Lecture/ Presentation/ Discussion/ Industrial visit
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To introduce students to the morphology, ultrastructure, and functional organization of prokaryotic cells, including cell membranes, cell walls, and external appendages.</p> <p><b>CO(A)2:</b> To explain the structure, composition, and physiological significance of cellular components such as ribosomes, inclusion bodies, endospores, and other specialized structures of prokaryotic cells.</p> <p><b>CO(A)3:</b> To provide knowledge of bacterial taxonomy and the distinguishing characteristics of prokaryotic and eukaryotic cells.</p> <p><b>CO(A)4:</b> To familiarize students with the structure, classification, and biological significance</p>

	<p>of viruses and other acellular and atypical microorganisms.</p> <p><b>CO(A)5:</b> To impart fundamental understanding of the diversity, classification, general characteristics, and importance of fungi, archaea, actinomycetes, protozoa, and algae.</p> <p><b>CO(A)6:</b> To develop an understanding of the ecological, medical, agricultural, and industrial significance of different groups of microorganisms and their role in nature and human welfare.</p>
--	---

<p><b>8</b></p>	<p><b>Course Outcomes:</b> Upon completion of the course, students will be able to:</p> <p><b>CO1</b> describe the morphology, structure, and functions of various components of prokaryotic cells, including the cell wall, plasma membrane, cytoplasmic inclusions, and external appendages.</p> <p><b>CO2</b> differentiate between Gram-positive and Gram-negative bacteria and explain the structure, formation, and significance of bacterial endospores.</p> <p><b>CO3</b> compare the structural and functional characteristics of prokaryotic and eukaryotic cells and understand the basis of bacterial taxonomy.</p> <p><b>CO4</b> explain the structure, classification, and biological significance of viruses and other atypical microorganisms such as rickettsiae, chlamydiae, mycoplasmas, and archaea.</p> <p><b>CO5</b> classify and describe the general characteristics, diversity, and significance of fungi, actinomycetes, protozoa, and algae.</p> <p><b>CO6</b> evaluate the ecological, medical, agricultural, and industrial importance of various groups of microorganisms and their roles in human welfare and the environment.</p>
-----------------	---

## Syllabus

### UNIT I: Prokaryotic Cell Structure

- **Morphology of Prokaryotic Cells:** Size, Shape, and Arrangement
- **Plasma Membrane:** The Fluid Mosaic Model, functions
- **Cytoplasm:** Ribosomes, Magnetosomes, gas vesicles, PHB granules, Metachromatic granules
- **Cell wall structure:** Peptidoglycan Structure, Gram-Positive and Gram-Negative Cell Walls, Lipopolysaccharide layer, Functions of the cell wall
- **Components external to cell wall:** capsule, slime layer, flagella, fimbriae, and pili
- **Bacterial endospores:** Structure and significance, stages in endospore formation
- **Bacterial Taxonomy:** Introduction
- Comparison of Prokaryotic and Eukaryotic Cells

### UNIT II: Study of Different Groups of Microbes

- **Viruses:** Structure of viruses-capsids, envelopes, genomes
- **Fungi:** Introduction, classification, general properties, and significance
- **Rickettsia, Coxiella, Chlamydia, Mycoplasma:** Introduction, general properties, and significance
- **Actinomycetes:** Introduction, classification, general properties, and significance
- **Archaea:** Introduction, classification, general properties, and significance
- **Protozoa:** Introduction, classification, general properties, and significance
- **Algae:** Introduction, classification, general properties, and significance

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**A. External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-1	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/ Assignment)	15
2.	Overall conduct as a responsible student attentiveness and attendance	5
		<b>Total 20</b>

11

**REFERENCES:**

1. Prescott, Hurley Klein-Microbiology, 7<sup>th</sup> edition, International edition, McGraw Hill
2. Michael T. Madigan & J. M. Martinko, D. Stahl, D. Clark Brock Biology of Microorganisms 13<sup>th</sup> ed. International Edition 2012, Pearson Prentice Hall
3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5th Edition
4. Kathleen Park Talaro & Arthur Talaro - Foundations in Microbiology International edition 2002, McGraw Hill
5. Stanier, Ingraham et al, General Microbiology 4th & 5th Ed. 1987, Macmillan Education Ltd

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- II**

**Title: Practical Study of Different Groups of  
Organisms**

**Vertical - 1  
Major Course**

**With effect from  
Academic Year 2026-2027**

**Title of the course: Practical study of different groups of organisms****Course Code: CHMMBII2**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course:</b>	This course provides hands-on training in advanced microbiological techniques for studying bacteria, fungi, algae, protozoa, and bacteriophages. Students will learn staining methods for cellular components such as the nucleus, capsule, cell wall, and endospores, along with motility observation using the hanging drop method. The course emphasizes fungal cultivation on Sabouraud's and Potato Dextrose Agar, slide culture techniques, and wet mount preparation for morphological analysis. It also includes algae cultivation and microscopic examination of permanent slides of algae and protozoa. Viral studies are introduced through demonstrations of spot and plaque assays for bacteriophages. Special staining techniques for lipid, flagella, metachromatic granules, and spirochaetes are covered to enhance diagnostic skills. Students will also gain proficiency in micrometry for measuring bacterial cell size. This course equips learners with essential laboratory skills for careers in microbiology, biotechnology, and clinical diagnostics.
<b>2</b>	<b>Vertical 1</b>	Major
<b>3</b>	<b>Type</b>	Practical
	<b>Teaching Methods</b>	Lecture/ Practical/ Demonstration/ Industrial visits
<b>4</b>	<b>Credit</b>	2 Credits
<b>5</b>	<b>Hours allotted</b>	60 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks

7	<p><b>Course Objectives:</b></p> <p><b>CO(A)1:</b> To familiarize students with various staining techniques used for the visualization of cellular structures and specialized components of microorganisms.</p> <p><b>CO(A)2:</b> To impart practical knowledge of bacterial motility determination and microscopic examination of microbial cells.</p> <p><b>CO(A)3:</b> To provide hands-on training in the cultivation, isolation, and maintenance of fungi and algae using appropriate culture media and techniques.</p> <p><b>CO(A)4:</b> To develop students' skills in the identification and characterization of fungi, algae, and protozoa based on their morphological features.</p> <p><b>CO(A)5:</b> To introduce students to bacteriophages and demonstrate methods such as spot assay and plaque assay for studying viral infection of bacteria.</p> <p><b>CO(A)6:</b> To train students in the measurement of microbial cell dimensions using micrometry and to interpret microscopic observations for microbial characterization.</p>
8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, students will be able to:</p> <p><b>CO1</b> perform various staining techniques for the visualization of microbial structures.</p> <p><b>CO2</b> demonstrate bacterial motility studies using hanging drop and stab inoculation methods and interpret the observed results.</p> <p><b>CO3</b> cultivate fungi and algae using appropriate culture media and maintain microbial cultures under laboratory conditions.</p> <p><b>CO4</b> identify and characterize fungi, algae, and protozoa based on their morphological and microscopic characteristics.</p> <p><b>CO5</b> explain the principles of bacteriophage assays and interpret the results of spot assay and plaque assay techniques.</p> <p><b>CO6</b> measure microbial cell dimensions using micrometry and analyze microscopic observations for the characterization and identification of microorganisms.</p>

## Syllabus

1. Staining of Nucleus – Giemsa's Method
2. Motility study of bacteria: Hanging drop method (Demonstration) /Stab Inoculation Method
3. Cultivation of fungi on
  - i. Sabouraud's agar
  - ii. Potato dextrose agar
4. Slide Culture technique: Fungal Cultures (*Penicillium* /*Aspergillus*/ *Mucor* /*Rhizopus*)
5. Fungal wet mounts and study of morphological characteristics
6. Cultivation of Algae
7. Permanent slides of algae and protozoa
8. Spot assay and plaque assay of Bacteriophage (Demonstration)
9. Special staining:
  - i. Cell wall
  - ii. Capsule
  - iii. Endospore
  - iv. Flagella(demonstration)
  - v. Lipid
  - vi. Metachromatic granules
  - vii. Spirochaetes (demonstration)
10. Measurement of bacterial cell size- Micrometry

<b>10</b>	<p><b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"> <b>Internal Continuous Assessment: 40% (20 Marks)</b> </th> <th style="text-align: center;"> <b>Semester End Examination: 60% (30 Marks)</b> </th> <th style="text-align: center;"> <b>Duration for End semester examination</b> </th> </tr> </thead> <tbody> <tr> <td>           Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Industrial visit /Overall performance (5 Marks) = 20 Marks         </td> <td style="text-align: center;">           Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)         </td> <td style="text-align: center;">           2 hours each day (2 days)         </td> </tr> </tbody> </table>	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>	Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Industrial visit /Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>					
Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Industrial visit /Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)					
<b>11</b>	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Prescott, Hurley Klein-Microbiology, 7<sup>th</sup> edition, International edition, McGraw Hill</li> <li>2. Michael T. Madigan &amp; J. M. Martinnko, D. Stahl, D. Clark Brock Biology of Microorganisms 13<sup>th</sup> ed. International Edition 2012, Pearson Prentice Hall</li> <li>3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5th Edition</li> <li>4. Kathleen Park Talaro &amp; Arthur Talaro - Foundations in Microbiology International edition 2002, McGraw Hill</li> </ol>						

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- II**

**Not Applicable**

**Vertical - 2  
Minor Course**

**With effect from  
Academic Year 2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- II**

**Title: Basics of Nutrition-2**

**Vertical - 3  
Open Elective**

**With effect from  
Academic Year 2026-2027**

## Title: Basics of Nutrition-2

**Course Code: CHMMBI3**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course provides an in-depth understanding of major food groups and their importance in human nutrition. It covers the structure, composition, and nutritional value of cereals, millets, pulses, fats, oils, and animal-based foods. Key processing techniques such as milling, parboiling, enrichment, fortification, refining, and hydrogenation are detailed. The course also examines quality parameters and cooking applications of various foods. Through this course, learners will gain the skills to design balanced diets and apply food processing principles to meet nutritional needs.
2	<b>Vertical 3</b>	Open Elective (OE)
3	<b>Type</b> <b>Teaching Methods</b>	Theory + Practicum Lecture/ Presentation/ Discussion/ Case studies
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>  <b>CO(A)1:</b> To develop a comprehensive understanding of the structure, composition, and nutritional significance of cereals, millets, and their processed products. <b>CO(A)2:</b> To examine the nutritional properties, germination processes, and protein quality of pulses and nuts for dietary planning. <b>CO(A)4:</b> To understand the chemistry, processing techniques, and cooking characteristics of fats and oils. <b>CO(A)5:</b> To analyze the composition, nutritive value, and quality parameters of animal-based foods, including meat, poultry, and fish.	
8	<b>Course Outcomes:</b> Upon completion of the course, student will be able to:  <b>CO1</b> evaluate and compare the nutritional profiles of cereals, millets, pulses, and animal foods while recommending appropriate processing and preparation methods. <b>CO2</b> assess the properties, processing techniques, and culinary applications of fats and oils, considering their smoking points and health implications.	

**CO3** apply principles of food fortification, enrichment, and balanced diet planning using diverse food groups.

9

## Syllabus

### UNIT I: Cereals, millets and pulses

#### Cereals and Cereal Products

##### Rice and Wheat

- Structure and nutritive value of rice, wheat
- Milling processes for rice and wheat
- Parboiling of rice: process and benefits
- Products derived from wheat
- Products derived from rice

##### Millets

- Nutritional importance of major millets:
  - Maize
  - Jowar (sorghum)
  - Ragi (finger millet)
  - Bajra (pearl millet)
  - Other minor millets
- Diet planning incorporating millets

##### Cereal Processing

- Enrichment of cereals and flours
- Fortification of cereals and flours

##### Pulses and Nuts

##### Nutritional Aspects

- Nutritive value of pulses and nuts
- Factors affecting cooking quality of pulses
- Protein-rich diet planning strategies

##### Germination

- Germination process for pulses
- Advantages of consuming germinated pulses

### UNIT 2 Fats, oils and animal foods

#### Fats and Oils

##### Processing and Properties

- Composition of fats and oils
- Processing methods

- Refining of fats and oils
- Production of refined oils
- Hydrogenation process
- Winterization process

#### **Cooking Characteristics**

- Smoking point definition
- Factors that lower smoking point
- Fat absorption during cooking process

#### **Animal Foods**

##### **Meat**

- Types of meat available
- Different cuts of meat

##### **Poultry**

- Composition and nutritional content
- Classification of poultry products

##### **Fish**

- Selection criteria for fresh fish
- Composition and nutritive value

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**A. External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

<b>Question No</b>	<b>Nature of Questions</b>	<b>Marks</b>
Q1	Attempt any three questions out of six (5 marks each) based on Unit 1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit 2	15
<b>Total 30</b>		

**Note:**

1. Equal Weightage is to be given to all the sub-topics

**B. Internal Examination: Continuous Evaluation - 20 marks**

	<b>Assessment / evaluation</b>	<b>Marks</b>
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles, Assignment)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
<b>Total 20</b>		

11

**REFERENCES:**

1. Fundamentals of Foods, Nutrition And Diet Therapy, Sumati R Mudambi, New Age International Private Limited.
2. Rujuta Diwekar (2016). *Indian superfoods: Change the way you eat*. Westland.
3. Indian food Composition Tables (Jan 2017), First Edition, National Institute of Nutrition.
4. Shakuntala Manay, Shadaksharaswamy. M (2000) Foods, Facts and Principles, New Age International Pvt Ltd Publishers, 2nd Edition.
5. Srilakshmi, B. Food Science, New Age International Publishers, New Delhi, 2010.
6. Swaminathan, M, Hand Book of Food Science and Experimental Foods, BAPPCO, Bangalore, 1992.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- II**

**Title: Techniques in Food and Water  
Analysis**

**Vertical - 4  
Vocational Skill Course (VSC)  
Practical Based**

**With effect from  
Academic Year 2026-2027**

## Title: Techniques in Food and Water Analysis

**Course Code: CHMMBII4**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course introduces students to essential microbiological techniques for analyzing food and water quality. It covers the identification of spoilage in fruits, vegetables, and canned foods through physical and microscopic examination, and includes isolation of pectinolytic organisms. Students will learn to assess microbial heat resistance using Thermal Death Time (TDT) and Thermal Death Point (TDP), and evaluate the preservative effects of salt and sugar through Minimum Inhibitory Concentration (MIC) testing. The water analysis segment focuses on determining microbial load in potable water using Standard Plate Count and detecting coliforms through presumptive, confirmed, and completed tests. Additionally, students will identify fecal streptococci to assess water safety. The course emphasizes hands-on laboratory skills and prepares students for roles in food safety, public health, and environmental microbiology.
2	<b>Vertical 4</b>	Vocational Skill Course (VSC)
3	<b>Type</b> <b>Teaching Methods</b>	Practical Hands-on experiments/ Presentation/ Discussion/ Demonstration/ Industrial visit
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To introduce students to the principles and techniques involved in the microbiological analysis of food and water samples.</p> <p><b>CO(A)2:</b> To familiarize students with the physical and microscopic examination of spoiled fruits, vegetables, and canned foods and the microorganisms associated with food spoilage.</p> <p><b>CO(A)3:</b> To provide practical training in the isolation and characterization of pectinolytic microorganisms involved in the deterioration of fruits and vegetables.</p>

	<p><b>CO(A)4:</b> To impart knowledge of thermal processing parameters, including Thermal Death Time (TDT) and Thermal Death Point (TDP), and their significance in food preservation.</p> <p><b>CO(A)5:</b> To develop students' skills in assessing microbial quality of water through standard plate count and the detection of indicator microorganisms.</p> <p><b>CO(A)6:</b> To train students in the identification of waterborne contamination using coliform and fecal streptococci tests, including presumptive, confirmed, completed, and MUG tests.</p>
--	---

<p><b>8</b></p>	<p><b>Course Outcomes:</b> Upon completion of the course, student will be able to:</p> <p><b>CO1</b> examine and interpret the physical and microscopic characteristics of spoiled fruits, vegetables, and canned foods to identify signs of microbial spoilage.</p> <p><b>CO2</b> isolate and characterize pectinolytic microorganisms associated with the spoilage of fruits and evaluate their role in food deterioration.</p> <p><b>CO3</b> determine the Thermal Death Time (TDT) and Thermal Death Point (TDP) of microorganisms and explain their significance in food preservation and processing.</p> <p><b>CO4</b> assess the effect of salt concentration on microbial growth and interpret the role of salt in food preservation.</p> <p><b>CO5</b> perform microbiological analysis of potable water using standard plate count methods and evaluate the microbial quality of water samples.</p> <p><b>CO6</b> detect and interpret indicators of water contamination by performing coliform tests (presumptive, confirmed, completed, and MUG tests) and the determination of fecal streptococci in water samples.</p>
-----------------	--

9

## Syllabus

### Food analysis

- Physical and microscopic observation of spoilt Fruit and vegetables, canned foods
- Isolation of Pectinolytic organism from spoilt fruit
- Determination of TDT
- Determination of TDP
- Salt tolerance

### Water analysis

- Standard Plate Count of potable water
- Detection of Coliforms in water:
  - Presumptive Test
  - Confirmed Test
  - Completed Test
  - MUG Test
- Determination of Fecal Streptococci in water sample

<b>10</b>	<b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b>		
<b>11</b>	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. Prescott, Hurley, Klein Microbiology, 10<sup>th</sup> edition, International edition, McGraw Hill.</li> <li>2. Tortora, Funke &amp; Case Microbiology, an Introduction 9<sup>th</sup> and 11<sup>th</sup> edition, Pearson education</li> <li>3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5<sup>th</sup> Edition</li> <li>4. Varghese N., Joy P. P. Microbiology Laboratory Manual, (2014) 1<sup>st</sup> ed, Aromatic and Medicinal Plants Research Station, Ernakulam, Kerala, India</li> <li>5. Biochemical Methods by S. S. Desai.</li> <li>6. Biochemistry Laboratory Manual by Rodney F. Boyer.</li> </ol>		

<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>
Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B. Sc.  
(Microbiology)**

**Semester- II**

**Title: Human - Microbe interactions**

**Vertical - 4  
Skill Enhancement Course (SEC)  
Practical Based**

**With effect from  
Academic Year 2026-2027**

## Title: Human - Microbe interactions

Course Code: CHMMBI15

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course offers a comprehensive introduction to medical microbiology, focusing on the human body's normal flora, microbial transmission, virulence factors, and common infectious diseases. Students will explore the distribution and role of normal flora across various anatomical sites, including the skin, oral cavity, respiratory and gastrointestinal tracts. Emphasis is placed on hands-on laboratory techniques such as Gram staining, culture methods using selective and differential media, and microbial identification. The course also investigates the role of fomites and aerosols in disease transmission, with practical exercises like cough plate techniques and fingerprint assays to assess sanitation effectiveness. Students will study key microbial virulence factors haemolysin, coagulase, and lecithinase and their role in pathogenesis. Additionally, the course introduces the use of specialized media for isolating pathogens responsible for diseases such as typhoid, gastroenteritis, and influenza. By integrating theoretical knowledge with practical skills, this course prepares students for further studies in microbiology, public health, and clinical diagnostics.
2	<b>Vertical 4</b>	Skill Enhancement Course (SEC)
3	<b>Type</b> <b>Teaching Methods</b>	Practical Hands-on experiments/ Presentation/ Discussion/ Demonstration/ Industrial visit
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To introduce students to the normal microbial flora associated with different regions of the human body and their significance in maintaining human health.</p> <p><b>CO(A)2:</b> To provide practical training in the isolation, staining, cultivation, and characterization of normal microbial flora from the skin and oral cavity using appropriate microbiological techniques.</p> <p><b>CO(A)3:</b> To familiarize students with the concepts of fomites, aerosols, and droplet nuclei and their roles in the transmission of microorganisms.</p>

	<p><b>CO(A)4:</b> To develop students' skills in assessing microbial contamination of environmental surfaces and evaluating the effectiveness of sanitization practices.</p> <p><b>CO(A)5:</b> To impart knowledge of important microbial virulence factors and their role in the pathogenicity of microorganisms.</p> <p><b>CO(A)6:</b> To train students in the use and applications of enrichment, selective, differential, and transport media for the isolation, identification, and handling of pathogenic microorganisms.</p>
--	--

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, students will be able to:</p> <p><b>CO1</b> describe the distribution and significance of normal microbial flora associated with different regions of the human body and explain their role in human health.</p> <p><b>CO2</b> perform Gram staining, isolation, and cultivation of normal flora from skin and oral cavity samples using appropriate microbiological media.</p> <p><b>CO3</b> explain the modes of microbial transmission through fomites, aerosols, and droplet nuclei and evaluate their importance in the spread of infections.</p> <p><b>CO4</b> assess microbial contamination of environmental surfaces and demonstrate the effectiveness of sanitization practices using fingerprint and fomite studies.</p> <p><b>CO5</b> analyze microbial virulence factors such as haemolysin, coagulase, and lecithinase and interpret their significance in microbial pathogenicity.</p> <p><b>CO6</b> select and utilize enrichment, selective, differential, and transport media for the isolation, cultivation, and preliminary identification of pathogenic microorganisms.</p>
-----------------	---

## Syllabus

- Overview of Normal flora of the human body: Skin, Nose & Nasopharynx, Oropharynx, Respiratory tract, Eye, External ear, Mouth, Stomach, Small intestine, Large intestine, Genitourinary tract
- Study of normal flora
  - i. Skin- Gram staining, isolation on NA, SIBA, Sabouraud's agar
  - ii. Oral cavity - Gram staining, isolation on NA, SIBA, Sabouraud's agar
  
- Common terminologies: Fomite, aerosols, droplet nuclei
- Cough plate technique
- Study of Fomites:
  - i. Table top
  - ii. Door handles
  - iii. Cell phones/Ear pods/Earphones
  - iv. Hand bags
- Fingerprints on NA plate- before and after sanitization
- Overview of Microbial virulence factors and common terms Study of virulence factors
  - i. Haemolysin
  - ii. Coagulase
  - iii. Lecithinase
  
- Use of Enrichment / Selective / Differential media for pathogens
  - i. Enrichment media - Tetrathionate / Selenite F
  - ii. Differential - SS/ XLD
  - iii. Selective - Baird Parker/Salt Mannitol agar
  - iv. Transport media - Cary and Blair Medium / Stuart's medium

10	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><b>Internal Continuous Assessment: 40% (20 Marks)</b></th> <th style="text-align: center;"><b>Semester End Examination: 60% (30 Marks)</b></th> <th style="text-align: center;"><b>Duration for End semester examination</b></th> </tr> </thead> <tbody> <tr> <td>Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks</td> <td style="text-align: center;">Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)</td> <td style="text-align: center;">2 hours each day (2 days)</td> </tr> </tbody> </table>	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>	Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>					
Minor experiment /Viva/ objective question test/ Assignment (15 Marks), Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)					
11	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Soil Microbiology by Subbarao N.S. 3rd Ed.</li> <li>2. A Handbook of Elementary Microbiology, 2014 by H.A. Modi</li> <li>3. Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg Microbiology TMH 5<sup>th</sup> Edition</li> <li>4. Practical Microbiology by Maheshwari D.K. (Author), 2010</li> </ol>						



**HSNC Board's**  
**Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar**  
**(Autonomous)**  
**Affiliated to the University of Mumbai**

**Bachelor of Commerce/  
Arts/Science/ SFC  
(Sindhi)**  
**(AEC – Ability Enhancement Course)**  
**(Aided Course)**

**Semester – II**

**Choice Based and Credit Based syllabus**  
**as per NEP 2020 with effect from the**  
**Academic Year 2025-2026**

## **PREAMBLE**

The Bachelor of Commerce (B.Com.) in Sindhi is a comprehensive program designed to develop Sindhi language. Language is the soul of Literature. Sindhi is medium of Communication, Education and Cultural exchange. Curriculum is designed specially in digital age.

Language enriches literature. This curriculum is prepared according to Social, Cultural and Academic needs. The B.Com. Sindhi subject offers students a unique opportunity to explore and widened Sindhi Culture through a wide range of literary programs. The curriculum not only emphasizes literary appreciation and analysis but also fosters ethical awareness, intercultural sensitivity and social responsibility.

The program is committed to developing critical thinking, ethical reasoning and inclusive perspectives. It encourages students to reflect and engage with communication in Sindhi, expertise in Business and Employment Creative work, meditation and listening, use of visual tails, expertise of asking questions, knowledge of different languages through communication.

Language allows us to share our ideas, thoughts, feelings and emotions with others through communication. There is a special contribution of the ideal citizen in nation building. It plays crucial role in creating civilized society.

## **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

**PSO-1** Students will understand the communication skills and role of language in communication.

**PSO-2** Students will be able to talk effectively in Sindhi language with friends, relatives and Business customers.

**PSO-3** Students will understand aspects of language.

**PSO-4** Students will be able to understand the Importance of communication, and they will communicate in different ways i.e. verbal, non-verbal, written and Digital methods.

**Smt**  
**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**First Year**

**Semester- II**

**Title: Communication Skills in Sindhi**

**Vertical - 5**  
**Ability Enhancement Course**  
**2 Credit**

**with effect from**  
**Academic Year 2025-2026**

**Title: Communication Skills in Sindhi**  
**COURSE CODE: CHMSINIAEC**

Sr. No.	Heading	Particulars
<b>1</b>	<b>Description the Course:</b>	Communication is the core component of commerce and trade. In communication, language plays very significant role. If a student has mastered the skills of language, undoubtedly, he or she would be able to communicate in the best manner. In this course basic part of Sindhi language would be taught based on the NEP 2020. Innovative approaches like critical thinking, creative mind, and use of technology will lead to communicating and participating with different groups. The vocabulary section would be given prominence. The course would be in the Devanagari script so that it can attract majority of the students. Even non-Sindhi students shall have opportunity to adopt this course.
<b>2</b>	<b>Vertical 1</b>	AEC – Ability Enhancement Course
<b>3</b>	<b>Type</b>	Theory + Practicum (Teaching Method: Lecture/ Discussion/Reading)
<b>4</b>	<b>Credit</b>	2 credits (1 credit = 15 hours for theory or 30 hours of Practical work in a semester)
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50Marks
<b>7</b>	<b>Course Objectives:</b> After successful completion of this course: <b>CO(A) 1:</b> The learner will get understanding of communication skills. <b>CO(A) 2:</b> The learner will understand how to accurate the pronunciation of special words in Sindhi <b>CO(A) 3:</b> The learner will improve the conversation skill in Sindhi. <b>CO(A) 4:</b> The learner will become best communicator in Sindhi language	
<b>8</b>	<b>Course Outcomes:</b> Student will be able to <b>CO1:</b> Know the basic special features of Sindhi language. <b>CO2:</b> Understand communication skills. <b>CO3:</b> Knowing the conversation with businessmen and customers <b>CO4:</b> Know the etiquettes with parents, relatives, friends and others in effective way	

**Communication Skills in Sindhi****UNIT I: Everyday & Professional Communication in Sindhi**

- Daily Life Conversation Skills: Greetings and introductions, asking for information, making requests/giving instructions, small talk in simple Sindhi
- Workplace & Business Communication: Customer interaction, Office enquiries, permissions, complaints, Bank/shop/travel conversation, Basic telephone conversation, Short Event Reports

**UNIT II: Digital & Modern Communication in Sindhi**

- Email & Message Writing: Professional emails, WhatsApp/SMS etiquette, Announcements, reminders
- Product and Promotive Communication: Short ads, Taglines & slogans, Simple product description, Pitch Presentation, Interview / Communication for Market

\*\*\*\*\*

## Syllabus

### Communication Skills in Sindhi

#### यूनिट १: रोज़मरह जी जिंदगी में गुफ्तगू (सिंधीअ में):

- वाकुफ़ियत डियण ऐ ज़ाण हासुल करण, वैंती मोकिलण, अर्ज करण, हिदायतूं डियण, सौली सिंधीअ में ग़ालाईण.
- कम करण वारी जग़ह ते राबतो ऐ कारोबारी राबतो: ग्राहकनि सा गुफ्तगू, ऑफिस में पूछताछ, परमीशन, शिकायत पत्र, बैंक जे करमचारियुनि सा गुफ्तगू, ग्राहकनि सा ग़ालिहाइणि, बेसिक टेलीफोनिक संवादु, नंडे जशन जी रिपोर्ट.

#### यूनिट २: डिजिटल ऐ आधुनिक संवादु (सिंधी में):

- ईमेल ऐ मैसेज लिखण, पेशेवर ईमेल, वाट्सप ऐ समसे (Message) जा शिष्टाचार (Etiquettes), घोषणा याद डियारण वारो नोट (Reminders),
- उत्पाद ऐ प्रचार प्रसार संवादु, नंडो विज्ञापन (Small Ads), टैगलाइन ऐ स्लोगन सौलो उत्पाद वर्णन.
- पिच प्रिन्टेशन, इंटरव्यू, मार्केट रिसर्च जे लाइ संवादु.

\*\*\*\*\*

<b>10</b>	<b>Scheme of Examination and Assessment Pattern</b>		
	Paper – 50 Marks		
	<b>External Examination: Semester End External - 30 marks Time: 1:00 hour</b>		
	Format of Question Paper		
	<b>Question No</b>	<b>Nature of Questions</b>	<b>Marks</b>
	Q1.A)	Objective Type Questions (Unit- I)	05
	Q1. B)	Attempt ANY 2 out of 4- (5 marks each) (Unit-I)	10
	Q2.A)	Objective Type Questions (Unit- II)	05
	Q2. B)	Attempt ANY 2 out of 4- (5 marks each) (Unit-II)	10
	<b>Total</b>		<b>30</b>
<b>Internal Examination: Continuous Evolution - 20 marks</b>			
		<b>Total 30</b>	
	<b>Assessment / evaluation</b>	<b>Marks</b>	
1.	<b>Written assignment on any one of the following topics</b> 1) Draft a formal letter and formal E_mail in Sindhi 2) Write a conversation between Customer and Shopkeeper, Nurse and patient. (Students are required to use AI assistance in the preparation of their drafts. Eg: Notion AI, Powtoon, Elicit)	15	
2.	Class Attendance and Participation	05	
<b>Total</b>		<b>20</b>	
<b>11</b>	<b>REFERENCE BOOKS:</b>		
	1. Sanchari Basha – By Dr. Pushpa Kodwani		
	2. Sindhi Pahakaa – Dr. Jetly M.K.		
	3. Sindhi Muhavahra – By Hardwani Lachhman		
	4. Sindhi Adhyat mak Shabdhkesh – By Hardwani Lachhman		
	5. Acho Sindhi Sikhu – By Hardwani Lachhman		

Name & Signature of the BoS Chairperson: (Mrs. Kajal Ramchandani) \_\_\_\_\_

Name & Signature of the Dean: (Dr. Nitin Arekar) \_\_\_\_\_

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year B.Sc.**

**Semester- II**

**Vertical – 5**

**Ability Enhancement Course (English)  
2 Credits**

**with effect from  
Academic Year 2026-2027**

**Title: Advanced English for Workplace and Academic Communication**  
**Course Code: CHMBSCAECII**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	<p>In an increasingly competitive academic and professional landscape, learners require advanced communication skills that enable clarity, precision, critical thinking, and professionalism. This course focuses on practical, real-world communication abilities needed for college-level academic work, job applications, workplace collaboration, and digital interactions.</p> <p>Through hands-on tasks, real-world assignments, and communication practice, learners become adept in using English confidently and appropriately in diverse settings.</p>
2	<b>Vertical 5</b>	<b>AEC: Advanced English for Workplace and Academic Communication</b>
3	<b>Type</b> Teaching Methods:	Theory+ Practicum (Lecture/ Discussion/ Presentation/ Reading sessions/ Worksheets/ etc.)
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>1. To develop advanced communication skills required for academic and professional success.</li> <li>2. To train learners in report writing, summary writing, and formal documentation.</li> <li>3. To enhance proficiency in digital and virtual communication platforms.</li> <li>4. To strengthen presentation, interview, and workplace communication skills.</li> <li>5. To build confidence in expressing ideas clearly to varied audiences.</li> </ol>	
8	<p><b>Learning Outcomes:</b> After completing this course, learners will be able to:</p> <p><b>LO-1:</b> Demonstrate clarity, precision, and professionalism in communication.</p> <p><b>LO-2:</b> Interpret and summarize written texts, visuals, and data accurately.</p> <p><b>LO-3:</b> Prepare well-structured reports, emails, and professional documents.</p>	

**LO-4:** Use digital tools and virtual communication etiquette effectively.  
**LO-5:** Communicate confidently in interviews, presentations, and teamwork situations

9

## Syllabus

### UNIT I: Communication for Academic & Professional Settings (15 Hours)

#### A. Communication in Academic & Workplace Contexts

1. Features of formal communication
2. Audience-centered communication
3. Ethics in communication: integrity, attribution, clarity
4. Explaining concepts in simple and clear language
5. Interpreting graphs, charts, tables, and infographics
6. Summarizing data concisely

#### B. Grammar & Style for Professional Writing

1. Tone: formal, neutral, objective
2. Avoiding redundancy and ambiguity
3. Active vs. passive structures
4. Editing, revising, and proofreading techniques

### UNIT II: Practical Documentation & Employability Skills (15 Hours)

1. Report writing (academic/field-based/observational)
2. Project summary reports
3. Preparing short presentations
4. Creating informational posters or digital slides
5. Writing a formal complaint or request email
6. Creating a short informational or awareness write-up

10

### Scheme of Examination and Assessment Pattern

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00 hour**

Format of Question Paper

All questions are compulsory:

Question No	Nature of Questions	Marks
Q. 1	<b>Short Notes</b> (Attempt any 3 out of 5) - <b>Unit 1</b> <b>OR</b> Attempt <b>Essay Type</b> question. (1 out of 2) - <b>Unit 1</b>	15
Q. 2	<b>Short Notes</b> (Attempt any 3 out of 5) - Unit 2 <b>OR</b>	15

	Attempt <b>Essay Type</b> question. (1 out of 2) - Unit 2	
	<b>Total</b>	<b>30</b>

**Internal Examination: Continuous Evaluation - 20 marks**




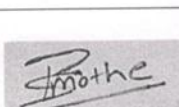
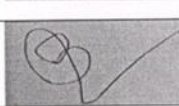

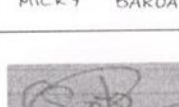
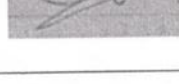
	<b>Assessment / evaluation</b>	<b>Marks</b>
1.	Assignments on <b>any one</b> of the following topics: Academic/Scientific Report/ Informational Poster / Digital Infographic (Students are required to use AI assistance in the preparation of their drafts. Eg: Notion AI, Otter.ai, Grammarly, Google Gemini, Canva, Piktochart, etc)	15
2.	Class Attendance and Participation	05
	<b>Total</b>	<b>20</b>

**11**

**References:**

1. Adler, Ronald B., et al. *Understanding Human Communication*. 15th ed., Oxford UP, 2021.
2. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. 5th ed., Routledge, 2018.
3. Cargill, Margaret, and Patrick O'Connor. *Writing Scientific Research Articles*. Wiley-Blackwell, 2013.
4. Eastwood, John. *Oxford Guide to English Grammar*. Oxford UP, 2005.
5. Gerson, Sharon J., and Steven M. Gerson. *Technical Communication: Process and Product*. 9th ed., Pearson, 2021.
6. Hewings, Martin. *Advanced Grammar in Use*. Cambridge UP, 2013.
7. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. 2nd ed., Oxford UP, 2018.
8. McCarthy, Michael, and Felicity O'Dell. *Academic Vocabulary in Use*. Cambridge UP, 2008.
9. Nordquist, Richard. *The Essentials of English Grammar*. McGraw-Hill Education, 2016.
10. Seely, John. *The Oxford Guide to Writing and Speaking*. Oxford UP, 2005.
11. Zinsser, William. *On Writing Well: The Classic Guide to Writing Nonfiction*. Harper Perennial, 2016.

### Syllabus Committee:

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Prof. (Dr.) Kailas Aute	Professor & Head, Dept. of English, Smt. CHM College	
2.	Prof. (Dr.) B. R. Hiramani,	(VC Nominee, University of Mumbai) Pancham Khemraj College, Sawantwadi	
3.	Prof. (Dr.) Vikas Raskar	(Subject Expert outside University) Hutatma Rajguru Mahavidyalay, Rajguru Nagar, Khed, (Affiliated to Savitribai Phule University)	
4.	Prof. (Dr.) Prashant Mothe	(Subject Expert outside University) Aadarsh Mahavidyalay, Umerga, Dharashiv, (Affiliated to Dr. Baba Saheb Ambedkar Marathwada University)	
5.	Mr. Ananda Pandhare	Asst. Professor, Dept. of English, Smt. CHM College	
6.	Ms. Sana Khan	Asst. Professor, Dept. of English, Smt. CHM College	
7.	Dr. Micky Barua	Faculty Vidyalankar Institute of technology, Alumni Member	 MICKY BARUA
8.	Ms. Sofy Verghese	Accenture, Industry Representative	

Name & Signature of the Ad-hoc BoS Chairperson: Prof. (Dr.) Kailas Aute :



Name & Signature of the Dean: Prof. (Dr.) Nitin Arekar



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year**

**Semester- II**

**Title: Cocurricular Course I**

**Vertical - 6  
Cocurricular Course - 2 Credits**

**with effect from  
Academic Year 2025-2026**

**Title: Cocurricular Course - I**

**Course Code: CHMCCI6**

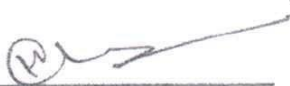
Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	<p>This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year.</p> <p>Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting.</p> <p>This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.</p>
2	<b>Vertical 6</b>	Cocurricular Course (Mandatory)
3	<b>Type Teaching Methods</b>	Non Theory Participation, Report Writing, Presentation etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<ol style="list-style-type: none"> <li>1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities.</li> <li>2. To enhance personal and interpersonal skills through real-life experiences and teamwork.</li> <li>3. To foster a sense of responsibility, leadership, and community engagement among students.</li> <li>4. To develop self-confidence and emotional well-being through creative expression and collaboration.</li> <li>5. To integrate classroom learning with experiential learning for holistic growth.</li> </ol>
8	<b>Learning Outcomes:</b>	<p>By the end of the course, students will be able to:</p> <p><b>LO1:</b> Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences.</p> <p><b>LO2:</b> Demonstrate improved communication, leadership, and teamwork skills.</p> <p><b>LO3:</b> Exhibit increased awareness of social responsibility and civic engagement.</p> <p><b>LO4:</b> Build confidence through creative, cultural, and intellectual expressions.</p> <p><b>LO5:</b> Maintain a portfolio or activity log to track participation and personal development.</p>

9	<b>Syllabus</b>																											
	<b>Unit I - Suggested Areas of Participation in the activities:</b> <ul style="list-style-type: none"> <li>• <b>Cultural Events:</b> Drama, dance, music, literary events, debates, etc.</li> <li>• <b>Social Outreach:</b> Blood donation, awareness campaigns, cleanliness drives.</li> <li>• <b>Clubs &amp; Societies:</b> Photography, quiz, environment club, shram club, etc.</li> <li>• <b>Sports &amp; Fitness:</b> College tournaments, yoga, marathons, fitness challenges.</li> <li>• <b>Institutional Events:</b> Foundation Day, Annual Day, College Festivals, Intercollegiate events.</li> <li>• <b>National Festivals:</b> Independence Day, Republic Day etc.</li> </ul> <b>Unit II - Program Specific Topics</b> <ul style="list-style-type: none"> <li>• <b>Workshops/Seminars:</b> Report Writing, Personality Development, Soft Skills, Leadership Talks.</li> <li>• <b>Speak, Show, Shine:</b> Presentation / Poster Presentation / Viva and Learning Experience</li> </ul> <b>Mode of Evaluation:</b> <ul style="list-style-type: none"> <li>• <b>Faculty Coordinator:</b> To guide and evaluate student progress.</li> <li>• <b>Participation Proof:</b> Certificates, photos, attendance records.</li> <li>• <b>Reflective Journal:</b> Minimum 2-3 pages summarizing experiences, learning, and growth.</li> <li>• <b>Final Viva/Presentation:</b> 5-minute talk on poster presentation and on overall learning.</li> </ul>																											
10	<b>Scheme of Examination and Assessment Pattern</b> <b>Based on 3 approved Activities</b> <b>Semester End External - 30 marks</b> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 20%;">Activity No</th> <th style="width: 60%;">Nature of Activities</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Title of Approved Activity - 1</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Title of Approved Activity - 2</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Title of Approved Activity - 3</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table> <b>Internal Examination: Continuous Evaluation – 20 marks</b> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 85%;">Assessment / Evaluation</th> <th style="width: 10%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Reflective journal</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Presentation/ poster presentation/viva</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </tbody> </table>	Activity No	Nature of Activities	Marks	1.	Title of Approved Activity - 1	10	2.	Title of Approved Activity - 2	10	3.	Title of Approved Activity - 3	10	<b>Total</b>		<b>30</b>		Assessment / Evaluation	Marks	1.	Reflective journal	10	2.	Presentation/ poster presentation/viva	10	<b>Total</b>		<b>20</b>
Activity No	Nature of Activities	Marks																										
1.	Title of Approved Activity - 1	10																										
2.	Title of Approved Activity - 2	10																										
3.	Title of Approved Activity - 3	10																										
<b>Total</b>		<b>30</b>																										
	Assessment / Evaluation	Marks																										
1.	Reflective journal	10																										
2.	Presentation/ poster presentation/viva	10																										
<b>Total</b>		<b>20</b>																										

**Suggested Readings:**












- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

**Name & Signature of the Principal & Chairperson, Academic Council:**

  
**Dr. Manju Lalwani Pathak**



**Board of Studies (BOS) Microbiology**

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sandhya Mulchandani	BOS-Chairperson, Associate Professor Smt. CHM College, Ulhasnagar	
2.	Dr. Sejal Rathod	Subject Expert (Nominated by Academic Council) K.C.College HSNC University	
3.	Dr. Pratibha Shah	Subject Expert (Nominated by Academic Council) K.C.College HSNC University	
4.	Dr. Ranjana Khade	Subject Expert ( Nominated by the Vice Chancellor) R.K. Talreja College, Ulhasnagar	
5.	Dr. Sharddha Ratnaparkhe	Industry Representative (Nominated by Principal) Galaxy surfactants Ltd	
6.	Dr. Anand S. Maurya	Alumni Representative (Nominated by Principal) Executive officer Serum Institute of India	
7.	Dr. Rasika Pawar	Assistant Professor Smt. CHM College, Ulhasnagar	
8.	Dr. Pranali Shete	Assistant Professor Smt. CHM College, Ulhasnagar	
9.	Dr. Ashish Jain	Associate Professor Smt. CHM College, Ulhasnagar	
10.	Dr. Nitin Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
11.	Dr. Renu Jaisinghani	Assistant Professor Smt. CHM College, Ulhasnagar	


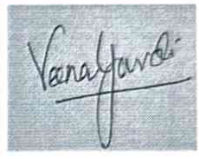


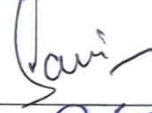


Name & Signature of the BoS Chairperson: Dr. Sandhya Mulchandani



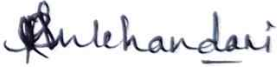
Name & Signature of the Dean: Dr. Neena Anand



**Board of Studies (BOS) Microbiology**

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sandhya Mulchandani	BOS-Chairperson, Associate Professor Smt. CHM College, Ulhasnagar	
2.	Dr. Veena Yardi	Retired Professor, Department of Food, Nutrition and Dietetics, Nirmala Niketan College of Home Science, Churchgate	
3.	Dr. Rasika Pawar	Assistant Professor Smt. CHM College, Ulhasnagar	
4.	Dr. Pranali Shete	Assistant Professor Smt. CHM College, Ulhasnagar	
5.	Dr. Ashish Jain	Associate Professor Smt. CHM College, Ulhasnagar	
6.	Dr. Nitin Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
7.	Dr. Renu Jaisinghani	Assistant Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: Dr. Sandhya Mulchandani



Name & Signature of the Dean: Dr. Neena Anand





**HSNC Board's**  
**Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar**  
**(Autonomous)**  
**Affiliated to the University of Mumbai**

**Bachelor of Science**  
**(Microbiology)**  
**(Aided Course)**

**Semester – III**

**Choice Based and Credit Based syllabus**  
**as per NEP 2020 with effect from the**  
**Academic Year 2026-27**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- III**

**Title: Basics of Biochemistry and Industrial  
Microbiology**

**Vertical - 1  
Major Course 1**

**With effect from  
Academic Year 2026-2027**

## Title: Basics of Biochemistry and Industrial Microbiology

**Course Code: CHMMBIII1**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	<p>The course explores the basic concepts of biochemistry, such as cellular and chemical foundations of life. It explains biological form and function in chemical terms. It also includes the physical and chemical properties of water. It covers the study of biomolecules required to build up a cell such as proteins, carbohydrates and lipids and different aspects of cellular structure and function.</p> <p>The course covers the fundamental concepts of fermentation and extends to application in industries. It explains different types of fermentation processes, media sources and formulation, inoculum development and fermenter design. It describes various screening methods for isolation of a production strain. The course emphasizes the importance of microorganisms in the fermentation process and biotechnology productions.</p>
2	<b>Vertical 1</b>	Major
3	<b>Type</b> <b>Teaching Method</b>	Theory  Lectures, Discussion, Presentation, Case Studies, Industrial visit, Flipped classroom etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To provide an understanding of the structure, properties, and functions of biomolecules in microbial cells.</p> <p><b>CO(A)2:</b> To introduce the fundamental principles of biochemistry and microbial metabolism.</p> <p><b>CO(A)3:</b> To familiarize students with the isolation, screening, preservation, and industrial significance of microorganisms used in microbial fermentation.</p> <p><b>CO(A)4:</b> To provide knowledge of the design, construction, operation, and applications of fermenters and industrial fermentation processes.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> explain the fundamental concepts of microbial cellular structures and the interactions of biomolecules that support microbial cellular processes.</p> <p><b>CO2</b> describe the cellular and chemical foundations of microbial life and explain the role of biomolecules in microbial cell structure and function.</p> <p><b>CO3</b> apply the principles of fermentation technology to formulate suitable media for different microbial fermentation processes.</p> <p><b>CO4</b> identify the major components of a fermenter and their functions, and illustrate the roles of industrially important microorganisms in fermentation processes.</p>

**Syllabus****UNIT I: Chemical Foundations and Biomolecules**

- Chemical Foundations – Introduction, Biomolecules are compounds of carbon with various functional groups (Diagrammatic), Macromolecules are major constituents of cell
- Biomolecules and water, Overview of macromolecules present in cells, Properties of water
- Structure and function of Carbohydrates, Aldoses, Ketoses, Monosaccharide, Disaccharides, Oligosaccharides, Polysaccharides, Epimer and enantiomer, Role of carbohydrates inside the cell
- Structure and function of Proteins, Chiral Carbon concept, Nomenclature, Classification, Peptide bond, Zwitterion concept, Levels of protein conformations- primary, secondary and tertiary.
- Structure and function of Lipids, Difference between properties of fats and lipids, Hydrophobic nature, Role in cell, Different lipids present in plasma membrane

**UNIT II: Introduction to Industrial Microbiology**

- An introduction to fermentation processes, The range of fermentation processes, The Components of a fermentation process.
- Screening -Definition, Significance of screening, Need for screening, sources of micro-organisms for screening, Concept of primary metabolites, secondary metabolites.
- Primary screening methods- Antibiotic producers, Crowded Plate Technique, Wilkin's Agar Overlay Method, Isolation of primary metabolite producers- Enrichment culture technique
- Isolation of organisms producing organic acid/amines, Isolation of organism producing industrially important enzymes Isolation of organism utilizing hydrocarbons.
- Secondary Screening Methods with examples of secondary screening for antibiotic producers, use of AI for high throughput scening
- Concepts in Fermentation - Fermentation Medium - Features, Raw material – Molasses, Corn steep liquor, Sulphite waste liquor, Precursors, Buffers, Antifoam agents, Inoculum development - Basic principle and schematic representation.
- Types of fermentations – Aerobic, Anaerobic, Surface, Submerged, Batch, Continuous, Fed batch and SSF (Brief description with at least one example each)
- Bioreactor Design - Features, Construction materials, Basic Design with parts (Diagram) Impellers, Spargers and Baffles (Description & function)

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**A. External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Assignment/Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
		<b>Total 20</b>

**11****REFERENCES:**

- Nelson, D.L., & Cox, M. M. (2005). Lehninger: Principles of Biochemistry (4th ed.). W.H. Freeman & Co.
- Satyanarayana and Chakrapani, Biochemistry, 4th edition.
- Voet, D., & Voet, J. (2016). Fundamentals of Biochemistry (5th ed.). Wiley.
- Conn, E. E., Stumpf, P. K., Bruening, G., & Doi, R. Y. (1987). Outlines of Biochemistry (5th ed.). John Wiley & Sons.
- Industrial Microbiology – An Introduction, Waites & Morgan
- An Introduction to Industrial Microbiology, Sivakumar, Joe & Sukesh
- Industrial Microbiology, A.H Patel
- Industrial Microbiology, L.E. Casida
- Principles of fermentation Technology, Stanbury & Whittaker, second edition
- A Textbook of Biotechnology, R.C. Dubey, 4th Edition 2006 S. Chand & Co. Ltd.
- Microbial Technology – Fermentation Technology Vol-II, H. J. Pepler & D. Perlman. Academic Press.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- III**

**Title: Introduction to Medical  
Microbiology and Epidemiology**

**Vertical - 1  
Major Course 2**

**With effect from  
Academic Year 2026-2027**

## Title: Introduction to Medical Microbiology and Epidemiology

### Course Code: CHMMBIII2

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course explores the fundamental concepts of medical microbiology, covering Host – parasite interaction, overview of pathogenesis of bacterial infection. The course also describes different cells of the immune system with special attention to their origin, formation and function. Moreover it also explores first and the second line of defense. The course elaborates on routes of infection, reservoirs of infection along with nosocomial infections. Furthermore, the course is outlined to develop basic concepts in epidemiology and understanding emerging and re-emerging diseases.
2	<b>Vertical 1</b>	Major
3	<b>Type</b> <b>Teaching Method</b>	Theory Lectures, Discussion, Presentation, Case Studies, Industrial visit, Flipped classroom etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To provide an understanding of the different immune cells and their roles in host immunity.</p> <p><b>CO(A)2:</b> To impart knowledge of the first and second lines of defense, with emphasis on innate and adaptive immune responses.</p> <p><b>CO(A)3:</b> To familiarize students with the terminology associated with infectious diseases and host–pathogen interactions.</p> <p><b>CO(A)4:</b> To introduce the fundamental principles of epidemiology, modes of disease transmission, levels of disease prevention in public health.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> explain the concepts of infection, pathogenicity, and host–pathogen interactions in relation to microbial diseases</p> <p><b>CO2</b> describe the structure and functions of immune cells and explain the mechanisms of innate and adaptive immune defenses.</p> <p><b>CO3</b> analyze the role of anatomical sites and host factors in the establishment, progression, and prevention of infectious diseases</p> <p><b>CO4</b> apply the principles and terminology of epidemiology in public health and preventive healthcare.</p>

## Syllabus

### UNIT I: Host Defence Mechanisms

- Host – parasite interaction, Understanding terminologies – infection, disease, types of diseases, pathogen, normal flora, opportunist, pathogenicity, virulence, pathogenic potential, attenuation, infectious dose 50, lethal dose 50
- The Concept of Immunity – Innate and Adaptive Immunity Overview, Haematopoiesis – role of bone marrow and thymus
- First Line of Defense – skin and mucus membranes, physical factors, Chemical factors.
- Second Line of Defense – Formed elements of Blood cells – Granulocytes and Agranulocytes.
- The lymphatic System – Phagocytosis, Inflammation, Tissue Repair and fever

### UNIT II: Medical microbiology and Epidemiology

- Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Disease, Disease Outbreak, Epidemiological Tools, Disease Progression, Herd Immunity,
- The Spread of Infection, Nosocomial infections, immune compromised host, Chain of transmission, Control of nosocomial infection
- Reservoirs of infection - Human reservoir, animal reservoir, non-living reservoir, Transmission of Disease- Contact transmission, Vehicle Transmission and vectors.
- Skin - Study of structure and function, Skin infections caused by Acne & Measles
- Nervous system - Structure and function of nervous system -Tetanus and Rabies
- Respiratory System - Structure and function of respiratory system, Pharyngitis, laryngitis, Sinusitis (only terms), Diphtheria and common cold
- Gastro-intestinal system - Structure and function of digestive system Hepatitis A, Rotavirus and Amoebiasis
- Tubulation infections of different organs

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**A. External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/Assignment/ Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
		<b>Total 20</b>

**11****REFERENCES:**

1. Willey, J. M., Sherwood, L., Woolverton, C. J., & Prescott, L. M. (2008). Prescott, Harley, and Klein's Microbiology (7th ed). McGraw-Hill Higher Education.
2. Anantnarayan & Paniker's edtn 8th. University press
3. Madigan, M. T., Martinko, J. M., Stahl, D., Clark, D. P. (2010). Brock Biology of Microorganisms (13th Edition). Benjamin Cummings.
4. Tortora, G. J., Funke, B. R., & Case, C. L. (2016). Microbiology: An introduction (12th ed.). Pearson.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- III**

**Title: Practical Techniques in Applied  
Microbiology**

**Vertical - 1  
Major Course 3**

**With effect from  
Academic Year 2026-2027**

## Title: Practical Techniques in Applied Microbiology

**Course Code: CHMMBIII3**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This practical course in Applied Microbiology focuses on Biochemistry, Medical and Industrial Microbiology all of which are vital for understanding how microbes contribute to health and disease at the molecular level. The learner is exposed to the practical aspects of microbial metabolism and biochemistry. In industrial microbiology, learner is introduced how microbes are used in large-scale fermentation to produce pharmaceuticals, biofuels, and food products. Laboratory training helps learners in identifying pathogens using microbiological media. This course prepares students for careers in industrial products, pharmaceuticals, and biotechnology.
2	<b>Vertical 1</b>	Major
3	<b>Type</b> <b>Teaching Method</b>	Practical  Demonstrations, simulations, project-based learning, peer teaching etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<b>CO(A)1:</b> To develop an understanding of the principles and techniques used in the detection and quantification of biomolecules. <b>CO(A)2:</b> To explain the principles and applications of selective and differential media for the isolation and identification of microorganisms. <b>CO(A)3:</b> To introduce the biochemical tests used for the characterization and identification of bacteria. <b>CO(A)4:</b> To familiarize students with the screening and identification techniques used to detect microorganisms capable of producing industrially important growth factors.
8	<b>Course Outcomes:</b>	Upon completion of the course the student will be able to: <b>CO1</b> understand the principles and techniques used for the detection and quantification of biomolecules, and interpret enzymatic reactions in relation to metabolite production. <b>CO2</b> interpret and analyze the characteristics of microorganisms grown on selective and differential media for their identification. <b>CO3</b> evaluate microorganisms for growth factor production using appropriate screening and identification techniques.

	<b>CO4</b> apply biochemical and microbiological principles to solve problems related to disease diagnosis, biotechnology, and industrial microbiology.		
<b>9</b>	<p><b>List of Practicals</b></p> <ol style="list-style-type: none"> <li><b>1. Quantitative estimation of Biomolecules</b> <ul style="list-style-type: none"> <li>• Reducing Sugar estimation by DNSA method.</li> <li>• Estimation of RNA by Orcinol method</li> <li>• Estimation of DNA by DPA method</li> <li>• Estimation of Proteins by Direct Biuret method.</li> </ul> </li> <li><b>2. Study of cultural characteristics of pathogenic bacteria using Selective and Differential Media</b> <ul style="list-style-type: none"> <li>• Salmonella Shigella Agar</li> <li>• XLD Agar</li> <li>• Cystine-Lactose-Electrolyte-Deficient Agar (CLED)</li> <li>• Salt Mannitol Agar</li> </ul> </li> <li><b>3. Characterization of pathogens using biochemical tests</b> <ul style="list-style-type: none"> <li>• Carbohydrate Fermentation Test (glucose and lactose)</li> <li>• Indole Test</li> <li>• Methyl Red Test</li> <li>• Voges-Proskauer Test</li> <li>• Citrate utilization test</li> <li>• Catalase test</li> <li>• Oxidase test</li> <li>• Urease test</li> <li>• Triple sugar iron agar Test</li> <li>• Phenylalanine agar test</li> <li>• Hugh Leifson agar test</li> </ul> </li> <li><b>4. Isolation and Screening of Industrially Important Microorganisms</b> <ul style="list-style-type: none"> <li>• Screening of growth factor-producing organisms - amino acids/antibiotic</li> </ul> </li> <li><b>5. Medical and Immunology</b> <ul style="list-style-type: none"> <li>• Blood Cell staining</li> <li>• Study of epidemiology Case study - Endemic or Pandemic cases</li> </ul> </li> </ol>		
<b>10</b>	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>

	Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>Scheme of Examination and Assessment Pattern</b> Paper – 50 Marks			
<b>11</b>	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. Biochemical Methods by S. S. Desai</li> <li>2. Fundamentals of Biochemistry by S.V Patel</li> <li>3. Biochemistry Laboratory Manual" by Rodney F. Boyer.</li> <li>4. Biochemistry Laboratory Modern Theory and Techniques-2nd Ed   PDF   Chromatography</li> <li>5. Patel, Dipeshkumar. (2023). A Textbook of Experimental Microbiology. Practicals on Chemical Foundations for the Basis of Life. <a href="https://www.researchgate.net/publication/371856450_A_Textbook_of_Experimental_Microbiology">https://www.researchgate.net/publication/371856450_A_Textbook_of_Experimental_Microbiology</a></li> <li>6. Cappuccino J.G. (2016) Microbiology; A Laboratory Manual, 11th Edition. Pearson Education (Singapore) Pvt. Ltd., (ISBN: 978-9332535190) /Microbiology A Laboratory Manual, Global Edition</li> <li>7. Cruickshank, Medical Microbiology , Vol -II</li> </ol>		

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- III**

**Title: Basic Concepts in Microbiology**

**Vertical - 2  
Minor Course 1**

**With effect from  
Academic Year 2026-2027**

## Title: Basic Concepts in Microbiology

**Course Code: CHMMBIII4**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	The Basic Concepts of Microbiology course introduces microorganisms' structure, classification, and functions. It includes the role of key biomolecules like proteins, carbohydrates, lipids, and nucleic acids. Students learn how microbes generate energy and carry out essential biochemical processes. The course also focuses on methods to control microorganisms using both physical and chemical methods. Practical sessions train students in culturing, staining, and identifying microbes. The course highlights the importance of microbes in health, industry, and the environment. Students gain essential laboratory and analytical skills. This course is essential for preparing students for advanced studies in Microbiology and related fields.
2	<b>Vertical 2</b>	Minor
3	<b>Type</b> <b>Teaching Method</b>	Theory Lectures, Discussion, Presentation, Case Studies, Industrial visit, Flipped classroom etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<b>CO(A)1:</b> To provide an understanding of the types, structures, and functions of biomolecules in microbial cells. <b>CO(A)2:</b> To explain the chemical structures and three-dimensional conformations of major biomolecules involved in microbial biochemical processes. <b>CO(A)3:</b> To introduce the principles, terminology, and methods used in the physical and chemical control of microorganisms. <b>CO(A)4:</b> To develop an understanding of the factors affecting the efficacy of antimicrobial agents and the principles involved in the evaluation of disinfectants.
8	<b>Course Outcomes:</b>	Upon completion of the course the student will be able to: <b>CO1</b> describe the structure and functions of major biomolecules and explain their roles in microbial cell structure, metabolism, and enzymatic reactions. <b>CO2</b> apply the relationship between molecular structure and function to explain cellular processes and biological systems. <b>CO3</b> analyze the nutritional requirements of microorganisms and the influence of physical and chemical factors on microbial growth and its control.

	<p><b>CO4</b> demonstrate the appropriate use of sterilization, disinfection, and antimicrobial agents for the effective control of microorganisms.</p>
<p>9</p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I: Foundations of Biochemistry</b></p> <ul style="list-style-type: none"> <li>• Types of bonds and their importance: Electrovalence, covalent, ester, phosphodiester, thioester, peptide, glycosidic</li> <li>• Water - Structure and Properties (In brief)</li> <li>• Carbohydrates - Introduction and Classification, Biological role of Monosaccharides, Disaccharides (maltose, sucrose, lactose) and polysaccharide (starch, glycogen, cellulose)</li> <li>• Lipids - Introduction and classification of fatty acids, Storage lipids and structural lipids, Types of lipids with general structure of each with examples.</li> <li>• Amino acids Peptides and Proteins, Introduction, structure and features of amino acids (emphasis on amphoteric nature), Classification of amino acids by R-groups, Peptides and proteins- Definition and general features and examples with biological role, Protein structure: Primary, secondary, tertiary, quaternary structures - Brief outline.</li> <li>• Nucleotides and Nucleic acids - Types of nitrogenous bases- Purines, Pyrimidines, Pentoses-Ribose, Deoxyribose, Nomenclature of Nucleosides and nucleotides, glycosidic bond, Phosphodiester bonds, Types of nucleic acids - RNA and DNA (Basic properties)</li> </ul> <p><b>UNIT II: Control of Micro-organisms</b></p> <ul style="list-style-type: none"> <li>• Basic Concepts in Control of Micro organisms, Definition of general terms used in control of microorganisms, Properties of an ideal disinfectant</li> <li>• Physical methods of microbial control, Moist Heat and Dry Heat - Principle and working of Hot air oven and Autoclave, UV, X-ray and Gamma radiations Mode of action, Membrane filters</li> <li>• Chemical methods of microbial control - mechanism &amp; advantages, disadvantages and applications, Phenolics and Alcohols, Heavy metals and their compounds, Halogens, Gaseous sterilizing agents, Formaldehyde, Ethylene oxide, Hydrogen peroxide</li> <li>• Disinfection, Disinfection of surfaces and spillages.</li> </ul>

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**A. External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six(5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/Assignment/Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
		<b>Total 20</b>

**11****REFERENCES:**

- Principles of Biochemistry 5th Edition Lehninger
- Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg
- Prescott, HarleyKlein-Microbiology, 5th & 6th edition, International edition 2002 & 2006, McGraw Hill.
- Michael T.Madigan & J.M.Martin, Brock ,Biology of Microorganisms 11th Ed. International edition ,2006, Pearson Prentice Hall.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- III**

**Title: Fundamental Techniques in  
Microbiology**

**Vertical - 2  
Minor Course 2**

**With effect from  
Academic Year 2026-2027**

## Title: Fundamental Techniques in Microbiology

**Course Code: CHMMBIII5**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	The Fundamental techniques in Microbiology course introduces the principles and techniques for quantifying the amounts of various biological molecules like carbohydrates, proteins, lipids, and nucleic acids in microbial cells. It would involve learning about different analytical methods and their applications in research and diagnostics. This course also covers the physical and chemical methods used to manage and eliminate unwanted microbial growth in various settings, including healthcare, food production, and the environment. This course is essential for preparing students for advanced studies in Microbiology and related fields.
2	<b>Vertical 2</b>	Minor
3	<b>Type</b>  <b>Teaching method</b>	Practical  Demonstrations, simulations, project-based learning, and peer teaching etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To provide practical knowledge of the principles and techniques used for the identification and quantification of biomolecules using analytical methods.</p> <p><b>CO(A)2:</b> To develop practical skills in the application of physical and chemical methods for the control of microorganisms.</p> <p><b>CO(A)3:</b> To develop an understanding of the factors influencing the effectiveness of antimicrobial agents and the principles involved in the evaluation of disinfectant</p> <p><b>CO(A)4:</b> To familiarize students with laboratory techniques for the assessment of microbial growth, antimicrobial activity, and microbial control measures.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> identify and quantify major microbial biomolecules using appropriate analytical techniques and laboratory procedures.</p> <p><b>CO2</b> perform physical and chemical methods for the control of microorganisms and demonstrate appropriate laboratory practices.</p> <p><b>CO3</b> apply microbiological and biochemical laboratory skills in industrial, clinical, and research settings following standard laboratory protocols.</p> <p><b>CO4</b> analyze and interpret experimental results obtained from biomolecule estimation and microbial control experiments to draw appropriate scientific conclusions.</p>

<p><b>9</b></p>	<p><b>List of Practicals</b></p> <ol style="list-style-type: none"> <li><b>1. Microbiology lab tour- Safety, Common glassware, equipment's and instruments</b></li> <li><b>2. Qualitative tests for</b> <ul style="list-style-type: none"> <li>• Carbohydrates - Molisch</li> <li>• Qualitative tests of Proteins- Biuret.</li> <li>• Qualitative tests of Amino acids- Ninhydrin.</li> <li>• Qualitative tests of DNA- DPA</li> <li>• Qualitative tests of RNA - Orcinol.</li> <li>• Solubility test of lipids in different solvents</li> </ul> </li> <li><b>3. Working of Colorimeter</b> <ul style="list-style-type: none"> <li>• Determination of lambda max- copper sulfate</li> <li>• Verification of Beer and Lambert's law - copper sulfate</li> </ul> </li> <li><b>4. Aseptic transfer techniques</b> Preparation of Broth, Butt, Slant, Plate</li> <li><b>5. Physical and Chemical Methods of Microbial control</b> <ul style="list-style-type: none"> <li>• Autoclave, Hot air oven</li> <li>• Effect of Triphenylamine dyes using disc diffusion, Effect of Antibiotics by disc diffusion</li> <li>• Study of Oligodynamic effect of heavy metals</li> <li>• Effect of disinfectants used in the lab (Swabbing of surfaces), Effect of UV light on bacteria</li> </ul> </li> </ol>						
<p><b>10</b></p>	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b> Paper – 50 Marks</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%; text-align: center;">Internal Continuous Assessment: 40% (20 Marks)</th> <th style="width: 30%; text-align: center;">Semester End Examination: 60% (30 Marks)</th> <th style="width: 30%; text-align: center;">Duration for End semester examination</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks</td> <td style="text-align: center;">Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)</td> <td style="text-align: center;">2 hours each day (2 days)</td> </tr> </tbody> </table>	Internal Continuous Assessment: 40% (20 Marks)	Semester End Examination: 60% (30 Marks)	Duration for End semester examination	Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
Internal Continuous Assessment: 40% (20 Marks)	Semester End Examination: 60% (30 Marks)	Duration for End semester examination					
Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)					
<p><b>11</b></p>	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Principles of Biochemistry 5th Edition Lehninger</li> <li>2. Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg</li> <li>3. Prescott, HarleyKlein-Microbiology, 5th &amp; 6th edition, International edition 2002 &amp; 2006, McGraw Hill.</li> <li>4. Michael T.Madigan &amp; J.M.Martin, Brock ,Biology of Microorganisms 11th Ed. 2006</li> </ol>						

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- III**

**Title: Basics of Nutrition-3**

**Vertical - 3  
Open Elective**

**With effect from  
Academic Year 2026-2027**

### Title: Basics of Nutrition-3

Course Code: CHMMBIII6

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course introduces students to the scientific principles of milk and dairy technology, food additives, food adulteration, food preservation, and nutrition labelling. It covers the composition, nutritional significance, processing, and preservation of milk, along with the production of dairy and fermented milk products. The course also examines the functions and applications of food additives, common adulterants and their detection, and various preservation methods used to enhance food safety and shelf life. In addition, students gain knowledge of nutrition labelling and food regulations relevant to the food industry.
2	<b>Vertical 3</b>	Open Elective (OE)
3	<b>Type Teaching Method</b>	Theory + Practicum Lecture/ Presentation/ Discussion/ Case studies
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<b>CO(A)1:</b> To provide an understanding of the composition, nutritional significance, and industrial importance of milk and dairy products. <b>CO(A)2:</b> To explain the chemical constituents of milk and their roles in determining the quality, stability, and nutritional value of dairy products. <b>CO(A)3:</b> To introduce the principles and applications of milk preservation, processing, and food preservation techniques used to ensure food safety and quality. <b>CO(A)4:</b> To familiarize students with food additives, food adulteration, nutrition labelling, and food regulations, including the interpretation of food labels in accordance with FSSAI standards.
8	<b>Course Outcomes:</b>	Upon completion of the course student will be able to: <b>CO1</b> describe the composition, nutritional significance, and processing methods of milk and dairy products. <b>CO2</b> analyze the principles of milk preservation techniques and evaluate their effects on the quality and shelf life of dairy products. <b>CO3</b> classify food additives based on their functions, detect common food adulterants, and analyze their impact on food quality, safety, and human health.

	<p><b>CO4</b> interpret nutrition labels and apply food safety regulations and FSSAI standards to evaluate the quality and safety of food products.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I: Overview on milk and milk products</b></p> <ul style="list-style-type: none"> <li>• <b>Introduction to milk as a food</b> - Historical and cultural significance of milk in human diet Milk-producing animals: cow, buffalo, goat, sheep, camel, Economic importance of the dairy industry.</li> <li>• <b>Chemical composition of milk</b> - Major components: water, lipids, proteins, carbohydrates, Proteins: casein fractions and whey proteins, Carbohydrate: lactose structure and function, Minerals, vitamins, and enzymes present in milk.</li> <li>• <b>Methods for the preservation of milk</b> - Pasteurization methods: LTLT and HTST, Ultra-high temperature (UHT) processing and aseptic packaging, Sterilization: batch and continuous methods, Cold storage preservation.</li> <li>• <b>Milk products and fermented milk products</b> - Milk powder and condensed milk, Indian fermented products: dahi, lassi, chaas, shrikhand, Whey protein concentrates (WPC) and isolates (WPI): production and uses</li> </ul> <p><b>UNIT 2: Food Additives, Adulteration, Preservation, and Nutrition Labelling</b></p> <ul style="list-style-type: none"> <li>• <b>Introduction to Food Additives</b> - Definition, classification, and functions of food additives, Types of additives: preservatives, antioxidants, emulsifiers, stabilizers, flavoring and coloring agents, Food additives used in processed foods and their applications.</li> <li>• <b>Food Adulteration</b> - Concept and significance of food adulteration, Common adulterants in cereals, pulses, milk, oils, spices, fruits, and vegetables, Health hazards associated with food adulteration, Detection methods for common food adulterants, Food safety regulations and prevention of adulteration.</li> <li>• <b>Food Preservation Methods</b> - Principles and objectives of food preservation, Physical methods: drying, refrigeration, freezing, pasteurization, sterilization, and irradiation, Chemical methods: use of salt, sugar, acids, and approved preservatives, Biological methods: fermentation and use of beneficial microorganisms, Modern preservation techniques: vacuum packaging, modified atmosphere packaging (MAP), and hurdle technology, Effect of preservation methods on nutritional quality and shelf life of foods</li> <li>• <b>Nutrition Labelling and Food Regulations</b> - Introduction to nutrition labelling and its importance, Components of nutrition labels: serving size, nutrient declaration, ingredient list, and health claims, Reading and interpretation of food labels, FSSAI regulations and standards for food labelling in India</li> </ul>

10

**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks**

**Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Assignment/Puzzles)	15
2.	Overall conduct as a responsible student and attentiveness	5
		<b>Total 20</b>

11

**References:**

1. Kober, A. K. M. H. (2024). Milk and dairy foods: Nutrition, processing and healthy aging. CRC Press / Routledge.
2. Marth, E. H., & Steele, J. L. (Eds.). (2001). Applied dairy microbiology (2nd ed.). Marcel Dekker / CRC Press.
3. Robinson, R. K. (Ed.). (2002). Dairy microbiology handbook: The microbiology of milk and milk products (3rd ed.). John Wiley & Sons.
4. Fellows, P. J. (2017). Food processing technology: Principles and practice (4th ed.). Woodhead Publishing.
5. Srilakshmi, B. (2022). Food Science (7th ed.). New Age International Publishers.
6. Manay, N. S., & Shadaksharaswamy, M. (2008). Foods: Facts and Principles (3rd ed.). New Age International Publishers.
7. FSSAI. (2020). Manual of Methods of Analysis of Foods. Food Safety and Standards Authority of India, New Delhi.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B.Sc.  
(Microbiology)**

**Semester- III**

**Title: Environmental Microbiology**

**Vertical – 4  
Skill Enhancement Course (SEC)**

**With effect from  
Academic Year 2026-2027**

# Title: Environmental Microbiology

Course Code: CHMMBIII7

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	A skill enhancement course on Environmental Microbiology focuses on hands-on techniques for studying microorganisms in natural environments. Students learn how to collect, culture, and analyze microbial samples from soil, water, and air. The course emphasizes methods for detecting and identifying environmental microbes. Students also investigate microbial diversity and population dynamics in different habitats. The course includes fieldwork to apply sampling techniques and environmental monitoring. Through lab reports and data interpretation, students develop critical scientific and analytical skills. This course prepares students for careers in environmental science, ecology, public health, and industrial microbiology.
2	<b>Vertical 4</b>	Skill Enhancement Course (Sec)
3	<b>Type</b> <b>Teaching Method</b>	Practical Demonstrations, simulations, project-based learning, peer teaching etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To introduce the principles of air sampling, air sanitation, and methods for assessing air quality.</p> <p><b>CO(A)2:</b> To provide an understanding of the physical, chemical, and biochemical characteristics of major aquatic ecosystems, including springs, rivers, lakes, marshes, and bogs.</p> <p><b>CO(A)3:</b> To explain the principles and significance of primary, secondary, and tertiary wastewater treatment processes in environmental protection.</p> <p><b>CO(A)4:</b> To familiarize students with the enrichment, isolation, and identification of bacteria, actinomycetes, and fungi from soil, and their ecological and functional roles.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> explain the role of microorganisms in the atmosphere, analyze factors affecting air quality, and apply the principles of air microbiology to environmental and public health contexts.</p> <p><b>CO2</b> identify and characterize common airborne microorganisms, analyze their impact on human health, and recommend appropriate measures for controlling airborne pathogens.</p> <p><b>CO3</b> analyze the role of microorganisms in wastewater, identify common wastewater pathogens, and apply appropriate wastewater treatment methods to protect public health and the environment.</p> <p><b>CO4</b> compare and evaluate physical, chemical, and biological wastewater treatment processes based on their effectiveness in removing pollutants and pathogenic microorganisms.</p>

9

### Syllabus

**1. Aero microbiology**

- Important airborne pathogens and toxins,
- Study of air microflora and type of organisms
- Study of air-flora and determination of sedimentation rate by gravity sedimentation method
- Enumeration of microorganisms in air and study of its load before and after fumigation (closed space)
- Introduction to Air Quality Standards using NAAQS Manual , Volume I

**2. Freshwater Microbiology – Lakes, Streams, Rivers**

- Isolation of bacteria
- Isolation of Fungi
- Isolation of algae

**3. Sewage Microbiology**

- Study of microbial flora in raw /treated sewage
- Monitoring of wastewater treatment process
- TS, TDS, colour, odour, pH
- Determination of Chemical Oxygen Demand
- Determination of Biological Oxygen Demand

**4. Soil and Geo Microbiology**

- Total viable count of soil microflora-
- Isolation of soil bacteria from Rhizospheric region
- Isolation of soil bacteria from non rhizosphere region
- Isolation of Actinomycetes from soil
- Study of Winogradsky's column
- Study of Buried slide technique
- Biogeochemical Cycles
- Study of Cellulose degraders
- Study of Sulphate reducers

**5. Use of AI tools in study of air, waste water and soil microbiology**

10





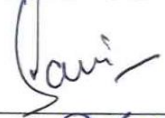


**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>
---	---	--

	Minor experiment /Viva/ objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)	
<b>11</b>	<b>REFERENCES</b> <ol style="list-style-type: none"> <li>1. Environmental Microbiology , 2nd Edition; Raina M. Maier, Ian L. Pepper, Charles P.Gerba, 2010 Academic Press</li> <li>2. Fundamental Principles of Bacteriology , 7th Editon; A.J. Salle ,Tata Mc Graw Hill Publishing Company</li> <li>3. Air Quality Standards- NAAQS Manual , Volume I</li> <li>4. Prescott’s Microbiology, 8th Edition; Joanne M. Willey, Linda M. Sherwood, Christopher J.Woolverton,2011, Mc Graw Hill International Edition</li> <li>5. Fundamentals of Microbiology, 9th Edition , Frobisher, Hinsdill, Crabtree, Goodheart, 1974, Saunders College Publishing</li> <li>6. Introduction to Environmental Microbiology – Barbara Kolwzan , Waldemar Adamiak (E Book)</li> <li>7. Soil Microbiology-4th Edition, N.S Subba Rao,2000, Oxford and IBH Publishing Co. Pvt.Ltd</li> <li>8. An Introduction to Air Pollution by R K Trivedy and P K Goel</li> <li>9. Handbook of Methods in Environmental Studies: Water and Waste Water Analysis by S K Maiti</li> </ol>			

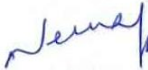
**Board of Studies (BOS) Microbiology**

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sandhya Mulchandani	BOS-Chairperson, Associate Professor Smt. CHM College, Ulhasnagar	
2.	Dr. Veena Yardi	Retired Professor, Department of Food, Nutrition and Dietetics, Nirmala Niketan College of Home Science, Churchgate	
3.	Dr. Rasika Pawar	Assistant Professor Smt. CHM College, Ulhasnagar	
4.	Dr. Pranali Shete	Assistant Professor Smt. CHM College, Ulhasnagar	
5.	Dr. Ashish Jain	Associate Professor Smt. CHM College, Ulhasnagar	
6.	Dr. Nitin Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
7.	Dr. Renu Jaisinghani	Assistant Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: Dr. Sandhya Mulchandani



Name & Signature of the Dean: Dr. Neena Anand



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year BA/BCom/BSc/SFC  
(Marathi)**

**Semester- III**

**Vertical -5  
Ability Enhancement Course (AEC) -2 Credits**

**with effect from  
Academic Year 2026-2027**

Title: लेखन कौशल्ये – १ (कार्यालयीन लेखनव्यवहार आणि पत्रव्यवहार)

COURSE CODE: CHMAECMARIII

Sr. No.	Heading	Particulars
1	Description the Course:	(कार्यालयीन लेखनव्यवहार आणि पत्रव्यवहार) लेखन ओळख ते लेखन कौशल्य हा बराच मोठा प्रवास आहे. वाचन आणि लेखनाच्या सरावाने, लेखन कौशल्य विकसित करता येते. बहुतेक वेळा आपण मिळवलेले ज्ञान हे लिखित स्वरूपात मांडावे लागते. त्यासाठी आपण लेखन कौशल्याचे योग्य उपयोजन करतो. लेखने म्हणजे मजकूर तंतोतंत उतरवणे नव्हे. एखादे निवेदन, वृत्त, निबंध, पुस्तकाची टिपणे, अर्ज यांसाठी लेखन आवश्यक असते. कार्यालयीन पत्रव्यवहार, कार्यवृत्ते, नोंदी, जाहिरात, टिप्पणी ही सर्व उपयोजित लेखन कौशल्ये आहेत. कार्यालयीन पत्रव्यवहार करणे हे एक वेगळ्या प्रकारचे कौशल्य आहे. त्यातील काही उपयोजन कौशल्यांचा विचार या अभ्यासपत्रिकेत अपेक्षित आहे. कार्यालयीन लेखन व्यवहार आणि पत्रव्यवहार या अभ्यासपत्रिकेत शिकविला जाईल.
2	Vertical 5	Ability Enhancement Course
3	Type	Theory
4	Credit	2 Credits (1 Credit = 15 Hours for Theory or 30 Hours of Practical Work in a Semester)
5	Hours allotted	30 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	CO(A) 1: कार्यालयीन लेखन व्यवहार स्वरूप समजावून सांगणे. CO(A) 2: कार्यालयीन पत्रव्यवहाराचे स्वरूप समजावून सांगणे, CO(A) 3: प्रभावी कार्यालयीन लेखनासाठी आवश्यक असणाऱ्या क्षमता आणि तंत्रांचा परिचय करून देणे,
8	Course Outcomes:	प्रस्तुत अभ्यासक्रम शिकल्यानंतर: CO1: विद्यार्थ्यांना कार्यालयीन लेखन व्यवहाराचे स्वरूप समजेल, CO2: विद्यार्थ्यांना कार्यालयीन पत्रव्यवहाराचे स्वरूप समजेल. CO3: प्रभावी कार्यालयीन लेखनासाठी आवश्यक असणाऱ्या तंत्रांचा विद्यार्थ्यांना परिचय होईल.

## Syllabus

9

### UNIT I कार्यालयीन लेखनव्यवहार

१. जाहीर निवेदन आणि माहितीपत्रक
२. इतिवृत्त लेखन
३. टिप्पणी लेखन

(६० मिनिटांच्या १५ तासिका, श्रेयांकन १)

(सूचना : विद्यार्थ्यांमध्ये उपरोक्त कार्यालयीन लेखन व्यवहार व पत्रव्यवहार करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील या दृष्टीने शिक्षकांनी सराव करून घ्यावा.)

### UNIT II: कार्यालयीन पत्रव्यवहार

१. कार्यालयीन/प्रशासनिक पत्र
२. नोकरीसाठी अर्जलेखन
३. पत्रात्मक लेखन: नवी रूपे (शुभेच्छा, निमंत्रण)

(६० मिनिटांच्या १५ तासिका, श्रेयांकन-१)

(सूचना : विद्यार्थ्यांमध्ये उपरोक्त कार्यालयीन लेखन व्यवहार व पत्रव्यवहार करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील या दृष्टीने शिक्षकांनी सराव करून घ्यावा.)

10

## Scheme of Examination and Assessment Pattern

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00**

hours

Format of Question Paper

All questions are compulsory:

Q. No	Nature of Questions	Marks
Q1	Essay type question on Module 1	10
Q2	Essay type question on Module 2	10
Q6	MCQs 15 out of 20, 10 MCQs on each module	10
		<b>Total 30</b>

**Internal Examination: Continuous Evaluation - 20 marks**

	Project and presentation / Viva	Marks
1.	<ul style="list-style-type: none"><li>AI च्या साहाय्याने जाहीर निवेदन आणि माहितीपत्रक तयार करणे. त्यामध्ये शीर्षक, उद्दिष्ट, कार्यक्रमाचे वेळापत्रक, संपर्क इत्यादींची आकर्षक मांडणी करणे.</li><li>AI साधने वापरून सभेचे Audio/Video नुसार इतिवृत्त तयार करणे.</li></ul>	20

		<p>त्यानंतर विद्यार्थ्यांनी त्यात आवश्यक ती सुधारणा करणे.</p> <ul style="list-style-type: none"> <li>● AI चा वापर करून कार्यालयीन टिप्पणी तयार करणे. त्यातील भाषा, रचना, औपचारिकता इत्यादींचे परीक्षण करून सुधारित टिप्पणी तयार करणे.</li> <li>● AI साधनांच्या माध्यमातून प्रशासनिक पत्रांचे विविध नमुनारूप तयार करणे. भाषेची औपचारिकता तपासणे.</li> <li>● AI साधनांच्या साहाय्याने नोकरीसाठी अर्ज तयार करणे. दिलेल्या जाहिरातीवर आधारित Cover Letter तयार करणे.</li> <li>● विविध प्रसंगांसाठी AI साधनांच्या आधारे निमंत्रणपत्र व शुभेच्छापत्र तयार करणे.</li> </ul> <p>AI साधने: <a href="#">ChatGPT</a>, <a href="#">Google Gemini</a>, <a href="#">Claude</a>, <a href="#">Perplexity AI</a>, <a href="#">NotebookLM</a>, <a href="#">Canva</a>, <a href="#">CapCut</a>, <a href="#">InVideo</a>, <a href="#">Grammarly</a>, <a href="#">QuillBot</a>, <a href="#">Whisper</a>, <a href="#">ElevenLabs</a></p>	
			<b>Total 20</b>
<b>11</b>	<p><b>संदर्भ ग्रंथ (Reference Books) :</b></p> <ol style="list-style-type: none"> <li>१. प्रशासनिक लेखन, भाषा संचालनालय, महाराष्ट्र शासन, मुंबई, १९६६</li> <li>२. भाषिक सर्जन आणि उपयोजन, राजन गवस, अरुण शिंदे, गोमटेश्वर पाटील, दर्या प्रकाशन, पुणे, २०१२</li> <li>३. परब प्रकाश, व्यावहारिक मराठी, मिथुन प्रकाशन, डोंबिवली पूर्व, मुंबई, १९८९</li> <li>४. नाईक सदानंद, राजभाषा मराठी, व्यावहारिक मराठी, प्रका-नागरी सेवा प्रबोधिनी, मुंबई, २००२</li> <li>५. तावरे स्नेहल (संपा.), व्यावहारिक मराठी, स्नेहवर्धन प्रकाशन, पुणे, चौथी आवृत्ती, २०११</li> <li>६. केतकी मोडक, संतोष शेणई, सुजाता शेणई (संपा.), उपयोजित मराठी, पद्मगंधा प्रकाशन, २०१२</li> <li>७. नसीराबादकर ल. रा., व्यावहारिक मराठी, भाषा विकास संशोधन संस्था, कोल्हापूर २०२३</li> </ol>		

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B.A  
(Hindi)**

**Semester – III**

**Title : हिंदी भाषा : कौशल के आधार**

**Vertical - 5  
Ability Enhancement Course 2 Credits**

**with effect from  
Academic Year 2025-2026**

**Title : हिंदी भाषा : कौशल के आधार**

**Course Code : CHMAECHINIII**

Sr.No.	Heading	Particulars
1.	<b>Description of the Course :</b>	विद्यार्थियों के लिए हिंदी एक सामान्य भाषा होने के साथ विशेष भाषा तब बन जाती है जब वह हिंदी के माध्यम से अपने कौशल में अभिवृद्धि करें, हिंदी के माध्यम से रोजगार के कई अवसरों को प्राप्त करें, इस दृष्टि से पाठ्यक्रम अत्यंत लाभवर्धक और उपयोगी सिद्ध होगा, हिंदी भाषा में कौशल विकास की असीम संभावनाएं हैं और कौशल के विभिन्न आयाम जुड़े हुए हैं जो अलग – अलग दिशाओं में देखे जा सकते हैं, पाठ्यक्रम विद्यार्थियों में लेखन, वाचन कौशल की अभिवृद्धि करने के साथ रोजगारपरक अवसर प्रदान करता है।
2.	<b>Vertical : 5</b>	AEC
3.	<b>Type : Teaching Method</b>	Theory + Practicum Lecture / Discussion / Presentation / Self Study, etc.
4.	<b>Credit :</b>	2 Credits
5.	<b>Hours Allotted :</b>	30 Hours
6.	<b>Marks Allotted :</b>	50 Marks
7.	<b>Course Objectives :</b> CO(A)1 : विद्यार्थियों को लेखन, वाचन कौशल का ज्ञान देना एवं रोजगार के अवसरों से जोड़ना। CO(A)2 : विद्यार्थियों को लेखन, वाचन कौशल से परिचय करते हुए अभिव्यक्ति की शैलियों का विकास करना। CO(A)3 : विद्यार्थियों को भाषण कला के विविध रूपों को समझाना, मौलिकता में अभिवृद्धि लाना एवं विशेषज्ञता दिलाना। CO(A)4 : विद्यार्थियों को श्रवण कौशल की विशेषताओं से परिचय कराते हुए श्रवण कौशल के लाभों से अवगत कराना।	

8.	<p><b>Course Outcomes :</b></p> <p><b>CO1 :</b> विद्यार्थियों का लेखन, वाचन कौशल के ज्ञान प्राप्ति के साथ मौलिक अभिव्यक्ति में बदलाव आएगा ।</p> <p><b>CO2 :</b> विद्यार्थियों का लेखन, वाचन कौशल द्वारा मानसिक विकास होगा, पठन शक्ति, शैली का विकास होगा ।</p> <p><b>CO3 :</b> विद्यार्थियों को लेखन, भाषण कौशल से भषिक – शक्ति, शैलियों का संवर्धन होगा विशेषज्ञता आएगी ।</p> <p><b>CO4 :</b> विद्यार्थियों को लेखन, वाचन, श्रावण, भाषण कौशल की विशेषताओं और उपयोगिता का ज्ञान प्राप्त होगा ।</p>
9.	<b>Syllabus</b>
	<b>UNIT I : हिंदी भाषा कौशल के आधार</b>
	<p>1.1 लेखन कौशल का अर्थ एवं स्वरूप लेखन कौशल की उपयोगिता एवं महत्व</p> <p>1.2 लेखन कौशल की विधियाँ एवं विशेषताएँ</p> <p>1.3 वाचन कौशल का अर्थ, स्वरूप एवं विशेषताएँ</p> <p>1.4 वाचन कौशल की उपयोगिता एवं विधियाँ</p>
	<b>UNIT II : हिंदी भाषा कौशल के आधार</b>
	<p>2.1 भाषण कौशल का अर्थ एवं स्वरूप</p> <p>2.2 भाषण कौशल का महत्व एवं उपयोगिता</p> <p>2.3 भाषण कौशल की विधियाँ एवं विशेषताएँ</p> <p>2.4 श्रवण कौशल का अर्थ, स्वरूप एवं विशेषताएँ</p> <p>2.5 श्रवण कौशल का महत्व एवं उपयोगिता</p>

10.

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination : Semester End External – 30 Marks Time : 1:00 Hour**

**Format of Question Paper**

**All Questions are Compulsory**

मूल्यांकन प्रारूप	इकाई	अंक
<b>बाह्य मूल्यांकन</b>		
प्रश्न 1 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए।	इकाई 1	15
प्रश्न 2 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए।	इकाई 2	15 □
<b>कुल अंक</b>		<b>30</b>

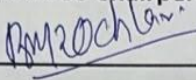
मूल्यांकन प्रारूप	अंक
<b>आंतरिक मूल्यांकन</b>	
<ul style="list-style-type: none"> <li>● AI Writing Tools की सहायता से हिंदी लेखन कौशल का अभ्यास, भाषा-संपादन, व्याकरण सुधार, सारांश लेखन एवं रचनात्मक लेखन करना।</li> <li>● AI की सहायता से दिए गए विषयों पर भाषण, लेख, संवाद एवं लघु-प्रस्तुति तैयार करना तथा भाषा, शैली एवं प्रभावशीलता का विश्लेषण करना।</li> <li>● AI Voice Tools का उपयोग करके हिंदी वाचन, भाषण, उच्चारण, स्वर, गति एवं प्रवाह का अभ्यास करना तथा AI आधारित Feedback प्राप्त करना।</li> <li>● AI Speech-to-Text एवं Text-to-Speech Tools की सहायता से श्रवण एवं वाचन कौशल विकसित करना तथा उच्चारण की शुद्धता का अभ्यास करना।</li> <li>● AI की सहायता से Reading Comprehension, प्रश्नोत्तर, शब्दार्थ, शब्दावली (Vocabulary) एवं भाषा-अभ्यास गतिविधियाँ तैयार करना।</li> <li>● AI आधारित Mock Interview, Group Discussion तथा Public Speaking गतिविधियों के माध्यम से भाषण एवं संप्रेषण कौशल विकसित करना।</li> <li>● AI की सहायता से हिंदी Podcast, Audio Narration एवं Listening Exercises तैयार करना तथा श्रवण कौशल का मूल्यांकन करना।</li> </ul>	20
<b>कुल अंक</b>	<b>20</b>

<b>11.</b>	<b>संदर्भ ग्रंथ सूची –</b> <ol style="list-style-type: none"><li>1. हिंदी भाषा शिक्षण के विविध आयाम – प्राध्यापक डॉ. राठौर, किनले एडिशन</li><li>2. अभिनव पत्र लेखन – डॉ. अनिल सिंह</li><li>3. हिंदी के व्यावहारिक रूप – डॉ. संतोष मोटवानी, परिदृश्य प्रकाशन, मुंबई</li><li>4. हिंदी भाषा लेखन कौशल – गुलीबाबा पब्लिकेशन प्राइवेट लिमिटेड</li></ol>
------------	---

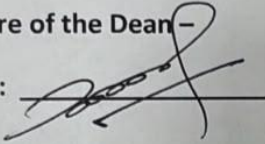
Bos in Hindi :

Sr No	Name of the Faculty	Designation and College
1.	Dr. Bhavna M.Rochlani	I/C HOD Asst. Professor CHM College Ulhasnagar
2.	Dr. Ajeet Kumar Rai	Associate Professor KC College Mumbai
3.	Dr. Santosh Motwani	Associate Professor RKT College Ulhasnagar

Name & Signature of the Ad-hoc BoS Chairperson -

Dr. Bhavna M. Rochlani : 

Name & Signature of the Dean -

Dr. Nitin Arekar : 





**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year**

**Semester - III**

**Title: Environmental Management and  
Sustainable Development-I**

**Vertical - 5  
VEC Subject - 2 Credits**

**With effect from  
Academic Year 2025-2026**

**Title: Environmental Management and Sustainable Development-I**  
**Course Code: CHMVECI**

Sr. No.	Heading	Particulars
<b>1</b>	<b>Description the Course:</b>	This course introduces students to the basics of environmental management and sustainable development. It explains how ecosystems work, the importance of biodiversity, and the need to protect our natural resources. Students will learn about different environmental problems, human impact on nature, and how to manage disasters. The course also covers Indian environmental movements, ethics, and the role of public awareness. Real-life examples and case studies help students understand the connection between nature and human communities in a simple and practical way.
<b>2</b>	<b>Vertical 5</b>	VEC
<b>3</b>	<b>Type &amp; Teaching Methods</b>	Theory + Practicum Lectures/Discussions/Presentations/Case Studies, etc.
<b>4</b>	<b>Credit</b>	2 Credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b> <b>CO(A)1:</b> To introduce about ecosystems, biodiversity and to make aware for the need of conservation. <b>CO(A)2:</b> To sensitize students towards environmental concerns, issues, and impacts of human population. <b>CO(A)3:</b> To analyze the impact of human population growth and development activities on the environment, including issues related to displacement, disaster response, and rehabilitation. <b>CO(A)4:</b> To foster awareness of environmental ethics and the role of cultural and social movements in shaping sustainable environmental practices through communication, policy, and activism.	
<b>8</b>	<b>Course Outcomes:</b> Student will be able to <b>CO1:</b> Explain the interrelationships within ecosystems and analyze energy flow and succession, using examples from various ecological zones. <b>CO2:</b> Critically evaluate biodiversity levels and conservation strategies, applying knowledge of endemic species, threats, and ecological services to real-world scenarios. <b>CO3:</b> Assess the socio-environmental implications of population growth, displacement, and disasters, incorporating case studies to understand sustainable development challenges. <b>CO4:</b> Demonstrate an understanding of environmental ethics and advocacy, by interpreting the influence of cultural values, environmental movements, and communication strategies on sustainability.	

9

## Syllabus

### UNIT I: Ecosystems, Biodiversity and Conservation

- Introduction, structure, and function of ecosystems; Energy flow: food chains, food webs and ecological succession. Case studies of the following:
  - Forest ecosystem
  - Grassland ecosystem
  - Desert ecosystem
  - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns.
- India as a mega-biodiversity nation; Endangered and endemic species of India.
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value.

### UNIT II: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g. CNG vehicles in Delhi).

10

### Scheme of Examination and Assessment Pattern

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

Format of Question Paper

**Attempt any 3 out of 4 questions.**

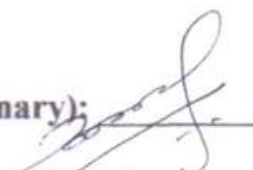
Question No	Nature of Questions	Marks
Q1	Theory based on Unit I	10
Q2	Theory based on Unit I	10
Q3	Theory based on Unit II	10
Q4	Theory based on Unit II	10
<b>TOTAL</b>		<b>30</b>

<b>Internal Examination: Continuous Evaluation - 20 marks</b>		
	<b>Assessment / evaluation</b>	<b>Marks</b>
1.	Class Test, Creative writing/visits/role play (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Quiz)	10
2.	Project /Presentation / Viva/Group Discussion/Case study	10
<b>TOTAL</b>		<b>20</b>

<b>11</b>	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Carson, R. (2002). <i>Silent Spring</i>. Houghton Mifflin Harcourt.</li> <li>2. Gadgil, M., &amp; Guha, R. (1993). <i>This Fissured Land: An Ecological History of India</i>. University of California Press.</li> <li>3. Gleeson, B., &amp; Low, N. (Eds.). (1999). <i>Global Ethics and Environment</i>. Routledge.</li> <li>4. Gleick, P. H. (1993). <i>Water in Crisis</i>. Pacific Institute for Studies in Development, Environment &amp; Security; Stockholm Environment Institute; Oxford University Press.</li> <li>5. Sodhi, N. S., Gibson, L., &amp; Raven, P. H. (Eds.). (2013). <i>Conservation Biology: Voices from the Tropics</i>. John Wiley &amp; Sons.</li> <li>6. Thapar, V. (1998). <i>Land of the Tiger: A Natural History of the Indian Subcontinent</i>.</li> <li>7. Warren, C. E. (1971). <i>Biology and Water Pollution Control</i>. W. B. Saunders.</li> <li>8. Wilson, E. O. (2006). <i>The Creation: An Appeal to Save Life on Earth</i>. W. W. Norton.</li> <li>9. Harper, Charles L. (2017). <i>Environment and Society: Human Perspectives on Environmental Issues</i> (6th Edition). Routledge.</li> <li>10. Rajagopalan, R. (2011). <i>Environmental Studies: From Crisis to Cure</i>. Oxford University Press.</li> <li>11. Harris, Frances (2012). <i>Global Environmental Issues</i> (2nd Edition). Wiley-Blackwell.</li> </ol>
-----------	--

Name & Signature of the Dean & Ad-hoc BoS Chairperson (Interdisciplinary):

  
Dr. Nitin Arekar



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Com.**

**Semester- III**

**Title: Field project**

**Vertical - 6  
Field Project 2 Credits**

**with effect from  
Academic Year 2025-2026**

## Title: Field Project

Course code:

Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	The Field Project course, introduced under CHM Autonomy in alignment with the NEP 2020, aims to bridge theoretical knowledge with practical experience. It provides students with hands-on exposure to real-world socio-economic contexts through field visits, observation, and analysis in both urban and rural settings. By engaging directly with development-related issues, students enhance their research, problem-solving, and analytical skills while fostering social responsibility and environmental awareness. The course ultimately prepares learners for employability and active participation in nation-building.
2	<b>Vertical 6</b>	Field Project
3	<b>Type &amp; Teaching Methods</b>	Field work
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	
	1. To connect theoretical learning with real-world socio-economic contexts through practical field experiences.	
	2. To develop analytical, problem-solving, and teamwork skills in addressing contemporary social issues.	
	3. To cultivate an appreciation for research and its role in promoting societal and national development.	
8	<b>Learning Outcomes:</b> <b>students will be able to:</b>	
	<b>LO1:</b> Apply classroom knowledge to analyze real-life socio-economic challenges effectively.	
	<b>LO2:</b> Demonstrate critical thinking, teamwork, and decision-making skills through field-based activities.	
	<b>LO3:</b> Reflect on the relevance of research and experiential learning in contributing to social and national progress.	

## Guidelines for Field Project

Following are the general guidelines for the conduct of Field Project (Semester III & IV)

### Head of the Department (HOD)/ Field Project Co-ordinator

1. To ensure that FP program aligns with departmental and academic objectives as per NEP Structure within syllabus framework.
2. Appointment of field project incharges from the faculty of the department for group of Students.
3. To conduct orientation of FP Supervisor and decide the time line of the project.
4. To support the student for Filed Project.

### FP Supervisor:

1. To give Guidelines for the field project.
2. To monitor student progress and provide guidance.

### Project (Dissertation) Report:

Students are required to submit a report of the field project at the end of the semester in following suggested format.

The project should be typed on A4 sheets  
 Font Size 12, Times New Roman, 1.5 line Spacing  
 The project report shall have student details with signature of Field Project Incharge and photographs if any and it should be of minimum of 10 pages.

10

### Scheme of Examination and Assessment Pattern



**External Examination: Semester End External - 30 marks**  
**Format of Question Paper**


Nature of Evaluation	Marks
Field Project Report	30
<b>Total 30</b>	

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Involvement in Survey of Field Project /	05
2.	Field visit participation & completion	10
3.	Overall Impression	05
		<b>Total 20</b>

<p>11</p>	<p style="text-align: center;"><b>Appendix I</b></p> <p style="text-align: center;"><b>Attendance of the Student: Active Participation</b></p> <p>I, the undersigned Ms / Mr. _____ Roll No. ___ studying in the _____ Year of _____ Full-time Course is doing my project work under the guidance of Dr./Ms./Mr. _____, I wish to state that I have met my Internal guide on the following dates mentioned below for Project Guidance: -</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sr.No.</th> <th style="text-align: center;">Date</th> <th style="text-align: center;">Signature of the Internal Guide</th> </tr> </thead> <tbody> <tr> <td style="height: 100px;"> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Signature of the Candidate Supervisor</b></p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Signature of Field Project Supervisor</b></p>	Sr.No.	Date	Signature of the Internal Guide			
Sr.No.	Date	Signature of the Internal Guide					
	<p style="text-align: center;"><b>Appendix II</b></p> <p style="text-align: center;"><b>Name of the Department/College/Institute</b></p> <p style="text-align: center;"><b>Certificate</b></p> <p>I hereby certify that Mr./Ms. _____ Student of _____ studying in _____, has completed a project titled _____ in the area of _____ specialization for the academic year 2025-2026 to the best of my knowledge the work of the student is original and the information included in the project is correct.</p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Field Project Supervisor</b></p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Head of the Department/Principal</b></p>						

   
**Board of Examination**

  
**Principal & Chief Controller**  
**Board of Examination**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year**

**Semester- III**

**Title: Cocurricular Course I**

**Vertical - 6  
Cocurricular Course - 2 Credits**

**with effect from  
Academic Year 2025-2026**

**Title: Cocurricular Course - I**

**Course Code: CHMCCI6**

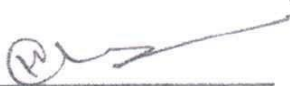
Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	<p>This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year.</p> <p>Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting.</p> <p>This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.</p>
2	<b>Vertical 6</b>	Cocurricular Course (Mandatory)
3	<b>Type Teaching Methods</b>	Non Theory Participation, Report Writing, Presentation etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<ol style="list-style-type: none"> <li>1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities.</li> <li>2. To enhance personal and interpersonal skills through real-life experiences and teamwork.</li> <li>3. To foster a sense of responsibility, leadership, and community engagement among students.</li> <li>4. To develop self-confidence and emotional well-being through creative expression and collaboration.</li> <li>5. To integrate classroom learning with experiential learning for holistic growth.</li> </ol>
8	<b>Learning Outcomes:</b>	<p>By the end of the course, students will be able to:</p> <p><b>LO1:</b> Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences.</p> <p><b>LO2:</b> Demonstrate improved communication, leadership, and teamwork skills.</p> <p><b>LO3:</b> Exhibit increased awareness of social responsibility and civic engagement.</p> <p><b>LO4:</b> Build confidence through creative, cultural, and intellectual expressions.</p> <p><b>LO5:</b> Maintain a portfolio or activity log to track participation and personal development.</p>

9	<b>Syllabus</b>																											
	<b>Unit I - Suggested Areas of Participation in the activities:</b> <ul style="list-style-type: none"> <li>• <b>Cultural Events:</b> Drama, dance, music, literary events, debates, etc.</li> <li>• <b>Social Outreach:</b> Blood donation, awareness campaigns, cleanliness drives.</li> <li>• <b>Clubs &amp; Societies:</b> Photography, quiz, environment club, shram club, etc.</li> <li>• <b>Sports &amp; Fitness:</b> College tournaments, yoga, marathons, fitness challenges.</li> <li>• <b>Institutional Events:</b> Foundation Day, Annual Day, College Festivals, Intercollegiate events.</li> <li>• <b>National Festivals:</b> Independence Day, Republic Day etc.</li> </ul> <b>Unit II - Program Specific Topics</b> <ul style="list-style-type: none"> <li>• <b>Workshops/Seminars:</b> Report Writing, Personality Development, Soft Skills, Leadership Talks.</li> <li>• <b>Speak, Show, Shine:</b> Presentation / Poster Presentation / Viva and Learning Experience</li> </ul> <b>Mode of Evaluation:</b> <ul style="list-style-type: none"> <li>• <b>Faculty Coordinator:</b> To guide and evaluate student progress.</li> <li>• <b>Participation Proof:</b> Certificates, photos, attendance records.</li> <li>• <b>Reflective Journal:</b> Minimum 2-3 pages summarizing experiences, learning, and growth.</li> <li>• <b>Final Viva/Presentation:</b> 5-minute talk on poster presentation and on overall learning.</li> </ul>																											
10	<b>Scheme of Examination and Assessment Pattern</b> <b>Based on 3 approved Activities</b> <b>Semester End External - 30 marks</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Activity No</th> <th style="width: 65%;">Nature of Activities</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Title of Approved Activity - 1</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Title of Approved Activity - 2</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Title of Approved Activity - 3</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table> <b>Internal Examination: Continuous Evaluation – 20 marks</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 70%;">Assessment / Evaluation</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Reflective journal</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Presentation/ poster presentation/viva</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </tbody> </table>	Activity No	Nature of Activities	Marks	1.	Title of Approved Activity - 1	10	2.	Title of Approved Activity - 2	10	3.	Title of Approved Activity - 3	10	<b>Total</b>		<b>30</b>		Assessment / Evaluation	Marks	1.	Reflective journal	10	2.	Presentation/ poster presentation/viva	10	<b>Total</b>		<b>20</b>
Activity No	Nature of Activities	Marks																										
1.	Title of Approved Activity - 1	10																										
2.	Title of Approved Activity - 2	10																										
3.	Title of Approved Activity - 3	10																										
<b>Total</b>		<b>30</b>																										
	Assessment / Evaluation	Marks																										
1.	Reflective journal	10																										
2.	Presentation/ poster presentation/viva	10																										
<b>Total</b>		<b>20</b>																										

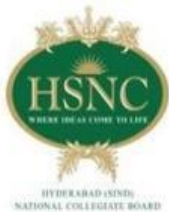
**Suggested Readings:**

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

Name & Signature of the Principal & Chairperson, Academic Council:

  
 Dr. Manju Lalwani Pathak





**HSNC Board's  
Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar  
(Autonomous)  
Affiliated to the University of Mumbai**

**Bachelor of Science  
(Microbiology)  
(Aided Course)**

**Semester – IV**

**Choice Based and Credit Based syllabus  
as per NEP 2020 with effect from the  
Academic Year 2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- IV**

**Title: Introduction to Microbial Metabolism  
and Enzymology**

**Vertical - 1  
Major Course 1**

**With effect from  
Academic Year 2026-2027**

## Title: Introduction to Microbial Metabolism and Enzymology

**Course Code: CHMMBIV1**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course explores the fundamental concepts of microbial metabolism, covering basic anabolic and catabolic pathways. This course also focuses on bioenergetics, kinetics, thermodynamics and redox reactions associated with microbial reactions. An understanding of microbial metabolism is crucial to the developments in biotechnology, medicine, and environmental sustainability. The course also explores the concepts of microbial enzymes, coenzymes and cofactors. Understanding kinetics and regulation of enzymes is crucial for developing basics of microbial metabolism.
2	<b>Vertical 1</b>	Major
3	<b>Type</b>  <b>Teaching Method</b>	Theory  Lectures, Discussion, Presentation, Case Studies, Industrial visit, Flipped classroom etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b> <b>CO(A)1:</b> To introduce the fundamental concepts of metabolism, biochemical reactions, bioenergetics, and thermodynamics in biological systems. <b>CO(A)2:</b> To develop an understanding of thermodynamic principles and their application in calculating energy changes in biochemical reactions. <b>CO(A)3:</b> To impart knowledge of enzyme kinetics and the factors influencing enzyme activity and catalytic efficiency. <b>CO(A)4:</b> To familiarize students with the classification, nomenclature, and applications of microbial enzymes in medicine, biotechnology, and drug design.	
8	<b>Course Outcomes:</b> Upon completion of the course the student will be able to: <b>CO1</b> explain the mechanism of enzyme action and determine the kinetic parameters governing enzyme-catalyzed reactions. <b>CO2</b> describe the concepts of activation energy, reaction rates, and the relationship between enzyme structure and function. <b>CO3</b> analyze the effects of environmental factors and regulatory mechanisms on enzyme activity. <b>CO4</b> classify enzymes based on their historical development, properties, and systematic nomenclature.	

**Syllabus****UNIT I: Introduction to Microbial Metabolism and Enzymology**

- Fundamentals of Metabolism - Concept of metabolism, anabolic versus catabolic pathways
- Bioenergetics and Thermodynamics - Concept of bioenergetics and energy flow in biological systems, Laws of thermodynamics in biological reactions, Gibbs free energy, entropy, and enthalpy,
- Energy Generation - ATP as the energy currency of the cell and other high energy compounds.
- Modes of ATP synthesis - Substrate level phosphorylation and Photophosphorylation, Oxidative phosphorylation
- Redox Reactions - Redox potential concept
- Central metabolic pathways: Glycolysis and TCA cycle (with structures and enzymes, balance sheets)

**UNIT II: Enzymology**

- An Introduction to Enzymes - Historical Background & Milestones in Enzymology, General properties of enzymes, How do enzymes accelerate reaction, Classification and nomenclature of enzymes
- Coenzymes and Cofactors - Different types and reactions (tabulation)
- Rate of law of reaction - for a simple catalyzed reaction, Michaelis-Menten equation and its derivation, Line weaver Burk plot
- Enzyme Kinetics - Factors affecting enzyme activity, Effect of substrate concentration (saturation kinetics), temperature, pH and Inhibitors-Reversible and irreversible, competitive, Non-competitive and Uncompetitive inhibitors
- Concept of Allosteric enzymes

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**A. External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/Assignment/Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
		<b>Total 20</b>

**11****REFERENCES:**

- Nelson, D.L., & Cox, M. M. (2005). Lehninger: Principles of Biochemistry (4th ed.). W.H. Freeman & Co.
- Nelson, D. L., & Cox, M. M. (2008). Lehninger principles of biochemistry (5th ed.). W.H. Freeman & Co
- Conn, E. E., Stumpf, P. K., Bruening, G., & Doi, R. Y. (1987). Outlines of Biochemistry (5th ed.). John Wiley & Sons.
- Zubay, G., Parson, W. W., & Vance, D. E. (1995). Principles of Biochemistry. Wm. C. Brown Publishers.
- Willey, J., Sherwood, L., & Woolverton, C. (2011). Prescott's Microbiology (ISE) (8th ed.). McGraw-Hill Education
- Madigan, M. T., Martinko, J. M., Stahl, D., & Clark, D. P. (2012). Brock Biology of Microorganisms (13th Global ed.). Pearson International.
- Trevor Palmer, Philip Bonner, Enzymology - Biochemistry, Biotechnology, Clinical Chemistry , Second edition. .

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- IV**

**Title: Introduction to Genetics**

**Vertical - 1  
Major Course 2**

**With effect from  
Academic Year 2026-2027**

## Title: Introduction to Genetics

**Course Code: CHMMBIV2**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course introduces the learner to the important milestones in discovery of DNA and its structure. It also emphasizes on types of DNA and mechanisms of DNA organization in chromosomes of prokaryotes and eukaryotes. The course further gives in-depth knowledge of key concepts in genetics like prokaryotic DNA and its types, central dogma of DNA, and steps associated with transcription of prokaryotic DNA.
2	<b>Vertical 1</b>	Major
3	<b>Type</b> <b>Teaching Method</b>	Theory  Lectures, Discussion, Presentation, Case Studies, Industrial visit, Flipped classroom etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To explain the milestones in the discovery of DNA, its composition, organization, and different structural forms.</p> <p><b>CO(A)2:</b> To develop an understanding of the organization of prokaryotic and eukaryotic chromosomes and the proposed models of DNA replication.</p> <p><b>CO(A)3:</b> To impart comprehensive knowledge of the mechanisms and types of DNA replication, emphasizing the roles of enzymes involved in the replication process.</p> <p><b>CO(A)4:</b> To enable students to analyze the steps, enzymes, and regulatory mechanisms governing transcription in prokaryotes.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> explain the experimental evidence and evaluate the contributions of different scientists to the discovery of DNA and the development of DNA compositional models.</p> <p><b>CO2</b> compare and analyze the organization of DNA in prokaryotic and eukaryotic chromosomes and interpret its functional significance.</p> <p><b>CO3</b> apply the principles of DNA replication to illustrate the roles of replication enzymes and analyze the mechanisms of prokaryotic DNA replication.</p> <p><b>CO4</b> analyze the molecular mechanisms of transcription in prokaryotes and evaluate the regulatory processes governing gene expression based on the central dogma.</p>

**Syllabus****UNIT I: DNA Structure and Introduction to Replication**

- Discovery of DNA - Griffith Experiment, Avery's Experiment, Hershey and Chase's Experiment, Exceptions - RNA as Genetic material
- The composition and Structure of DNA and RNA - Components of Nucleotides, The DNA Double Helix, Base composition studies, X- Ray Diffraction Studies, Watson and Crick's Model for DNA, Types of DNA and RNA - A Form, B Form, and Z
- Organization of Prokaryotic and Eukaryotic DNA in Chromosomes - Viral and Prokaryotic genetic material, Packaging of DNA into Eukaryotic Chromosome, Structure of – Chromatin, Euchromatin, Heterochromatin, Telomere, and Centromere
- Introduction to DNA Replication - Meselson and Stahl Experiment, Models for DNA Replication

**UNIT II: Replication and Transcription in Prokaryotes**

- Enzymes in DNA Replication and their roles - DNA Polymerases I & III, DNA Helicases, DNA Primase, DNA Gyrase, DNA Ligase, SSB, replisome.
- Molecular model of DNA Replication - Initiation of Replication, Elongation and Termination, Semi Discontinuous DNA Replication, Rolling Circle Replication
- Transcription in Bacteria - Initiation of Transcription at Promoters, role of RNA Polymerase, Role of Promoter, Role of Consensus sequence, Role of Sigma Factor Elongation of an RNA chain, Termination of an RNA chain by Rho dependent and independent mechanism

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**A. External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/Assignment/Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
		<b>Total 20</b>

**11****REFERENCES:**

1. Peter J. Russell (2006), "I Genetics-A molecular approach", Third edition.
2. M. Madigan, J. Martinko, J. Parkar, (2009), "Brock Biology of microorganisms", 12th edition, Pearson Education International
3. Prescott, Harley and Klein, "Microbiology", 7th edition McGraw Hill international edition
4. Nelson and Cox, "Principles of Biochemistry", 8th Edition, WH Freeman Publishing House.
5. Molecular Biology of the Gene, Watson, Baker, Bell, Gann, Levine, Lodish, 7th edition, 2007, Pearson Education

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- IV**

**Title: Essential Techniques in Enzymology  
and Dairy Microbiology**

**Vertical - 1  
Major Course 3**

**With effect from  
Academic Year 2026 - 2027**

## Title: Essential Techniques in Enzymology and Dairy Microbiology

**Course Code: CHMMBIV3**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This practical course is based on microbial enzymes and dairy Microbiology. The course aims to enable learners understand microbial enzyme production, enzyme-extraction, purification and effect of environmental factors on enzyme activity. Dairy and Food Microbiology related experiments, focus on bacteriological analysis, and rapid platform tests to assess the quality of milk. The course also includes assignment and educational visit to the Food / Dairy industry for experiential learning for slow learners.
2	<b>Vertical 1</b>	Major
3	<b>Type</b> <b>Teaching Method</b>	Practical  Demonstrations, simulations, project-based learning, peer teaching, field visit etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To develop an understanding of the methods involved in the production, extraction, and purification of the enzyme invertase.</p> <p><b>CO(A)2:</b> To enable students to apply enzyme assay techniques and analyze the effects of environmental parameters on enzyme activity.</p> <p><b>CO(A)3:</b> To impart knowledge of analytical chemical methods used for assessing the microbial quality of milk.</p> <p><b>CO(A)4:</b> To enable students to evaluate biological methods for determining the microbial quality of milk and their applications in quality assessment.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> apply the principles and techniques involved in the production, extraction, and purification of microbial enzymes.</p> <p><b>CO2</b> explain the principles underlying rapid platform tests used for assessing the quality of milk.</p> <p><b>CO3</b> analyse the influence of different environmental and experimental parameters on enzyme activity and interpret the observed results.</p> <p><b>CO4</b> evaluate the quality of milk by applying BIS/FSSAI standards to interpret the results of rapid chemical and biological quality tests.</p>

9

**List of Practicals**

**1. Problems on Bioenergetics**

- Keq - Gibbs energy, enthalpy

**2. Enzymology**

- Production of Invertase from Yeasts
- Study of the effect of pH on invertase activity.
- Study of the effect of Temperature on invertase activity.
- Study of effect of Substrate concentration on invertase activity.
- Study of the effect of Enzyme concentration on invertase activity.

**3. Extraction of DNA**

- Onion DNA Extraction and Purification
- Confirmation by DPA

**4. Dairy Microbiology**

- Introduction to milk standards - BIS / FSSAI standards for milk quality
- Rapid Platform Tests of milk
- RRT, MBRT
- DMC, Specific Gravity, Phosphatase Test for Milk
- Determination of Microbial Quality of Milk - Raw Milk
- SPC
- Psychrophilic
- Thermophilic
- Coliform Count
- Determination of Microbial Quality of Milk -Pasteurized Milk
- LPC
- Psychrophilic
- Thermophilic
- Coliform Count
- AI in dairy
- Industrial Visit

<b>10</b>	<table border="1"> <tr> <td><b>Internal Continuous Assessment: 40% (20 Marks)</b></td> <td><b>Semester End Examination: 60% (30 Marks)</b></td> <td><b>Duration for End semester examination</b></td> </tr> <tr> <td>Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks</td> <td>Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)</td> <td>2 hours each day (2 days)</td> </tr> </table>	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>	Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination: 60% (30 Marks)</b>	<b>Duration for End semester examination</b>				
Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)					
<b>Scheme of Examination and Assessment Pattern</b> Paper – 50 Marks							
<b>11</b>	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. FSSAI Manual of methods of analysis- Microbiological Examination of Food and Water</li> <li>2. Food Microbiology by James Jay</li> <li>3. BIS Standards, FSSAI</li> <li>4. Outlines of Biochemistry, E.E.Conn and P.K.Stumpf, G. Bruening, R.N.Do. 5th edition, John Wiley and sons.</li> <li>5. Laboratory Manual in Biochemistry, J. Jayaraman, (2003) New Age International Publisher</li> <li>6. Applied Dairy Microbiology by Martha &amp; Steele</li> </ol>						

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- IV**

**Title: Microbial growth and Cultivation**

**Vertical - 2  
Minor Course 1**

**With effect from  
Academic Year 2026-2027**

## Title: Microbial growth and Cultivation

**Course Code: CHMMBIV4**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	The Cultivation and Growth of Microorganisms course introduces the fundamental principles and laboratory techniques used for the cultivation of microorganisms. It covers the nutritional requirements of microbes and the composition and applications of various types of culture media, including complex, selective, and differential media. The course also provides knowledge and practical skills for obtaining pure cultures, along with a brief introduction to techniques for pure culture preservation. In addition, the course explains the different phases of microbial growth and the factors that influence microbial growth, such as temperature, pH, and oxygen availability. Furthermore, it introduces various methods used to measure microbial growth.
2	<b>Vertical 2</b>	Minor
3	<b>Type</b> <b>Teaching Method</b>	Theory Lectures, Discussion, Presentation, Case Studies, Industrial visit, Flipped classroom etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To develop an understanding of the nutritional requirements of bacteria and the laboratory methods used for their cultivation.</p> <p><b>CO(A)2:</b> To explain the composition, selection, and applications of different culture media and microbial preservation techniques.</p> <p><b>CO(A)3:</b> To impart knowledge of the physical, chemical, and biological factors influencing microbial growth.</p> <p><b>CO(A)4:</b> To enable students to apply and analyze different methods for measuring microbial growth under laboratory conditions.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> explain the diverse nutritional categories of microorganisms and apply the principles of microbial physiology to explain their growth requirements.</p> <p><b>CO2</b> differentiate and analyze culture media based on their physical state, chemical composition, and functional properties for microbial cultivation.</p> <p><b>CO3</b> identify, describe, and analyze the phases of the microbial growth curve and apply appropriate methods for measuring microbial growth.</p> <p><b>CO4</b> analyse the effects of physical and chemical factors influencing microbial survival and proliferation and evaluate their significance in microbial growth and control.</p>

**Syllabus****UNIT I: Cultivation of Microorganisms**

- Nutritional requirements – Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorus, Sulfur and growth factors.
- Nutritional types of microorganisms.
- Types of Culture media - Synthetic and Complex- Allen /Chu/ M9 and Nutrient broth, Fungal – Sabourauds agar, Differential - Mac Conkeys agar, Enriched – SIBA, Selective-Salt mannitol agar Enrichment - Ashby's mannitol broth,
- Isolation of microorganisms and pure culture Techniques – Streak plate method
- Preservation of microorganisms - Periodic transfer, Refrigeration, Glycerol method, Lyophilization, soil stock method

**UNIT II: Microbial Growth**

- Growth - Definition of growth, Phases of growth (Growth Curve)
- Continuous culture of microorganisms - Chemostat, Turbidostat
- Measurement of growth - Measurement of cell number - DMC, Colony Counter, Viable Count, Measurement of cell mass - Spectroscopic Method
- Influence of environmental factors on growth- Solute and water activity, pH, Temperature, Oxygen concentration, Pressure and Radiation.

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**A. External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**B. Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Assignment/Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
		<b>Total 20</b>

**11****REFERENCES:**

1. Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg
2. Prescott ,Harley.Klein-Microbiology, 5th & 6th edition, International edition 2002 & 2006, McGraw Hill.
3. Michael T.Madigan & J.M.Martin,Brock ,Biology of Microorganisms 11th Ed. International edition ,2006, Pearson Prentice Hall.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)  
Semester- IV**

**Title: Basic Techniques in Microbiology**

**Vertical - 2  
Minor Course 2**

**With effect from  
Academic Year 2026-2027**

## Title: Basic Techniques in Microbiology

**Course Code: CHMMBIV5**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	The basic techniques in Microbiology course introduces the principles and techniques for isolation of bacteria on different microbiological media. It would involve learning about different methods for obtaining pure cultures and preservation methods. This course also covers different physical and chemical parameters impacting microbial growth along with practical methodologies for measuring growth.
2	<b>Vertical 2</b>	Minor
3	<b>Type</b>  <b>Teaching method</b>	Practical  Demonstrations, simulations, project-based learning, and peer teaching etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To equip students with the practical skills required for obtaining and maintaining pure bacterial cultures using aseptic techniques.</p> <p><b>CO(A)2:</b> To develop an understanding of the composition, preparation, and applications of complex, selective, and differential culture media.</p> <p><b>CO(A)3:</b> To impart practical knowledge of the methods used for measuring microbial growth and interpreting growth patterns.</p> <p><b>CO(A)4:</b> To enable students to analyze the effects of environmental factors on microbial growth and evaluate their significance in microbial cultivation.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to.</p> <p><b>CO1</b> describe the techniques required for obtaining and maintaining pure bacterial cultures using aseptic procedures.</p> <p><b>CO2</b> apply the knowledge of different culture media to select appropriate media and analyze their effects on microbial growth and characteristics.</p> <p><b>CO3</b> perform different techniques for measuring microbial growth and interpret the experimental results.</p> <p><b>CO4</b> analyze the effects of environmental parameters on microbial growth and evaluate their application in manipulating microbial cultivation under laboratory conditions.</p>

9	<p><b>List of Practicals</b></p> <ol style="list-style-type: none"> <li>1. <b>Monitoring of surfaces, swabbing of wall, floor, handles, mobiles, etc.</b></li> <li>2. <b>Principles and application of types of media</b> <ul style="list-style-type: none"> <li>● General purpose media Nutrient agar- Bacterial cultivation (<i>Escherichia coli</i>, <i>Bacillus subtilis</i>, one pigment producer) Sabourauds agar - Fungal cultivation</li> <li>● Differential and Selective (MacConkey's agar, Salt mannitol agar)</li> </ul> </li> <li>3. <b>Concepts and techniques of Preservation of cultures</b> <ul style="list-style-type: none"> <li>● Periodic transfer</li> <li>● Soil stock</li> </ul> </li> <li>4. <b>Enumeration Methods</b> <ul style="list-style-type: none"> <li>● DMC</li> <li>● Pour /Spread Plate Technique - Demonstration</li> <li>● Brown's opacity tube</li> </ul> </li> <li>5. <b>Effect of Environmental Parameters</b> <ul style="list-style-type: none"> <li>● Effect of pH on growth</li> <li>● Effect of temperature on growth</li> <li>● Effect of salt concentration on growth</li> </ul> </li> </ol>						
10	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b></p> <p style="text-align: center;">Paper – 50 Marks</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Internal Continuous Assessment: 40% (20 Marks)</th> <th style="text-align: center;">Semester End Examination: 60% (30 Marks)</th> <th style="text-align: center;">Duration for End semester examination</th> </tr> </thead> <tbody> <tr> <td>Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks</td> <td style="text-align: center;">Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)</td> <td style="text-align: center;">2 hours each day (2 days)</td> </tr> </tbody> </table>	Internal Continuous Assessment: 40% (20 Marks)	Semester End Examination: 60% (30 Marks)	Duration for End semester examination	Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
Internal Continuous Assessment: 40% (20 Marks)	Semester End Examination: 60% (30 Marks)	Duration for End semester examination					
Minor experiment /Viva/ Objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)					
11	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Principles of Biochemistry 5th Edition Lehninger</li> <li>2. Microbiology TMH 5th Edition by Michael J. Pelczar Jr., E.C.S. Chan, Noel R. Krieg</li> <li>3. Prescott, Harley Klein-Microbiology, 5th &amp; 6th edition, International edition 2002 &amp; 2006, McGraw Hill.</li> <li>4. Michael T. Madigan &amp; J.M. Martin, Brock, Biology of Microorganisms 11th Ed. International edition, 2006, Pearson Prentice Hall.</li> </ol>						

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Sc.  
(Microbiology)**

**Semester- IV**

**Title: Basics of Nutrition – 4**

**Vertical - 3  
Open Elective**

**With effect from  
Academic Year 2026-2027**

## Title: Basics of Nutrition – 4

**Course Code: CHMMBIV6**

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	This course introduces the fundamental principles of nutrition in relation to health, disease prevention, and recovery. It explores the role of diet and lifestyle factors in the development and management of major non-communicable diseases such as obesity, diabetes mellitus, and cardiovascular diseases. The course also examines nutritional requirements and dietary strategies during communicable diseases, including gastrointestinal, respiratory, and viral infections. Students will develop an understanding of evidence-based nutritional approaches that support disease prevention, health promotion, and overall well-being
2	<b>Vertical 3</b>	Open Elective (OE)
3	<b>Type Teaching Method</b>	Theory + Practicum Lectures/ Discussion / Presentation/ Case Studies
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To develop an understanding of the relationship between nutrition, lifestyle, and the development of communicable and non-communicable diseases.</p> <p><b>CO(A)2:</b> To explain the nutritional risk factors, causes, health consequences, and dietary management of obesity, diabetes mellitus, and cardiovascular diseases.</p> <p><b>CO(A)3:</b> To impart knowledge of dietary requirements, nutritional interventions, and the role of nutrients, functional foods, and nutraceuticals in disease prevention, recovery, and immune support.</p> <p><b>CO(A)4:</b> To enable students to analyze and evaluate healthy dietary practices and lifestyle modifications for the prevention and management of diseases.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> classify communicable and non-communicable diseases and explain the role of nutrition in their prevention and management.</p> <p><b>CO2</b> analyze and evaluate the influence of diet, physical activity, and lifestyle factors on obesity, diabetes mellitus, and cardiovascular diseases.</p> <p><b>CO3</b> apply the principles of nutritional management to plan appropriate dietary interventions for gastrointestinal, respiratory, and viral infection.</p> <p><b>CO4</b> evaluate the role of immune-supportive nutrients, functional foods, and nutraceuticals, and recommend appropriate dietary and lifestyle strategies for disease prevention and health promotion</p>

## Syllabus

### UNIT I: Nutrition and Non-Communicable Diseases (NCDs)

- **Introduction to Non-Communicable Diseases** - Definition, characteristics, and major types of non-communicable diseases (NCDs), Difference between communicable and non-communicable diseases, Impact of sedentary habits, stress, tobacco, and alcohol on health, Benefits of regular physical activity, exercise and mindful eating
- **Nutrition and Obesity** - Definition, causes, and classification of obesity, Concept of energy balance and body weight regulation, Health consequences associated with obesity, Dietary and lifestyle strategies for weight management
- **Diabetes Mellitus** - Types, causes, and symptoms of diabetes mellitus, Risk factors and complications of diabetes, Principles of dietary management and glycemic control, Role of physical activity and lifestyle modification in diabetes prevention and management
- **Cardiovascular Diseases** - Overview of hypertension, coronary artery disease, Major risk factors associated with cardiovascular diseases, Influence of diet, fats, cholesterol, and sodium on heart health

### UNIT 2: Nutrition and communicable diseases

- **Nutrition in Gastrointestinal Infection** - Dietary management of acute and chronic diarrheal diseases, Oral rehydration therapy and nutritional rehabilitation, Nutrition in other food- and water-borne infections (Tabulation)
- **Nutrition in Tuberculosis and Respiratory Infections** - Energy, protein, and micronutrient requirements during Tuberculosis, Nutritional support during respiratory tract infections, Role of vitamins and minerals in immune function and recovery, Dietary strategies to improve treatment outcomes
- **Nutrition in Viral Diseases** - Dietary considerations during viral hepatitis, Nutrition during dengue and other viral infections, Importance of hydration and nutrient-dense diets during illness
- **Nutrition-Based Approaches for Disease Prevention and Recovery** - Immune-supportive nutrients and foods, Functional foods and nutraceuticals in communicable disease management, Dietary strategies for infection prevention and faster recovery

10

**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks****Time: 1:00 hour**

Format of Question Paper

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
<b>Total</b>		<b>30</b>

**Note:**

1. Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / Evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Overall conduct as a responsible student, attentiveness and attendance	5
<b>Total</b>		<b>20</b>

11

**References:**

1. Srilakshmi, B. (2022). *Nutrition science* (8th ed.). New Age International Publishers.
2. Mudambi, S. R., & Rajagopal, M. V. (2017). *Fundamentals of foods, nutrition and diet therapy* (7th ed.). New Age International Publishers.
3. Fellows, P. J. (2017). *Food processing technology: Principles and practice* (4th ed.). Woodhead Publishing.
4. Gaman, P. M., & Sherrington, K. B. (2018). *The science of food: An introduction to food science, nutrition and microbiology* (6th ed.). Elsevier.
5. Mann, J., & Truswell, A. S. (2017). *Essentials of human nutrition* (5th ed.). Oxford University Press.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B.Sc.  
(Microbiology)**

**Semester- IV**

**Title: Basic Bio-analytical Techniques**

**Vertical – 4  
VOCATIONAL SKILL COURSE(VSC)**

**With effect from  
Academic Year 2026-2027**

## Title: Basic Bio-analytical Techniques

Course Code: CHMMBIV7

Sr. No.	Heading	Particulars
1	<b>Description of the Course:</b>	A vocational skill course on Basic Bio-analytical techniques focuses on analytical techniques employed for examining microorganisms. Students will understand the principles, operation, and application of analytical techniques like gradient centrifugation, chromatography, pH meter and buffering action. These techniques are precise, efficient, and widely used in laboratories. Together, they provide critical information about the composition and behaviour of biological samples. Mastery of these tools is fundamental for students and professionals in the life sciences.
2	<b>Vertical 4</b>	Vocational Skill Course (VSC)
3	<b>Type</b> <b>Teaching Method</b>	Practical Demonstrations, simulations, project-based learning, peer teaching etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To develop an understanding of the construction, working principles, and applications of analytical instruments used in microbiological analysis.</p> <p><b>CO(A)2:</b> To enable students to differentiate the principles and applications of differential, rate-zonal, and isopycnic (density gradient) centrifugation techniques.</p> <p><b>CO(A)3:</b> To impart knowledge of the components and working principles of pH measurement systems and their role in microbial media buffering.</p> <p><b>CO(A)4:</b> To explain the principles and applications of different chromatographic techniques used for the separation, purification, and identification of microbial products.</p>
8	<b>Course Outcomes:</b>	<p>Upon completion of the course the student will be able to:</p> <p><b>CO1</b> explain the physical forces involved in sedimentation and analyze the principles underlying different centrifugation techniques for the separation of biological components.</p> <p><b>CO2</b> identify the key components of a pH measurement and buffering system and apply their principles in microbiological analysis.</p> <p><b>CO3</b> describe and analyze the mechanisms of adsorption, partition, ion exchange, size exclusion, and affinity interactions involved in chromatographic separation.</p> <p><b>CO4</b> apply analytical techniques to analyze and interpret industrial and environmental samples for microbiological investigations.</p>

**1. pH Meter**

- Concepts of pH and Buffer
- Types of electrodes
- Construction, working and principle
- Calibration and care
- Preparation of Buffers and measurement of pH (acetate/ phosphate/ borate)

**2. Extraction of Phytochemicals – Soxhlet Method**

- Working and Construction
- Extraction of plant material

**3. Centrifugation techniques**





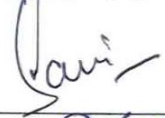


- Introduction: Basic principles of sedimentation
- Study of types of centrifuges (Give an overview)
- Bench top centrifuges
- Types of Rotors - any 2
- Large capacity refrigerated centrifuges
- Small high speed refrigerated centrifuges
- Preparative and analytical
- Care and safety aspects of centrifuges
- Density Gradient Centrifugation
- Separation of Bacteria and yeasts by density gradient centrifugation

**4. Chromatography techniques**

- Principle of chromatography
- Types of chromatography (General introduction)
- Paper chromatography and Thin layer chromatography
- Applications of chromatography
- Separation of amino acids by paper chromatography
- Separation of a mixture of sugars/ amino acids by Thin Layer Chromatography (TLC) – Demo
- AI in instrumentation

<b>10</b>	<b>Scheme of Examination and Assessment Pattern</b> Paper – 50 Marks		
	<b>Internal Continuous Assessment: 40% (20 Marks)</b>	<b>Semester End Examination:  60% (30 Marks)</b>	<b>Duration for End semester examination</b>
	Minor experiment /Viva/ objective question test (15 Marks). Overall performance (5 Marks) = 20 Marks	Experiments (15 marks Major + 5 marks Viva/Spots + 5 marks Quiz and 5 Marks for Journal = 30 Marks)	2 hours each day (2 days)
<b>11</b>	<b>REFERENCES</b> <ol style="list-style-type: none"> <li>1. Principles &amp; Techniques of Biochemistry &amp; Molecular Biology 7th ed, Keith Wilson &amp; John Walker, Cambridge University press</li> <li>2. An Introduction to Practical Biochemistry by David T Plummer</li> <li>3. Principles &amp; Techniques of Biochemistry &amp; Molecular biology 7th ed, Keith Wilson &amp; John Walker, Cambridge University press</li> <li>4. Karp's Cell and Molecular Biology</li> </ol>		

**Board of Studies (BOS) Microbiology**

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sandhya Mulchandani	BOS-Chairperson, Associate Professor Smt. CHM College, Ulhasnagar	
2.	Dr. Veena Yardi	Retired Professor, Department of Food, Nutrition and Dietetics, Nirmala Niketan College of Home Science, Churchgate	
3.	Dr. Rasika Pawar	Assistant Professor Smt. CHM College, Ulhasnagar	
4.	Dr. Pranali Shete	Assistant Professor Smt. CHM College, Ulhasnagar	
5.	Dr. Ashish Jain	Associate Professor Smt. CHM College, Ulhasnagar	
6.	Dr. Nitin Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
7.	Dr. Renu Jaisinghani	Assistant Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: Dr. Sandhya Mulchandani



Name & Signature of the Dean: Dr. Neena Anand



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year BA/BCom/BSc/SFC  
(Marathi)**

**Semester- IV**

**Vertical -5  
Ability Enhancement Course (AEC) -2 Credits**

**with effect from  
Academic Year 2026-2027**

Title: लेखन कौशल्ये - २ (महाजालावरील लेखन)

COURSE CODE: CHMAECMARIII

Sr. No.	Heading	Particulars
1	Description the Course:	<p>राष्ट्रीय शैक्षणिक धोरण - २०२० विद्यार्थ्यांच्या सर्वांगीण विकासावर (Wholistic Development) भर देते. या धोरणात सर्वांगीण विकासाचा भाग म्हणून क्षमता वर्धन अभ्यासक्रम (Ability Enhancement Course) या स्तंभांतर्गत भाषिक कौशल्य अभ्यासक्रमाचा समावेश करण्यात आला आहे. कला, वाणिज्य व विज्ञान या विद्याशाखांमध्ये अध्ययन करणाऱ्या विद्यार्थ्यांना तिसऱ्या सत्रामध्ये 'आधुनिक भारतीय भाषां'चे अध्ययन अनिवार्य करण्यात आले आहे. सदर क्षमता वर्धन अभ्यासक्रमाचे स्वरूप प्रामुख्याने भाषाकेंद्री असावे, असेही राष्ट्रीय शैक्षणिक धोरणात नमूद करण्यात आले आहे. विद्यार्थ्यांना विविध प्रकारच्या भाषिक कौशल्यांचा तपशीलवार परिचय करून देणे, तसेच ती कौशल्ये आत्मसात करण्याची संधी विद्यार्थ्यांना उपलब्ध करून देणे, ही या अभ्यासक्रमाची महत्त्वाची उद्दिष्टे आहेत. ही उद्दिष्टे लक्षात घेऊन 'लेखन कौशल्ये - २ (महाजालावरील लेखन)' (श्रेयांकने २) या अभ्यासपत्रिकेची आखणी करण्यात आली आहे.</p> <p>आंतरमहाजाल हे एकविसाव्या शतकातील अत्यंत प्रभावी साधन आहे. जगभरातील संगणक एकमेकांशी जोडले जाऊन त्यांचे जाळे तयार झाले आहे. विविध सामाजिक माध्यमस्थळांवर स्वतःचे खाते (अकाउंट) तयार करणे आणि त्यावर मराठी भाषा व देवनागरी लिपीतून लिहिणे, ही समकालीन संपर्क व्यवहारातील आवश्यक बाब झाली आहे. यास अनुसरून आपल्या अभिव्यक्तीला व्यासपीठ मिळवून देणारी अनुदिनी (ब्लॉग) तयार करणे, विकिपीडियावर भोवतालातील भाषा, साहित्य, संस्कृतीशी निगडित माहितीपर व विश्लेषणात्मक नोंदी लिहिणे, सामाजिक माध्यमस्थळांवरील आपल्या खात्यावर सातत्याने अभ्यासपूर्ण लेखन करणे, स्वक्षमतेशी निगडित समाजगट / आभासी कट्टे (कम्युनिटी ग्रुप) तयार करणे, या बाबींसाठी आवश्यक सामाजिक माध्यमस्थळ साक्षरता आणि मराठी भाषा व देवनागरी लिपीतून लिहिण्याची क्षमता 'लेखन कौशल्ये - २ (महाजालावरील लेखन)' (श्रेयांकने २) या अभ्यासपत्रिकेच्या अध्ययनातून विद्यार्थ्यांमध्ये निर्माण होईल.</p>
2	Vertical 5	Ability Enhancement Course
3	Type	Theory
4	Credit	2 Credits (1 Credit = 15 Hours for Theory or 30 Hours of Practical Work in a Semester)
5	Hours allotted	30 Hours
6	Marks allotted	50 Marks

7	<p><b>Course Objectives:</b></p> <p><b>CO(A) 1:</b> महाजालावरील लेखन कौशल्याचे स्वरूप समजावून सांगणे.</p> <p><b>CO(A) 2:</b> महाजालावर प्रभावी लेखन करण्यासाठी आवश्यक असणाऱ्या तंत्रांचा परिचय करून देणे.</p> <p><b>CO(A) 3:</b> नेहमीच्या पठडीतील लेखन व महाजालावरील लेखन यांमधील साम्य-भेद स्पष्ट करणे.</p> <p><b>CO(A) 4:</b> विविध सामाजिक माध्यमस्थळांवर लेखन करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित करणे.</p>
8	<p><b>Course Outcomes:</b></p> <p>प्रस्तुत अभ्यासक्रम शिकल्यानंतर:</p> <p><b>CO1:</b> विद्यार्थ्यांना महाजालावरील लेखन कौशल्याचे स्वरूप समजेल.</p> <p><b>CO2:</b> विद्यार्थ्यांना महाजालावर प्रभावी लेखन करण्यासाठी आवश्यक तंत्रांचा परिचय होईल.</p> <p><b>CO3:</b> विद्यार्थ्यांना नेहमीच्या पठडीतील लेखन व महाजालावरील लेखन यांमधील साम्य-भेद स्पष्ट होईल.</p> <p><b>CO4:</b> विद्यार्थ्यांमध्ये विविध सामाजिक माध्यमस्थळांवर लेखन करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील.</p>
9	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I: सामाजिक माध्यमस्थळांवर मराठी भाषा व देवनागरी लिपीचा वापर करून लेखन (भाग - १)</b></p> <ol style="list-style-type: none"> <li>१. माध्यम साक्षरता</li> <li>२. अनुदिनी (ब्लॉग) लेखन</li> <li>३. विकिपीडियावरील लेखन</li> </ol> <p>(६० मिनिटांच्या १५ तासिका, श्रेयांकन १)</p> <p>(सूचना : विद्यार्थ्यांमध्ये उपरोक्त सामाजिक माध्यमस्थळांवर लेखन करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील या दृष्टीने शिक्षकांनी सराव करून घ्यावा.)</p> <p><b>UNIT II: सामाजिक माध्यमस्थळांवर मराठी भाषा व देवनागरी लिपीचा वापर करून लेखन (भाग - २)</b></p> <ol style="list-style-type: none"> <li>१. फेसबुक, इन्स्टाग्राम, एक्स यांवरील लेखन</li> <li>२. समाज गट (कम्युनिटी ग्रुप), आभासी कट्टे यांवरील लेखन</li> </ol> <p>(६० मिनिटांच्या १५ तासिका, श्रेयांकन-१)</p> <p>(सूचना : विद्यार्थ्यांमध्ये उपरोक्त सामाजिक माध्यमस्थळांवर लेखन करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील या दृष्टीने शिक्षकांनी सराव करून घ्यावा.)</p>

10

**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00**

hours

Format of Question Paper

All questions are compulsory:

Q. No	Nature of Questions	Marks
Q1	Essay type question on Module 1	10
Q2	Essay type question on Module 2	10
Q6	MCQs 15 out of 20, 10 MCQs on each module	10
		<b>Total 30</b>

**Internal Examination: Continuous Evaluation - 20 marks**

	Project and presentation / Viva	Marks
1.	<ul style="list-style-type: none"> <li>विकिपीडियासाठी माहिती संकलन, संदर्भ व्यवस्थापन, तथ्य पडताळणी <b>Fact Checking tool</b> तयार करणे आणि लेख तयार करणे.</li> <li><b>AI</b> साधने वापरून <b>Facebook, Instagram</b> आणि <b>X (Twitter)</b> साठी मराठीतील पोस्ट, <b>Caption, Hashtags</b> आणि <b>Content Calendar</b> तयार करणे.</li> <li><b>AI Copywriting Tools</b> चा वापर करून सामाजिक माध्यमांसाठी आकर्षक व लक्षित (<b>Targeted</b>) मजकूर तयार करणे.</li> <li><b>AI</b> साधनाच्या सहाय्याने <b>Social Media Content</b> चे भाषा विश्लेषण, शुद्धलेखन तपासणी आणि देवनागरी लिपीतील लेखन सुधारणा करणे.</li> <li><b>AI</b> साधनाच्या सहाय्याने <b>Community Groups</b> आणि <b>Virtual Discussion Platforms</b> साठी माहितीपूर्ण पोस्ट, जनजागृती मोहीम आणि संवादात्मक मजकूर तयार करणे.</li> <li><b>AI Image Generation</b> आणि <b>Video Tools</b> च्या सहाय्याने सामाजिक माध्यमांसाठी <b>Creative Campaign</b> तयार करणे.</li> <li><b>Blog, Wikipedia</b> आणि <b>Social Media Content</b> यांची <b>AI-assisted comparative analysis</b> करून प्रभावी डिजिटल लेखनाचा अभ्यास करणे.</li> </ul> <p>AI साधने: <a href="#">ChatGPT</a>, <a href="#">Google Gemini</a>, <a href="#">Claude</a>, <a href="#">Perplexity AI</a>, <a href="#">NotebookLM</a>, <a href="#">Canva</a>, <a href="#">CapCut</a>, <a href="#">InVideo</a>, <a href="#">Grammarly</a>, <a href="#">QuillBot</a>, <a href="#">Whisper</a>, <a href="#">ElevenLabs</a></p>	20
		<b>Total 20</b>

11

**संदर्भ ग्रंथ (Reference Books) :**

१. मराठी व्याकरण आणि लेखन, विनायक गंधे व मीरा जोशी, निराली प्रकाशन, पुणे, २०१२.
२. उपयोजित मराठी, (संपा.) केतकी मोडक व अन्य, पद्मगंधा प्रकाशन, पुणे, २०१२.
३. मराठी भाषिक कौशल्य विकास, (संपा.) पृथ्वीराज तौर, अथर्व पब्लिकेशन्स, धुळे, २०१८.
४. व्यावहारिक मराठी, ल. रा. नसिराबादकर, भाषा विकास संशोधन संस्था, कोल्हापूर, २०२३.
५. *Aayushi International Interdisciplinary Research Journal* (ISSN 2349-638x) Peer Reviewed Journal [www.aiirjournal.com](http://www.aiirjournal.com)

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B.A.  
(Marathi)**

**Semester- III**

**Vertical -6**

**Field Project (FP) – 2 Credits**

**with effect from  
Academic Year 2025-2026**

**Title: क्षेत्रीय प्रकल्प Field Projects (FP)**

**Course Code: CHMMARIII5**

Sr. No.	Heading	Particulars																
1	<b>Description the Course:</b>	राष्ट्रीय शैक्षणिक धोरण - २०२० विद्यार्थ्यांच्या सर्वांगीण विकासावर (Holistic Development) भर देते. या धोरणात सर्वांगीण विकासाचा भाग म्हणून स्तंभ 6 या स्तंभांतर्गत क्षेत्रीय प्रकल्प अभ्यासक्रमाचा समावेश करण्यात आला आहे. या अभ्यासक्रमामुळे क्षेत्रीय प्रकल्प (Field Project) हा अभ्यासक्रम विद्यार्थ्यांना त्यांच्या विषयाशी संबंधित वास्तव जगाशी थेट संपर्क साधून प्रत्यक्ष अनुभव घेण्याची संधी प्रदान करतो. या अभ्यासक्रमाच्या माध्यमातून विद्यार्थ्यांना संशोधनात्मक दृष्टिकोन तयार करणे, प्रत्यक्ष क्षेत्रात जाऊन माहिती संकलन करणे, निरीक्षण करणे, आणि ती माहिती सुसंगत पद्धतीने मांडणे याचे प्रशिक्षण दिले जाईल. या अभ्यासपत्रिकेमुळे विद्यार्थ्यांमध्ये संशोधन वृत्ती वाढून त्यांच्यामध्ये संशोधनपर लेखनाचे कौशल्य निर्माण होऊन ते वृद्धिंगत होईल.																
2	<b>Vertical 6</b>	<b>Field Projects (FP)</b>																
3	<b>Type</b>	Theory & Practical																
4	<b>Credit</b>	2 Credits (1 Credit = 15 Hours for Theory or 30 Hours of Practical Work in a Semester)																
5	<b>Hours allotted</b>	30 Hours																
6	<b>Marks allotted</b>	50 Marks																
7		<table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Name of the Topic</th> </tr> </thead> <tbody> <tr> <td>१.</td> <td>मराठी माध्यमाच्या शाळा व मराठी विषयाच्या शिक्षकांसमोरील आव्हानांचे सर्वेक्षण</td> </tr> <tr> <td>२.</td> <td>शाळा व महाविद्यालयातील मराठी विषयाचा अभ्यासक्रम व अध्यापनाच्या पद्धतींचा (नावीन्य / तंत्रज्ञानस्नेही साधने) अभ्यास करण्यासाठी क्षेत्रभेटी व सर्वेक्षण.</td> </tr> <tr> <td>३.</td> <td>शाळा, महाविद्यालयांसह विविध सरकारी, खाजगी ग्रंथालयांना भेट व तेथील मराठी भाषेतील पुस्तके, नियतकालिके, संशोधन साहित्य इत्यादी संसाधनाविषयीच्या माहितीचे संकलन /सर्वेक्षण.</td> </tr> <tr> <td>४.</td> <td>वाचनसंस्कृतीचे सर्वेक्षण व विश्लेषण- विविध वयोगट व सामाजिक स्तरातील प्रातिनिधिक वाचकांचे वाचन, पुस्तकांची निवड,कल आवड, या संदर्भातील सर्वेक्षण.</td> </tr> <tr> <td>५.</td> <td>ग्रंथ भांडार, पुस्तकांची दुकाने इत्यादींना भेटी देऊन पुस्तकांची मागणी, खप या आधारे वाचन संस्कृतीविषयी सर्वेक्षण करून अहवाल तयार करणे.</td> </tr> <tr> <td>६.</td> <td>मराठी भाषकांचे भाषिक कौशल्य व भाषिक ज्ञान या संदर्भातील सर्वेक्षण- विविध वयोगट व सामाजिक स्तरातील प्रातिनिधिक भाषकांना अवगत मराठीचे शब्दभांडार, वाक्यरचना कौशल्य, संवादकौशल्ये व भाषाप्रभुत्वाचे पद्धतशीर सर्वेक्षण.</td> </tr> <tr> <td>७.</td> <td>मराठीतील ग्रंथव्यवहाराच्या व्यवसायिक बाजूसंदर्भातील सर्वेक्षण- प्रकाशक, मुद्रक, ग्रंथविक्रेते, पुस्तकांचे दुकानदार, इ-विक्रेते इत्यादींना भेटी देऊन ग्रंथनिर्मिती, अर्थपुरवठा, पुस्तकांचे वितरण, विपणन, जाहिराती</td> </tr> </tbody> </table>	Sr. No.	Name of the Topic	१.	मराठी माध्यमाच्या शाळा व मराठी विषयाच्या शिक्षकांसमोरील आव्हानांचे सर्वेक्षण	२.	शाळा व महाविद्यालयातील मराठी विषयाचा अभ्यासक्रम व अध्यापनाच्या पद्धतींचा (नावीन्य / तंत्रज्ञानस्नेही साधने) अभ्यास करण्यासाठी क्षेत्रभेटी व सर्वेक्षण.	३.	शाळा, महाविद्यालयांसह विविध सरकारी, खाजगी ग्रंथालयांना भेट व तेथील मराठी भाषेतील पुस्तके, नियतकालिके, संशोधन साहित्य इत्यादी संसाधनाविषयीच्या माहितीचे संकलन /सर्वेक्षण.	४.	वाचनसंस्कृतीचे सर्वेक्षण व विश्लेषण- विविध वयोगट व सामाजिक स्तरातील प्रातिनिधिक वाचकांचे वाचन, पुस्तकांची निवड,कल आवड, या संदर्भातील सर्वेक्षण.	५.	ग्रंथ भांडार, पुस्तकांची दुकाने इत्यादींना भेटी देऊन पुस्तकांची मागणी, खप या आधारे वाचन संस्कृतीविषयी सर्वेक्षण करून अहवाल तयार करणे.	६.	मराठी भाषकांचे भाषिक कौशल्य व भाषिक ज्ञान या संदर्भातील सर्वेक्षण- विविध वयोगट व सामाजिक स्तरातील प्रातिनिधिक भाषकांना अवगत मराठीचे शब्दभांडार, वाक्यरचना कौशल्य, संवादकौशल्ये व भाषाप्रभुत्वाचे पद्धतशीर सर्वेक्षण.	७.	मराठीतील ग्रंथव्यवहाराच्या व्यवसायिक बाजूसंदर्भातील सर्वेक्षण- प्रकाशक, मुद्रक, ग्रंथविक्रेते, पुस्तकांचे दुकानदार, इ-विक्रेते इत्यादींना भेटी देऊन ग्रंथनिर्मिती, अर्थपुरवठा, पुस्तकांचे वितरण, विपणन, जाहिराती
Sr. No.	Name of the Topic																	
१.	मराठी माध्यमाच्या शाळा व मराठी विषयाच्या शिक्षकांसमोरील आव्हानांचे सर्वेक्षण																	
२.	शाळा व महाविद्यालयातील मराठी विषयाचा अभ्यासक्रम व अध्यापनाच्या पद्धतींचा (नावीन्य / तंत्रज्ञानस्नेही साधने) अभ्यास करण्यासाठी क्षेत्रभेटी व सर्वेक्षण.																	
३.	शाळा, महाविद्यालयांसह विविध सरकारी, खाजगी ग्रंथालयांना भेट व तेथील मराठी भाषेतील पुस्तके, नियतकालिके, संशोधन साहित्य इत्यादी संसाधनाविषयीच्या माहितीचे संकलन /सर्वेक्षण.																	
४.	वाचनसंस्कृतीचे सर्वेक्षण व विश्लेषण- विविध वयोगट व सामाजिक स्तरातील प्रातिनिधिक वाचकांचे वाचन, पुस्तकांची निवड,कल आवड, या संदर्भातील सर्वेक्षण.																	
५.	ग्रंथ भांडार, पुस्तकांची दुकाने इत्यादींना भेटी देऊन पुस्तकांची मागणी, खप या आधारे वाचन संस्कृतीविषयी सर्वेक्षण करून अहवाल तयार करणे.																	
६.	मराठी भाषकांचे भाषिक कौशल्य व भाषिक ज्ञान या संदर्भातील सर्वेक्षण- विविध वयोगट व सामाजिक स्तरातील प्रातिनिधिक भाषकांना अवगत मराठीचे शब्दभांडार, वाक्यरचना कौशल्य, संवादकौशल्ये व भाषाप्रभुत्वाचे पद्धतशीर सर्वेक्षण.																	
७.	मराठीतील ग्रंथव्यवहाराच्या व्यवसायिक बाजूसंदर्भातील सर्वेक्षण- प्रकाशक, मुद्रक, ग्रंथविक्रेते, पुस्तकांचे दुकानदार, इ-विक्रेते इत्यादींना भेटी देऊन ग्रंथनिर्मिती, अर्थपुरवठा, पुस्तकांचे वितरण, विपणन, जाहिराती																	

	या संदर्भातील सर्वेक्षण.
८.	साहित्यसंस्था, साहित्यविषयक महोत्सव, संमेलने यांना भेटी, मुलाखती यांच्या आधारे साहित्यविषयक विविध उपक्रम, वाचकांचा सहभाग व या सर्व साहित्यव्यवहारांचा उपक्रमांचा परिणाम याविषयी निरीक्षण, नोंदी, अहवाल
९.	स्थानिक बोलीभाषांचा अभ्यास( शब्द, वाक्यरचना, भाषिक प्रयोग या पातळीवरील नमुने संकलन, विश्लेषण व नोंद)
१०.	मोबाईल व समाजमाध्यमांवरील मराठी भाषा, इमोजी इत्यादींचा अभ्यास. (निरीक्षणे व नोंदी)
११.	तरुणाईच्या भाषेचा अभ्यास - कॉकक्ला (कॉलेज, कट्टा, क्लास येथील भाषेच्या नमुन्यांचे संकलन, विश्लेषण व नोंदी)
१२.	ग्रामीण भागातील म्हणी, वाक्प्रचार आणि त्यामागील लोकजीवनाचे प्रतिबिंब यांचा अभ्यास. (संकलन, विश्लेषण व नोंदी)
१३.	स्थानिक लोकसाहित्याचा (लोकगीते, लोककथा, आख्यायिका, दंतकथा इत्यादी) अभ्यास. (भेटी, निरीक्षण, संकलन, विश्लेषण, नोंदी)
१४.	स्थानिक सादरीकरणात्मक लोककलांचा (कीर्तन, दशावतार, लळिते, लोकनाट्य, वगनाट्य, तमाशा, लोकनृत्ये) अभ्यास. (भेटी, निरीक्षण, संकलन, विश्लेषण, नोंदी)
१५.	स्थानिक लोककलांचा (चित्रकला, कातळशिल्पे, मंदिरातील चित्रे इत्यादी) अभ्यास. (भेटी, निरीक्षण, संकलन, विश्लेषण, नोंदी)
१६.	स्थानिक ऐतिहासिक वास्तूंना भेटी देणे व अहवाल तयार करणे. ( साहित्याशी संबंधित ऐतिहासिक वास्तू-लेखकांची स्मारके, संग्रहालये व अन्य वास्तू)
१७.	गावकुसातील मंदिरे, देऊळवाडे यांना भेट व त्यांच्या भाषिक व सांस्कृतिक स्वरूपाचा अभ्यास.
१८.	साहित्यसंस्थांना भेटी देऊन त्यांच्या विविध उपक्रमांची माहिती संकलित करणे.
१९.	स्थानिक नाट्यसंस्था, नाट्यविषयक चळवळींची केंद्र यांना भेट देणे. त्यांच्या विविध उपक्रमांची माहिती घेणे, संकलन व सर्वेक्षण करणे.
२०.	परिसरातील महाविद्यासयातील एकांकिका समूह, त्यांची संस्कृती, अर्थकारण इत्यादींचा अभ्यास करून त्याचा अहवाल तयार करणे, रिपोर्टाज लेखन करणे.
२१.	परिसरातील सामाजिक संस्था, सामाजिक चळवळी यासंदर्भात मुलाखती व रिपोर्टाज लेखन करणे.
२२.	परिसरातील वर्तमानपत्रांची कार्यालये व मुद्रणालयांना भेट देणे, तेथील कामाचे निरीक्षण करून संबंधितांच्या मुलाखती घेणे व त्या आधारे अहवाल/ रिपोर्टाज लेखन करणे.
२३.	स्थानिक लेखकांची भेटी घेणे, त्यांच्या लेखन कार्याविषयी मुलाखत घेणे.
२४.	स्थानिक कलाकार, कारागीर, सुप्रसिद्ध व्यक्ती किंवा अन्य व्यक्तींच्या मुलाखती घेणे व शब्दांकन करणे.
२५.	स्थानिक लोककलावंतांचा चरित्रकोश तयार करणे, असंघटित कामगार व शेतकऱ्यांच्या भाषेचा कोश बनवणे.
	वर सुचवलेल्या विषयांच्या अनुषंगाने विद्यार्थ्यांना क्षेत्रीय प्रकल्प देण्यात यावेत.

08

**Scheme of Examination and Assessment Pattern**  
50 Marks

All questions are compulsory:

<b>Q. No</b>	<b>Nature of Questions</b>	<b>Marks</b>
Q1	Objectives, Literature Review , Methodology, Data Analysis, Conclusion and Recommendations	15
Q2	Overall Project Report Structure and Style	5
Q6	Presentation Skills & Communication	10
	<b>Total</b>	<b>30</b>

**Internal Examination: Continuous Evaluation - 40 marks**

	<b>Assessment / evaluation</b>	<b>Marks</b>
1.	Attendance and interaction	10
2.	Presentation Skills & Communication	10
	<b>Total</b>	<b>20</b>

**Smt. Chandibai Himathmal Mansukhani  
College**

**(Autonomous)**

**Second Year B.A**

**(Hindi)**

**Semester – IV**

**Title : हिंदी भाषा : व्यावहारिक प्रयोग**

**Vertical - 5**

**AEC – 2 Credits**

**with effect from**

**Academic Year 2025-2026**

**Title : हिंदी भाषा : व्यावहारिक प्रयोग****Course Code : CHMAECHINIV**

Sr.No.	Heading	Particulars
1.	<b>Description of the Course :</b>	<p>भाषा का जीवन में सदैव महत्व रहा है, जीवन और भाषा का चोली – दामन का संबंध है, जब हमारी भाषा मधुर और सार्थक होती है तो श्रेता पर विशिष्ट प्रभाव पड़ता है, भाषा का यदि सही और सार्थक रूप से प्रयोग किया जाए तो मुनष्य जीवन में कहीं भी असफल नहीं हो सकता है, इसी भाषा के माध्यम से हम सभी को अपनी ओर आकर्षित भी करते हैं, वर्तमान युग में रोजगार में बहुत से क्षेत्र भाषा से जुड़े हुए हैं, जिसके माध्यम से विद्यार्थी इनका लाभ ग्रहण कर सकते हैं, भाषाई क्षमता हमारे विचारों की संवाहक होती है, आज डिजिटल युग में अभिव्यक्ति के कई माध्यमों का प्रसार हुआ है, इन माध्यमों में भाषा ही सशक्त तत्व है जो आपकी अभिव्यक्ति को पूरे जगत को अवगत कराती है, भाषा का महत्व हर समय, हर माध्यम में रहा है, परंतु भाषा का सार्थक रूप का प्रयोग आज बहुत आवश्यक है। आज हिंदी अंतरराष्ट्रीय स्तर पर प्रयोग में लाई जा रही है, तकनीक, सूचना प्रौद्योगिकी सोशल मीडिया, राजनीति की भाषा हिंदी बन चुकी है, जीवन में कई क्षेत्रों में व्यावहारिक स्तर पर हमें अपनी भाषा के लिखित स्वरूप के कार्यों को करना होता है और ऐसे में कार्य-दक्षता महत्व रखती है, हिंदी भाषा में व्यावहारिक प्रयोग को केंद्र में रखकर और इन्हीं पहलुओं को ध्यान में रखते हुए इस पाठ्यक्रम का गठन किया गया है, हम हिंदी भाषा को सही और शुद्ध रूप में प्रयोग कर अभिव्यक्ति को सफल बनाए और बिना व्याकरण के यह संभव नहीं है, इस दृष्टि से पाठ्यक्रम सर्वाधिक लाभकारी सिद्ध होगा</p>
2.	<b>Vertical : 5</b>	AEC
3.	<b>Type :</b> <b>Teaching Methods :</b>	Theory + Practium Lecture / Discussion / Presentation / Self Study, etc.

4.	<b>Credit :</b>	2 Credits (1 Credit = 15 Hours for Theory)
5.	<b>Hours Allotted :</b>	30 Hours
6.	<b>Marks Allotted :</b>	50 Marks
7.	<b>Course Objectives :</b> <b>CO(A)1:</b> विद्यार्थियों को राजभाषा हिंदी का विधिवत ज्ञान प्रदान करना । <b>CO(A)2:</b> विद्यार्थियों को राजभाषा हिंदी के संवैधानिक महत्त्व से परिचित करवाना । <b>CO(A)3:</b> विद्यार्थियों को संज्ञा आदि का ज्ञान प्रदान करना । <b>CO(A)4:</b> विद्यार्थियों को कारकों, वाक्य रचना एवं भाषिक चिन्हों आदि का ज्ञान प्रदान करना ।	
	<b>Course Outcomes :</b> <b>CO1 :</b> विद्यार्थियों को राजभाषा हिंदी का ज्ञान प्राप्त होगा, एवं दक्षता प्राप्त होगी । <b>CO2 :</b> विद्यार्थियों को राजभाषा हिंदी के संवैधानिक महत्त्व की जानकारी प्राप्त होगी । <b>CO3 :</b> विद्यार्थियों को हिंदी – संज्ञा आदि का ज्ञान प्राप्त होने के साथ भाषा के शुद्ध, व्यावहारिक रूप का ज्ञान होगा । <b>CO4 :</b> विद्यार्थियों को कारकों, वाक्य रचना एवं भाषिक चिन्हों आदि का ज्ञान प्राप्त होगा ।	
9.	<b>Syllabus</b>	
	<b>UNIT I :</b>	
	1. हिंदी भाषा – सामान्य परिचय	
	2. राजभाषा हिंदी – संवैधानिक महत्त्व	
	3. वर्णमाला – स्वर एवं व्यंजन	
	4. शब्द भेद – सामान्य परिचय (संज्ञा आदि)	
	<b>UNIT II :</b>	
	1. वाक्य – सामान्य परिचय	
	2. वर्तनी – शुद्धता का प्रयोग एवं सावधानियाँ	
	3. कारक एवं विराम चिन्ह	
	4. निबंध लेखन – ( सामाजिक निबंध, आत्मकथात्मक निबंध, समसामायिक निबंध )	

10.

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination : Semester End External – 30 Marks Time : 1:00 Hours**

**Format of Question Paper**

**All Questions are Compulsory**

मूल्यांकन प्रारूप	इकाई	अंक
<b>बाह्य मूल्यांकन</b>		
प्रश्न 1 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए ।	इकाई 1	15
प्रश्न 2 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए ।	इकाई 2	15
	<b>कुल अंक</b>	<b>30</b>

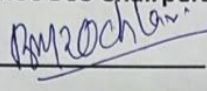
मूल्यांकन प्रारूप	अंक
<b>आंतरिक मूल्यांकन</b>	
<ul style="list-style-type: none"> <li>● AI की सहायता से हिंदी भाषा, राजभाषा हिंदी एवं उसके संवैधानिक महत्व पर शोध, सारांश एवं डिजिटल प्रस्तुति (Presentation) तैयार करना।</li> <li>● AI Grammar एवं Writing Tools का उपयोग करके वर्णमाला, शब्द-भेद, वाक्य-रचना, कारक, विराम-चिह्न तथा वर्तनी शुद्धता का अभ्यास करना एवं त्रुटियों का विश्लेषण करना।</li> <li>● AI की सहायता से हिंदी व्याकरण पर आधारित प्रश्नसंच (Question Bank), Quiz तथा Interactive अभ्यास-पत्र तैयार करना।</li> <li>● AI Writing Tools का उपयोग करके सामाजिक, आत्मकथात्मक एवं समसामयिक विषयों पर निबंध लेखन करना तथा AI द्वारा तैयार निबंध और विद्यार्थी द्वारा लिखे गए निबंध का तुलनात्मक विश्लेषण करना।</li> <li>● AI की सहायता से कठिन शब्दों के अर्थ, पर्यायवाची, विलोम, शब्दावली तथा सरल भाषा में व्याख्या तैयार करना।</li> <li>● AI Voice Tools का उपयोग करके शुद्ध उच्चारण, वाचन एवं मौखिक अभिव्यक्ति का अभ्यास करना तथा उच्चारण संबंधी Feedback प्राप्त करना।</li> </ul>	20
<b>कुल अंक</b>	<b>20</b>

<b>11.</b>	<b>संदर्भ ग्रंथ सूची –</b> <ol style="list-style-type: none"><li>1. बाबूराम सक्सेना – सामान्य भाषा विज्ञान, हिंदी साहित्य सम्मेलन, प्रयाग ।</li><li>2. कामताप्रसाद गुरू – हिंदी व्याकरण, लोकभारती प्रकाशन, इलाहाबाद ।</li><li>3. आचार्य देवेन्द्र नाथ शर्मा – भाषा विज्ञान की भूमिका, राधाकृष्ण प्रकाशन, दिल्ली ।</li><li>4. भाषा विज्ञान एवं भाषा शास्त्र – कपिलदेव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी ।</li><li>5. भोलानाथ तिवारी, भाषा विज्ञान, किताब महल, इलाहाबाद ।</li></ol>
------------	--

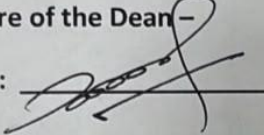
BoS in Hindi :

Sr No	Name of the Faculty	Designation and College
1.	Dr. Bhavna M. Rochlani	I/C HOD Asst. Professor CHM College Ulhasnagar
2.	Dr. Ajeet Kumar Rai	Associate Professor KC College Mumbai
3.	Dr. Santosh Motwani	Associate Professor RKT College Ulhasnagar

Name & Signature of the Ad-hoc BoS Chairperson -

Dr. Bhavna M. Rochlani : 

Name & Signature of the Dean -

Dr. Nitin Arekar : 



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year**

**Semester - IV**

**Title: Environmental Management and  
Sustainable Development - II**

**Vertical - 5  
VEC Subject - 2 Credits**

**with effect from  
Academic Year 2025-2026**

## Title: Environmental Management and Sustainable Development - II

**Course Code: CHMVEC2**

Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	This course examines the relationship between environmental pollution and human health, with detailed coverage of air, water, soil, noise, thermal, and radioactive pollution and their sources, standards, and impacts. It enables learners to understand pollution generation processes, waste management challenges, and the assimilative capacity of the environment. The course also introduces environmental laws, constitutional provisions, and regulatory frameworks, along with tools such as Environmental Management Systems (ISO 14001), life cycle analysis, and cost–benefit analysis. Emphasis is placed on sustainable practices, pollution control measures, the 3R concept, ecolabeling, and global initiatives such as the Sustainable Development Goals and Mission LiFE.
2	<b>Vertical 5</b>	VEC
3	<b>Type &amp; Teaching Methods</b>	Theory + Practicum Lectures/Discussions/Presentations/Case Studies, etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1:</b> To develop a comprehensive understanding of various types of environmental pollution, their sources, standards, and impacts on human health and ecosystems.</p> <p><b>CO(A)2:</b> To familiarize students with environmental laws, constitutional provisions, and regulatory frameworks related to environmental protection and management.</p> <p><b>CO(A)3:</b> To equip learners with knowledge of environmental management tools, pollution control measures, and sustainable waste management practices.</p> <p><b>CO(A)4:</b> To create awareness about global and national sustainability initiatives such as the Sustainable Development Goals, Mission LiFE, and their role in achieving sustainable development.</p>

8	<p><b>Course Outcomes:</b> Student will be able to</p> <p><b>CO1:</b> Identify and analyze different types of environmental pollution and assess their impacts on human health and ecological systems.</p> <p><b>CO2:</b> Explain key environmental laws, constitutional provisions, and institutional mechanisms for environmental protection.</p> <p><b>CO3:</b> Apply environmental management tools and sustainable waste management practices in real-world contexts.</p> <p><b>CO4:</b> Evaluate sustainability initiatives such as the SDGs and Mission LiFE and relate them to environmental management and sustainable development practices.</p>
9	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I: Environmental Pollution and Health</b></p> <ul style="list-style-type: none"> <li>• Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution.</li> <li>• Air pollution: Sources of air pollution; Primary and secondary pollutants; Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards.</li> <li>• Water pollution: Sources of water pollution; River, lake and marine pollution, groundwater pollution; water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life.</li> <li>• Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health.</li> <li>• Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health.</li> <li>• Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.</li> </ul> <p><b>UNIT II: Environmental Management</b></p> <ul style="list-style-type: none"> <li>• Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights;</li> <li>• Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Life cycle analysis; Cost-benefit analysis</li> <li>• Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme.</li> <li>• Introduction to Millennium Development Goals, Sustainable Development Goals, &amp; Mission Life.</li> </ul>

**10****Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

Format of Question Paper

**Attempt any 3 out of 4 questions.**

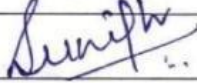
Question No	Nature of Questions	Marks
Q1	Theory Question based on Unit I	10
Q2	Theory Question based on Unit I	10
Q3	Theory Question based on Unit II	10
Q4	Theory Question based on Unit II	10
<b>TOTAL</b>		<b>30</b>

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Assignment / Project	10
2.	Case Study / Assignment	10
<b>TOTAL</b>		<b>20</b>

**11****REFERENCES:**

1. Barrow, C. J. (2012). *Environmental management for sustainable development* (2nd ed.). Routledge.
2. Doabia, T. S. (2023). *Environmental and pollution laws in India* (4th ed.). Eastern Book Company.
3. Kumar, S. (2009). *Environmental policies in India*. Northern Book Centre.
4. Rajagopalan, R. (2023). *Environmental studies* (4th ed.). Oxford University Press India.
5. Rogers, P. P., Jalal, K. F., & Boyd, J. A. (2007). *An introduction to sustainable development*. Earthscan.
6. Singh, J., Singh, A., & Gupta, S. (2019). *Environmental science and engineering*. New Age International Publishers.

Sr No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sunil Lalchandani	Dean, Faculty of Interdisciplinary	



**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Com.**

**Semester- III**

**Title: Field project**

**Vertical - 6  
Field Project 2 Credits**

**with effect from  
Academic Year 2025-2026**

## Title: Field Project

Course code:

Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	The Field Project course, introduced under CHM Autonomy in alignment with the NEP 2020, aims to bridge theoretical knowledge with practical experience. It provides students with hands-on exposure to real-world socio-economic contexts through field visits, observation, and analysis in both urban and rural settings. By engaging directly with development-related issues, students enhance their research, problem-solving, and analytical skills while fostering social responsibility and environmental awareness. The course ultimately prepares learners for employability and active participation in nation-building.
2	<b>Vertical 6</b>	Field Project
3	<b>Type &amp; Teaching Methods</b>	Field work
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	
	1. To connect theoretical learning with real-world socio-economic contexts through practical field experiences.	
	2. To develop analytical, problem-solving, and teamwork skills in addressing contemporary social issues.	
	3. To cultivate an appreciation for research and its role in promoting societal and national development.	
8	<b>Learning Outcomes:</b> <b>students will be able to:</b>	
	<b>LO1:</b> Apply classroom knowledge to analyze real-life socio-economic challenges effectively.	
	<b>LO2:</b> Demonstrate critical thinking, teamwork, and decision-making skills through field-based activities.	
	<b>LO3:</b> Reflect on the relevance of research and experiential learning in contributing to social and national progress.	

## Guidelines for Field Project

Following are the general guidelines for the conduct of Field Project (Semester III & IV)

### Head of the Department (HOD)/ Field Project Co-ordinator

1. To ensure that FP program aligns with departmental and academic objectives as per NEP Structure within syllabus framework.
2. Appointment of field project incharges from the faculty of the department for group of Students.
3. To conduct orientation of FP Supervisor and decide the time line of the project.
4. To support the student for Filed Project.

### FP Supervisor:

1. To give Guidelines for the field project.
2. To monitor student progress and provide guidance.

### Project (Dissertation) Report:

Students are required to submit a report of the field project at the end of the semester in following suggested format.

The project should be typed on A4 sheets  
 Font Size 12, Times New Roman, 1.5 line Spacing  
 The project report shall have student details with signature of Field Project Incharge and photographs if any and it should be of minimum of 10 pages.

10

### Scheme of Examination and Assessment Pattern



**External Examination: Semester End External - 30 marks**  
**Format of Question Paper**


Nature of Evaluation	Marks
Field Project Report	30
<b>Total 30</b>	

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Involvement in Survey of Field Project /	05
2.	Field visit participation & completion	10
3.	Overall Impression	05
<b>Total 20</b>		

<p>11</p>	<p style="text-align: center;"><b>Appendix I</b></p> <p style="text-align: center;"><b>Attendance of the Student: Active Participation</b></p> <p>I, the undersigned Ms / Mr. _____ Roll No. ___ studying in the _____ Year of _____ Full-time Course is doing my project work under the guidance of Dr./Ms./Mr. _____, I wish to state that I have met my Internal guide on the following dates mentioned below for Project Guidance: -</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sr.No.</th> <th style="text-align: center;">Date</th> <th style="text-align: center;">Signature of the Internal Guide</th> </tr> </thead> <tbody> <tr> <td style="height: 100px;"> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p style="display: flex; justify-content: space-between; margin-top: 20px;"> <span>_____ Signature of the Candidate Supervisor</span> <span>_____ Signature of Field Project Supervisor</span> </p>	Sr.No.	Date	Signature of the Internal Guide			
Sr.No.	Date	Signature of the Internal Guide					
	<p style="text-align: center;"><b>Appendix II</b></p> <p style="text-align: center;"><b>Name of the Department/College/Institute</b></p> <p style="text-align: center;"><b>Certificate</b></p> <p>I hereby certify that Mr./Ms. _____ Student of _____ studying in _____, has completed a project titled _____ in the area of _____ specialization for the academic year 2025-2026 to the best of my knowledge the work of the student is original and the information included in the project is correct.</p> <p style="display: flex; justify-content: space-between; margin-top: 20px;"> <span>_____ Field Project Supervisor</span> <span>_____ Head of the Department/Principal</span> </p>						

   
**Board of Examination**

  
**Principal & Chief Controller**  
**Board of Examination**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**First Year**

**Semester- IV**

**Title: Cocurricular Course I**

**Vertical - 6  
Cocurricular Course - 2 Credits**

**with effect from  
Academic Year 2025-2026**

**Title: Cocurricular Course - I**

**Course Code: CHMCCI6**

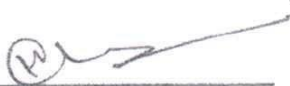
Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	<p>This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year.</p> <p>Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting.</p> <p>This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.</p>
2	<b>Vertical 6</b>	Cocurricular Course (Mandatory)
3	<b>Type Teaching Methods</b>	Non Theory Participation, Report Writing, Presentation etc.
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<ol style="list-style-type: none"> <li>1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities.</li> <li>2. To enhance personal and interpersonal skills through real-life experiences and teamwork.</li> <li>3. To foster a sense of responsibility, leadership, and community engagement among students.</li> <li>4. To develop self-confidence and emotional well-being through creative expression and collaboration.</li> <li>5. To integrate classroom learning with experiential learning for holistic growth.</li> </ol>
8	<b>Learning Outcomes:</b>	<p>By the end of the course, students will be able to:</p> <p><b>LO1:</b> Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences.</p> <p><b>LO2:</b> Demonstrate improved communication, leadership, and teamwork skills.</p> <p><b>LO3:</b> Exhibit increased awareness of social responsibility and civic engagement.</p> <p><b>LO4:</b> Build confidence through creative, cultural, and intellectual expressions.</p> <p><b>LO5:</b> Maintain a portfolio or activity log to track participation and personal development.</p>

9	<b>Syllabus</b>																											
	<b>Unit I - Suggested Areas of Participation in the activities:</b> <ul style="list-style-type: none"> <li>• <b>Cultural Events:</b> Drama, dance, music, literary events, debates, etc.</li> <li>• <b>Social Outreach:</b> Blood donation, awareness campaigns, cleanliness drives.</li> <li>• <b>Clubs &amp; Societies:</b> Photography, quiz, environment club, shram club, etc.</li> <li>• <b>Sports &amp; Fitness:</b> College tournaments, yoga, marathons, fitness challenges.</li> <li>• <b>Institutional Events:</b> Foundation Day, Annual Day, College Festivals, Intercollegiate events.</li> <li>• <b>National Festivals:</b> Independence Day, Republic Day etc.</li> </ul> <b>Unit II - Program Specific Topics</b> <ul style="list-style-type: none"> <li>• <b>Workshops/Seminars:</b> Report Writing, Personality Development, Soft Skills, Leadership Talks.</li> <li>• <b>Speak, Show, Shine:</b> Presentation / Poster Presentation / Viva and Learning Experience</li> </ul> <b>Mode of Evaluation:</b> <ul style="list-style-type: none"> <li>• <b>Faculty Coordinator:</b> To guide and evaluate student progress.</li> <li>• <b>Participation Proof:</b> Certificates, photos, attendance records.</li> <li>• <b>Reflective Journal:</b> Minimum 2-3 pages summarizing experiences, learning, and growth.</li> <li>• <b>Final Viva/Presentation:</b> 5-minute talk on poster presentation and on overall learning.</li> </ul>																											
10	<b>Scheme of Examination and Assessment Pattern</b> <b>Based on 3 approved Activities</b> <b>Semester End External - 30 marks</b> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 15%;">Activity No</th> <th style="width: 65%;">Nature of Activities</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Title of Approved Activity - 1</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Title of Approved Activity - 2</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Title of Approved Activity - 3</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table> <b>Internal Examination: Continuous Evaluation – 20 marks</b> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 70%;">Assessment / Evaluation</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Reflective journal</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Presentation/ poster presentation/viva</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </tbody> </table>	Activity No	Nature of Activities	Marks	1.	Title of Approved Activity - 1	10	2.	Title of Approved Activity - 2	10	3.	Title of Approved Activity - 3	10	<b>Total</b>		<b>30</b>		Assessment / Evaluation	Marks	1.	Reflective journal	10	2.	Presentation/ poster presentation/viva	10	<b>Total</b>		<b>20</b>
Activity No	Nature of Activities	Marks																										
1.	Title of Approved Activity - 1	10																										
2.	Title of Approved Activity - 2	10																										
3.	Title of Approved Activity - 3	10																										
<b>Total</b>		<b>30</b>																										
	Assessment / Evaluation	Marks																										
1.	Reflective journal	10																										
2.	Presentation/ poster presentation/viva	10																										
<b>Total</b>		<b>20</b>																										

**Suggested Readings:**

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

Name & Signature of the Principal & Chairperson, Academic Council:

  
 Dr. Manju Lalwani Pathak





# **Bachelor of Science (Microbiology) (Aided)**

**Semester– V**

**Choice Based and Credit Based syllabus as per  
NEP 2020 with effect from the Academic Year  
2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V  
Vertical – 1**

**Title: Genetic Code, Translation and Mutation  
Major Course I**

**With effect from  
Academic Year 2026-2027**

# **Title: Genetic Code, Translation and Mutation**

**Course Code: CHMMICROV1**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This course describes the nature and key characteristics of the genetic code, providing a foundation for understanding how genetic information is translated into proteins. It explores the structure and function of transfer RNA (tRNA) and ribosomes, highlighting their critical roles in protein synthesis. The course further elaborates on the sequential steps involved in translation, including initiation, elongation, and termination. In addition, it introduces the terminology associated with mutations and explains the various types of mutations. Finally, it discusses physical and chemical mutagenic agents and examines the mechanisms by which they induce genetic changes.
<b>2</b>	<b>Vertical</b>	Major Course I
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	<p><b>CO(A)1</b> To familiarize students with the concept of genetic code, its nature and characteristics.</p> <p><b>CO(A)2</b> To describe the significance and function of tRNA and ribosomes in the process of translation</p> <p><b>CO(A)3</b> To explain the details of prokaryotic translation and protein sorting.</p> <p><b>CO(A)4</b> To introduce different terminologies associated with mutation with special emphasis on types of mutations, microbiological methods for Ames test and replica plating technique for isolation of mutants.</p> <p><b>CO(A)5</b> To familiarize students with the fundamentals of physical and chemical mutagens with emphasis on mode of action.</p>

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall the genetic code and understand the role of mRNA and codons in translation.</p> <p><b>CO2</b> Describe the structure, function and role of tRNA and ribosomes in translation.</p> <p><b>CO3</b> Apply key microbiological methods, such as the Ames test and replica plating technique, to understand mutagenesis and isolate mutants as well carry out gene manipulation experiments.</p> <p><b>CO4</b> Compare different types of mutations and translation process in bacteria and eukaryotes.</p> <p><b>CO5</b> Evaluate physical and chemical mutagens and their mechanism of action.</p> <p><b>CO6</b> Elaborate on DNA replication errors as well as repair mechanisms.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I : Nature of Genetic Code and Translation</b></p> <p><b>Nature of Genetic Code</b></p> <ul style="list-style-type: none"> <li>• Genetic code - Nature of Genetic code</li> <li>• The genetic code is a triplet code</li> <li>• Deciphering the genetic code and the characteristics of the genetic code.</li> </ul> <p><b>Translation</b></p> <ul style="list-style-type: none"> <li>• Ribosomes (Prokaryotic and Eukaryotic)</li> <li>• Ribosomes - Ribosomal RNA, Ribosomal RNA Genes</li> <li>• Transfer RNA-Structure of tRNA, Transfer RNA Genes</li> <li>• Recognition of the tRNA Anticodon by the mRNA Codon</li> <li>• Adding an Amino acid to tRNA</li> </ul> <p><b>Translation Process - Bacteria</b></p> <ul style="list-style-type: none"> <li>• Initiation of Translation</li> <li>• Elongation of the Polypeptide chain</li> <li>• Peptide Bond Formation</li> <li>• Translocation</li> <li>• Termination of Translation</li> <li>• Protein Sorting in the Cell</li> </ul> <p><b>UNIT II : Mutation types and Causes of Mutation</b></p> <p><b>Terminology</b> - Mutation, Chromosomal mutation, Point mutation, Gene mutations, Somatic mutation, Germ line mutation, Mutation rate, Mutation frequency</p> <p><b>Point Mutation</b></p> <ul style="list-style-type: none"> <li>• Transition, Transversion</li> <li>• Missense, nonsense, neutral, silent</li> <li>• Frameshift mutation</li> <li>• Spontaneous and Induced Mutations</li> </ul>

**DNA Replication Errors**

- Spontaneous changes - Depurination, Deamination
- Induced Mutations - Radiation, Chemical Mutagens - Base analogs, Base modifying agents, Intercalating agents
- Screening of Potential Mutagens - Ames Test
- Detection of Mutations - Visible mutants, Nutritional Mutants
- Replica Plate Technique

**DNA Repair Mechanisms**

- Mismatch Repair
- Light Repair
- Base excision repair
- Nucleotide Excision Repair
- SOS Repair

**10****Scheme of Examination and Assessment Pattern****Paper – 50 Marks****A: External Examination: Semester End External - 30 marks****Time: 1:00 hours****Format of Question Paper****Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.**B: Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11****REFERENCES:**

1. Peter J. Russell (2006), "I Genetics-A molecular approach", 2nd edition.
2. Benjamin A. Pierce (2008), "Genetics a conceptual approach", 3rd edition, W. H. Freeman and company.
3. R. H. Tamarin, (2004), "Principles of genetics", Tata McGraw Hill.
4. Robert Weaver, "Molecular biology", 3rd edition. Mc Graw Hill international edition.
5. Nancy Trun and Janine Trempy, (2004), "Fundamental bacterial genetics", Blackwell Publishing
6. Snustad, Simmons, "Principles of genetics", 3rd edition. John Wiley & sons, Inc.

**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**Third Year B.Sc.**  
**(Microbiology)**

**Semester- V**  
**Vertical – 1**

**Title: Essentials of Immunology**  
**Major Course II**

**With effect from**  
**Academic Year 2026-2027**

# **Title: Essentials of Immunology**

**Course Code: CHMMICROV2**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	Immunology is an integral component of Medical Microbiology, and this course is specifically designed for TYBSc Microbiology students. It is assumed that students possess a basic understanding of innate immunity and host defence mechanisms acquired during earlier stages of study. The course aims to develop a systematic understanding of how the immune system protects the body against invading pathogens. Emphasis is placed on the innate immune response as the first line of defence, followed by the adaptive immune response that is activated when innate mechanisms are insufficient to eliminate infection. The curriculum further explores the mechanisms of humoral and cell-mediated immunity, antigen recognition, immune activation, and immune regulation. Closely linked with Microbiology, Biochemistry, Genetics, and Biotechnology, this course provides strong academic, research, and industrial relevance, preparing students for careers in healthcare, diagnostics, pharmaceuticals, biotechnology, and research laboratories.
<b>2</b>	<b>Vertical</b>	Major Course II
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	
	<b>CO(A)1</b>	To understand the major components of the immune system, including antigen-presenting cells, cytokines, and major histocompatibility complex (MHC) molecules.
	<b>CO(A)2</b>	To describe the nature and properties of antigens, antibodies, and the various factors influencing immune responses.
	<b>CO(A)3</b>	To illustrate the structure, classes, and biological functions of immunoglobulins, as well as the principles and applications of monoclonal antibody production.
	<b>CO(A)4</b>	To explain the basic organization and functioning of the immune system, with special emphasis on the roles and interactions of innate and adaptive immunity in protecting the host against pathogens.

	<p><b>CO(A)5</b> To describe the structure, activation, and differentiation of T cells and B cells, and their roles in cell-mediated and humoral immune responses.</p>
<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Integrate innate and adaptive immune mechanisms to explain host defence responses against specific pathogens, highlighting the coordinated roles of immune cells, receptors, and effector molecules.</p> <p><b>CO2</b> Explain the role of antigen-presenting cells, antigen processing pathways, and MHC molecules in adaptive immunity</p> <p><b>CO3</b> Describe the structure, classes, and biological functions of immunoglobulins in immune defence.</p> <p><b>CO4</b> Differentiate between T cells, B cells, and NK cells based on receptors, activation mechanisms, and immune functions.</p> <p><b>CO5</b> Evaluate the role of cytokines, antigen-processing pathways, immune signaling pathways, and regulatory mechanisms in immune responses.</p> <p><b>CO6</b> Explain fundamental concepts of antigens, antibodies, immunogenicity, and antigen–antibody interactions.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Overview of immune system</b></p> <p><b>Organs and tissues of the immune system:</b></p> <ul style="list-style-type: none"> <li>• Primary lymphoid organs - structure and function of Thymus and Bone marrow.</li> <li>• Secondary lymphoid organs – structure and function of Spleen, Lymph node, Mucosa associated lymphoid tissues.</li> </ul> <p><b>Antigens</b></p> <ul style="list-style-type: none"> <li>• Immunogenicity versus antigenicity: Concepts - Immunogenicity, Immunogen, Antigenicity, Antigen, Haptens.</li> <li>• Factors that influence immunogenicity – foreignness, molecular size, chemical composition, heterogenicity, ability to be processed and presented, contribution of the biological system to immunogenicity – genotype of the recipient, animal, immunogen dosage, route of administration</li> <li>• Adjuvants and Epitopes / antigen determinants (only concepts).</li> <li>• Types of antigens – heterophile antigens, isophile antigens, sequestered antigens, super antigens, bacterial and viral antigens.</li> </ul> <p><b>Immunoglobulins</b></p> <ul style="list-style-type: none"> <li>• Immunoglobulins: Basic and fine structure.</li> <li>• Immunoglobulin classes and biological activities.</li> <li>• Antigenic determinants on immunoglobulins – isotypes, allotypes, idiotype.</li> <li>• Immunoglobulin Superfamily (Diagram).</li> <li>• Monoclonal antibodies, Production (Diagrammatically) &amp; applications</li> </ul>

	<p><b>UNIT II Components of the Immune system</b></p> <p><b>Antigen presenting cells</b></p> <ul style="list-style-type: none"> <li>• Antigen Presentation and types of APCs</li> <li>• Endogenous antigens: The cytosolic pathway.</li> <li>• Exogenous antigens: The endocytic pathway</li> </ul> <p><b>Cytokines</b></p> <ul style="list-style-type: none"> <li>• Concepts - cytokines, lymphokines, monokines, interleukines, chemokines.</li> <li>• Properties of cytokines.</li> <li>• Biological functions of cytokines</li> </ul> <p><b>MHC complex and MHC molecules</b></p> <ul style="list-style-type: none"> <li>• Three major classes of MHC encoded molecules: The basic structure and functions of Class I and Class II MHC Molecules</li> <li>• Peptide – MHC interaction - Peptide binding by Class I and Class II MHC molecule</li> </ul> <p><b>Complement System</b></p> <ul style="list-style-type: none"> <li>• Functions and Components of complement.</li> <li>• Complement Activation—classical, alternative and lectin pathway.</li> </ul>																								
<p><b>10</b></p>	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b></p> <p style="text-align: center;"><b>Paper – 50 Marks</b></p> <p style="text-align: center;"><b>A: External Examination: Semester End External - 30 marks      Time: 1:00 hours</b></p> <p style="text-align: center;"><b>Format of Question Paper</b></p> <p style="text-align: center;"><b>Attempt all questions.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Question No</th> <th style="width: 70%;">Nature of Questions</th> <th style="width: 15%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Q1</td> <td>Attempt any three questions out of six (5 marks each) based on Unit-1</td> <td style="text-align: center;">15</td> </tr> <tr> <td style="text-align: center;">Q2</td> <td>Attempt any three questions out of six (5 marks each) based on Unit-2</td> <td style="text-align: center;">15</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table> <p style="text-align: center;"><b>Note:</b> Equal Weightage is to be given to all the Units.</p> <p style="text-align: center;"><b>B: Internal Examination: Continuous Evaluation - 20 marks</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 75%;">Assessment / evaluation</th> <th style="width: 15%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Overall conduct as a responsible student, attentiveness and attendance</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </tbody> </table>	Question No	Nature of Questions	Marks	Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15	Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15	<b>Total</b>		<b>30</b>		Assessment / evaluation	Marks	1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10	2.	Overall conduct as a responsible student, attentiveness and attendance	10	<b>Total</b>		<b>20</b>
Question No	Nature of Questions	Marks																							
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15																							
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15																							
<b>Total</b>		<b>30</b>																							
	Assessment / evaluation	Marks																							
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10																							
2.	Overall conduct as a responsible student, attentiveness and attendance	10																							
<b>Total</b>		<b>20</b>																							
<p><b>11</b></p>	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Jawetz, Melnick and Adelberg's Medical Microbiology, 26<sup>th</sup> edition, Lange publication</li> <li>2. Introduction to diagnostic microbiology for lab Science Maria Dannessa Delost 2015</li> <li>3. Prescott's microbiology 10<sup>th</sup> edition 2017</li> <li>4. Kuby Immunology, 4<sup>th</sup> and 6<sup>th</sup> edition, W H Freeman and Company</li> <li>5. Pathak &amp; Palan, Immunology: Essential &amp; Fundamental, 1<sup>st</sup> &amp; 3<sup>rd</sup> edition, Capital Publishing Company</li> <li>6. Fahim Khan, Elements of Immunology, Pearson Education</li> </ol>																								

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V  
Vertical – 1**

**Title: Metabolism of Carbohydrates and  
Bioenergetics  
Major Course III**

**With effect from  
Academic Year 2026-2027**

# **Title: Metabolism of Carbohydrates and Bioenergetics**

**Course Code: CHMMICROV3**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This course covers the fundamental biochemical processes governing microbial metabolism and energy generation. It focuses on the catabolism of carbohydrates, major metabolic pathways, and diverse fermentative mechanisms in microorganisms. The course further explores microbial bioenergetics, including electron transport chains, ATP synthesis, and alternative mechanisms of electrochemical energy generation in both prokaryotic and eukaryotic systems. This course focuses on the components and organization of electron transport chains in prokaryotes and eukaryotes, including electron carriers, terminal oxidases, and patterns of electron flow. It also covers the chemiosmotic basis of ATP synthesis, the structure and function of ATP synthase, and the mechanism of rotational catalysis. Emphasis is placed on understanding metabolic integration, energetics, and the structural and functional organization of cellular energy systems.
<b>2</b>	<b>Vertical</b>	Major Course III
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	
	<b>CO(A)1</b>	To explain the major pathways involved in microbial carbohydrate metabolism
	<b>CO(A)2</b>	To elucidate different fermentative pathways in microorganisms and highlight the metabolic and industrial significance
	<b>CO(A)3</b>	To interpret the amphibolic nature of central metabolic pathways and emphasize their role in biosynthesis and energy production.
	<b>CO(A)4</b>	To describe the components and organization of electron transport chains mitochondria and prokaryotes.
	<b>CO(A)5</b>	To explain the chemiosmotic mechanism of ATP synthesis and the structural basis of ATP synthase function.

	<p><b>CO(A)6</b> To discuss alternative mechanisms of electrochemical energy generation and specialized phenomena such as bioluminescence in microorganisms.</p> <p><b>CO(A)7</b> To understand the structure, components, and functioning of electron transport chains in mitochondria and bacteria,</p> <p><b>CO(A) 8</b> To explain the principles of oxidative phosphorylation and ATP synthesis.</p>
<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall the central and major catabolic and anabolic pathways of carbohydrate metabolism.</p> <p><b>CO2</b> Describe the major catabolic and anabolic pathways for carbohydrates and explain the microbial bioenergetic system</p> <p><b>CO3</b> Apply knowledge of metabolic pathways to construct energy balance sheets and interpret microbial energy yields under different conditions.</p> <p><b>CO4</b> Differentiate between aerobic and anaerobic electron transport systems in prokaryotes and eukaryotes, including pathway variations and branching patterns</p> <p><b>CO4</b> Evaluate the biochemical mechanisms involved in ATP synthesis and electrochemical energy generation, and assess their physiological significance</p> <p><b>CO5</b> Elaborate on the physiological importance of metabolic adaptations such as incomplete TCA cycles, glyoxylate bypass, and alternative energy-generating mechanisms.</p> <p><b>CO6</b> Describe the organization and operation of electron transport chains in both prokaryotic and eukaryotic and explain the mechanism of ATP synthesis through chemiosmosis and rotational catalysis</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Central Metabolism and Fermentations</b></p> <p><b>Catabolism of Carbohydrates (with structures and enzymes)</b></p> <ul style="list-style-type: none"> <li>• Breakdown of polysaccharides – Glycogen, Starch, Cellulose</li> <li>• Breakdown of oligosaccharides - Lactose, Maltose, Sucrose, Cellobiose.</li> <li>• Utilization of monosaccharides - Fructose, Galactose</li> </ul> <p><b>Major catabolic pathway (with structures and enzymes)</b></p> <ul style="list-style-type: none"> <li>• ED pathway</li> <li>• Anaplerotic reactions</li> </ul>

- Glyoxylate bypass

**Amphibolic role of EMP pathway and TCA cycle**

**Energetics of Glycolysis, TCA cycle and ED pathway**

[Balance sheet format as in Lehninger (2.5 ATP/NADH and 1.5 ATP /FADH<sub>2</sub>); Based on this format make balance sheet for Glycolysis -Lactic acid and Alcohol fermentation and for ED pathway)

**Fermentative pathways**

- Lactic acid fermentation:
- Homofermentation
- Heterofermentation
- Bifidum pathway
- Alcohol fermentation:
- By ED pathway in bacteria
- By EMP in yeasts

**Other modes of fermentation in microorganisms**

- Mixed acid
- Acetone Butanol

**Anabolism of Carbohydrates**

- Gluconeogenesis

**UNIT II Prokaryotic and Eukaryotic Electron transport chain**

**Electron carriers**

- Electron Acceptors Supplying electrons to the ETC: NAD
- Carriers in ETC: Flavoproteins, Quinones, iron sulfur proteins, cytochromes.

**Mitochondrial electron transport chain**

- Biochemical anatomy of mitochondria
- A brief overview of complexes in mitochondrial ETC

**Prokaryotic electron transport chain**

- Organization of different terminal oxidases in bacteria
- Branched bacterial ETC
- Pattern of electron flow in aerobic and anaerobic ETC in *E coli*.

**ATP synthesis**

- Definitions of terms: proton motive force, Proton pump, Coupling sites, Redox potential.
- Chemiosmotic theory
- Structure of Mitochondrial ATP synthase
- Mechanism of rotational catalysi

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**A: External Examination: Semester End External - 30 marks**

**Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15

	<b>Total 30</b>
--	-----------------

**Note:** Equal Weightage is to be given to all the Units.

**B: Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11**

**REFERENCES:**

1. Conn, E. E., Stumpf, P. K., Bruening, G., & Doi, R. Y. (1987). *Outlines of Biochemistry* (5th ed.). John Wiley & Sons.
2. Gottschalk, G., (1985), *Bacterial Metabolism*, 2nd edition, Springer Verlag
3. Madigan, M. T., Martinko, J. M., Stahl, D., & Clark, D. P. (2012). *Brock Biology of Microorganisms* (13th Global ed.). Pearson International.
4. Moat, A. G., Foster, J. W., & Spector, M. P. (2002). *Microbial physiology* (4th ed.). Wiley-Liss
5. Nelson, D.L., & Cox, M. M. (2005). *Lehninger: Principles of Biochemistry* (4th ed.). W.H. Freeman & Co.
6. Nelson, D. L., & Cox, M. M. (2008). *Lehninger principles of biochemistry* (5th ed.). W.H. Freeman & Co
7. Stanier, R. Y., M. Doudoroff and E. A. Adelberg. *General Microbiology*, 5th edition, The Macmillan press Ltd
8. Voet, D., & Voet, J. (2016). *Fundamentals of Biochemistry* (5th ed.). Wiley.
9. White, D., (1995), *The Physiology and Biochemistry of Prokaryotes*, 3rd edition
10. Zubay, G., Parson, W. W., & Vance, D. E. (1995). *Principles of Biochemistry*. Wm. C. Brown Publishers

**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**Third Year B.Sc.**  
**(Microbiology)**

**Semester- V**  
**Vertical – 1**

**Title: Techniques in Applied and Clinical**  
**Microbiology**

**Major Course IV**  
**Practical**

**With effect from**  
**Academic Year 2026-2027**

# Title: Techniques in Applied and Clinical Microbiology

## Course Code: CHMMICROV4

Sr. No.	Heading	Particulars
1	Description of the Course	This practical course is designed to equip learners with a comprehensive set of hands-on laboratory skills spanning microbiology, biochemistry, immunology, and clinical diagnostics. Learners will engage in fundamental molecular biology techniques including the extraction and quantification of bacterial genomic DNA, alongside mutagenesis experiments involving UV-induced isolation of antibiotic-resistant and auxotrophic mutants. The course further enables learners to investigate microbial metabolic diversity through the study of homofermentative and heterofermentative Lactic Acid Bacteria, while developing proficiency in clinical biochemistry assays such as SGOT, SGPT, blood glucose estimation by the GOD-POD method, and total protein quantification by the Lowry method. Learners will also gain practical exposure to immunological techniques including Single Radial Immunodiffusion (SRID) for antigen quantification, alongside mycological skills such as the isolation of Candida using Chrome agar and germ tube examination.
2	Vertical	Major Course IV
3	Type Teaching Method	Practical
4	Credit	2 credits
5	Hours allotted	60 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	<p><b>CO(A)1</b> To illustrate the underlying principles of mutagenesis and employ systematic approaches for the successful isolation of microbial mutants.</p> <p><b>CO(A)2</b> To develop proficiency in the replica plating technique as a tool for the phenotypic identification and characterization of nutritional auxotrophic mutants.</p> <p><b>CO(A)3</b> To evaluate microbial metabolic diversity through the study of oxidative-fermentative pathways and Homofermentative and Heterofermentative Lactic Acid Bacteria (LAB).</p> <p><b>CO(A)4</b> To achieve proficiency in clinical diagnostic modalities</p> <p><b>CO(A)5</b> To understand the importance of enzymatic determination of SGOT and SGPT activity in serum and interpret the results in the context of hepatic and cardiac disorders.</p>

8	<p><b>Course Outcomes:</b>  <b>On completion of this course, the learner will be able to:</b></p> <p><b>CO1</b> enumerate the procedural steps for isolating microbial mutants and assess the mutagenic impact of physical agents on microbial populations.</p> <p><b>CO2</b> comprehend the fundamental principles underlying the replica plating technique and its application in microbial genetic screening.</p> <p><b>CO3</b> utilize rapid diagnostic tests for the timely and accurate identification of infectious diseases such as tuberculosis and fungal infections.</p> <p><b>CO4</b> proficiently perform SGPT and SGOT assays, express enzyme activity in IU/L, and interpret their differential clinical significance in disease diagnosis.</p> <p><b>CO5</b> quantitatively estimate blood plasma glucose levels using the enzymatic GOD-POD method and correlate results with standard clinical reference ranges.</p>						
9	<p style="text-align: center;"><b>Syllabus</b></p> <ul style="list-style-type: none"> <li>• Extraction of bacterial genomic DNA</li> <li>• Quantification and purity analysis of DNA using UV-Vis spectrophotometer</li> <li>• Study of effect of UV mutagenesis and isolation of antibiotic-resistant mutants</li> <li>• Isolation of auxotrophic mutants/ antibiotic-resistant mutants using replica plate technique</li> <li>• Determination of SGOT (Serum Glutamic-Oxaloacetate Transaminase) in serum</li> <li>• Determination of SGPT (Serum Glutamate Pyruvate Transaminase) in serum</li> <li>• Study of homofermentative and heterofermentative lactic acid bacteria</li> <li>• Quantitative estimation of blood glucose using the GOD-POD enzymatic method</li> <li>• Quantitative estimation of total protein concentration by Lowry method</li> <li>• Isolation of Candida using CHROM agar and examination of Candida germ tube.</li> <li>• Quantitative determination of antigen in biological samples using single radial immunodiffusion (SRID)</li> <li>• Rapid diagnostic microscopy-based tests: Acid-fast staining of Nocardia</li> </ul>						
10	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b>  <b>Paper – 50 Marks</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">1</td> <td style="width: 50%;">Internal Continuous Assessment: 40%</td> <td style="width: 40%; text-align: center;">External, Semester End Examination 60% Individual Passing in Internal and External Examination</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )</td> <td style="text-align: center;">As per pattern given below* 2 hours each day (2days)</td> </tr> </table>	1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination	2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 2 hours each day (2days)
1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination					
2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 2 hours each day (2days)					

	3	<p style="text-align: center;">*Pattern of the end semester practical examination</p> <p style="text-align: center;">(25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)</p>	
11	<p><b>REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. Cappuccino, J. G., &amp; Welsh, C. <i>Microbiology: A laboratory manual</i>. Pearson.</li> <li>2. Miller, J. H. <i>A short course in bacterial genetics: A laboratory manual and handbook for Escherichia coli and related bacteria</i>. Cold Spring Harbor Laboratory Press.</li> <li>3. Tille, P. M. <i>Bailey &amp; Scott's diagnostic microbiology</i>. Elsevier.</li> <li>4. Clinical and Laboratory Standards Institute. <i>M100: Performance standards for antimicrobial susceptibility testing</i>. CLSI.</li> <li>5. Patwardhan, B., &amp; Mukherjee, P. K. <i>Drug discovery and development from medicinal plants</i>. CRC Press.</li> <li>6. Cruickshank. <i>Medical microbiology, Vol II</i>.</li> </ol>		

**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**Third Year B.Sc.**  
**(Microbiology)**

**Semester- V**  
**Vertical – 1**

**Title: Ancient Indian Microbial Science & Health Foods**  
**Subject Specific Indian Knowledge System (IKS)**

**Major Course V**

**With effect from**  
**Academic Year 2026-2027**

# **Title: Ancient Indian Microbial Science & Health Foods**

## **Course Code: CHMMICROV5**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This course explores the fascinating connection between ancient Indian Vedic knowledge and modern microbiology, tracing how early Indian thinkers understood and described microorganisms through concepts such as Krimi and Sukshmajivanu. It highlights the remarkable contributions of ancient sages like Rishi Kanva, Charaka, and Sushruta, who laid the groundwork for microbiological thinking long before modern science emerged. Learners will discover how traditional Indian practices such as fermentation, food preservation, and environmental management align closely with what we understand through modern microbiology today. The course also introduces learners to ancient Indian approaches to medical bacteriology, natural healing, and Ayurvedic health principles, including early awareness of the gut microbiome and its role in overall wellbeing.
<b>2</b>	<b>Vertical</b>	IKS Microbiology
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	<p><b>CO(A)1</b> To trace the historical evolution of microbiological thought in ancient India by exploring its progression from early Vedic scriptures to classical Ayurvedic literature.</p> <p><b>CO(A)2</b> To scientifically interpret ancient Indian concepts of microorganisms, disease, and environmental management through the lens of contemporary microbiology.</p> <p><b>CO(A)3</b> To examine traditional Indian fermented foods and age-old preservation techniques, appreciating their cultural relevance and significance to modern health science.</p> <p><b>CO(A)4</b> To understand the foundations of ancient Indian medical microbiology, Ayurvedic disease-defense mechanisms, and naturopathic therapies rooted in Indian tradition and holistic health philosophy.</p>

<p>8</p>	<p><b>Course Outcomes:</b>  <b>On completion of this course, the learner will be able to:</b></p> <p><b>CO1</b> Review the areas of interactions between IKS and Microbiology</p> <p><b>CO2</b> Summarize Vedic and Ayurvedic proto-microbiological concepts and India's foundational role in the history of biological sciences.</p> <p><b>CO3</b> Apply indigenous microbiological insights to contemporary environmental and agricultural challenges using traditional practices</p> <p><b>CO4</b> Correlate traditional Indian fermented foods and preservation practices with modern food science, evaluating their relevance to contemporary public health nutrition and dietary wellness.</p> <p><b>CO5</b> Synthesize Ayurvedic, naturopathic, and modern microbiological perspectives to develop an integrative understanding of human health and disease.</p>
<p>9</p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT 1 Areas of Interactions Between Indigenous Knowledge System and Microbiology</b></p> <p><b>Vedas and Microbiology</b></p> <ul style="list-style-type: none"> <li>• Time span of the Vedic period Vedic scientific terms for microorganisms – Krimi, Shudra, and Sukshmajivanu Basis of microbiology in Vedas – Concept of Krimi (microorganisms) in Ayurveda</li> <li>• Rishi Kanva and the concept of Sukshmajeevanu (Kanva as the Father of Microbiology) Contributions of Rishi Kanva and descendants in microbiology – Kanva, Agasti, Charak, and Shushruta.</li> <li>• India's proto-microbiology – Krimi in Vedic literature, post-Vedic literature, and Ayurvedic literature.</li> <li>• Significance of microorganisms in human health, diseases, and remedies for infections.</li> </ul> <p><b>Environmental Microbiology and Indigenous Practices:</b></p> <ul style="list-style-type: none"> <li>• Understanding traditional water management, waste management, and agricultural practices from a microbiological perspective.</li> <li>• Agnihotra and its effects on the environment and agriculture. Influence of other rituals on microbes. Use of Ayurvedic combinations for eco- friendly management of plant diseases.</li> </ul> <p><b>UNIT 2 Ancient Wisdom of India on Foods and Health</b></p> <p><b>Traditional fermented foods and health benefits</b></p> <ul style="list-style-type: none"> <li>• Cereal-based fermented foods</li> <li>• Vegetable-based fermented foods</li> <li>• Regional Probiotic Foods Traditions Across India</li> <li>• Indigenous fermentation practices: Curd, Idli, Dosa, Pickles, kanji, Anarasa</li> </ul>

(methodology & traditional importance)

**Ancient Indian Knowledge of Medical Microbiology, Naturopathy, Ayurveda**

- Krimi in water, milk and food ii) Krimi on/in the body
- Disease – defences by good health and Vedic concept
- Microbial transfer and Madhav Nidan Examples of disease enlisted in ancient Indian literature details i) Piliya(Jaundice), ii) Masurika (smallpox), iii) Galaganda (mumps)
- Prakriti- Nature as Healer
- Panchabhuta Siddhanta
- Specific naturopathic therapies and their Indian origin
- Concept of Hita Ahara
- Gut Microbiome in Ayurvedic Thought

**10**

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**A: External Examination: Semester End External - 30 marks**

**Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**B: Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11**

**Text Books**

1. Vedic Microbiology – A Scientific Approach, R.C. Dubey, Published by Motilal Banarsidass International.
2. Foundations in Microbiology, Ulhas Patil, J.S. Kulkarni, A.B. Chaudhari, S.B. Chincholkar, Nirali Publication.
3. Textbook of Naturopathy, R. Vasudevan, Published by National Institute of Naturopathy (NIN), Pune.

**Reference Books**

1. Charaka Samhita, translated by P.V. Sharma or R.K. Sharma & Bhagwan Dash.
2. Sushruta Samhita, translated by K.M. Nadkarni or P.K. Gode.

- |  |  |
|--|--|
|  | <ol style="list-style-type: none"><li>3. The Roots of Ayurveda, Dominik Wujastik.</li><li>4. Ancient Indian Science and Technology, O.P. Jaggi.</li><li>5. History of Science in India, Indian National Science Academy.</li><li>6. Lost Discoveries, Dick Teresi.</li><li>7. Dravyaguna Vijnana, P.V. Sharma.</li><li>8. Science and Technology in Ancient India, Bharatiya Vidya Bhavan Series.</li><li>9. Ashtanga Hridayam, translated by Prof. K.M. Sreekumar.</li><li>10. Krimi Vijnana in Ayurveda, available in select Ayurvedic university libraries.</li></ol> |
|--|--|

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V  
Vertical – 1**

**Title: Essentials of Medical Microbiology  
Elective-1 (Subject specific)**

**With effect from  
Academic Year 2026-2027**

# Title: Essentials of Medical Microbiology

Course Code: CHMMICROV6

Sr. No.	Heading	Particulars
1	Description of the Course	This course provides comprehensive knowledge of important human bacterial diseases affecting the respiratory, skin, gastrointestinal, and urinary tracts. It emphasizes the study of pathogenic microorganisms, their disease mechanisms, and laboratory diagnosis. The course also introduces principles of antimicrobial therapy, characteristics of chemotherapeutic agents, antibiotic susceptibility testing, and mechanisms of action of major antibiotics. Students gain practical and theoretical understanding of rational drug use, antimicrobial selection, and treatment strategies for bacterial, viral, fungal, and parasitic infections.
2	Vertical	Elective-Subject Specific
3	Type Teaching Method	Theory
4	Credit	2 credits
5	Hours allotted	30 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	<p><b>CO(A)1</b> To introduce students to the etiology, pathogenesis, symptoms, diagnosis, and prevention of major respiratory, skin, gastrointestinal, and urinary tract bacterial diseases.</p> <p><b>CO(A)2</b> To develop understanding of important pathogenic microorganisms such as <i>Streptococcus pyogenes</i>, <i>Klebsiella pneumoniae</i>, <i>Staphylococcus aureus</i>, <i>Pseudomonas</i>, <i>Escherichia coli</i>, and <i>Salmonella typhi</i> associated with human infections.</p> <p><b>CO(A)3</b> To familiarize students with the principles of antimicrobial chemotherapy and the characteristics of an ideal chemotherapeutic agent.</p> <p><b>CO(A)4</b> To train students in laboratory methods used for antimicrobial susceptibility testing, including determination of Minimum Inhibitory Concentration (MIC) and Kirby–Bauer antibiotic sensitivity testing.</p> <p><b>CO(A)5</b> To provide knowledge about the mechanism of action of different classes of antibiotics targeting cell wall synthesis, protein synthesis, nucleic acid synthesis, and metabolic pathways.</p> <p><b>CO(A)6</b> To create awareness regarding the therapeutic applications of antibacterial, antiviral, antifungal, and antiparasitic drugs and the importance of rational antimicrobial use.</p>

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Identify important pathogenic bacteria and correlate them with the diseases they cause in humans.</p> <p><b>CO2</b> Explain the causative agents, pathogenesis, clinical manifestations, and control measures of major respiratory, skin, gastrointestinal, and urinary tract infections.</p> <p><b>CO3</b> Differentiate various classes of antibiotics based on their mechanisms of action and therapeutic applications.</p> <p><b>CO4</b> Apply knowledge of antimicrobial therapy for understanding treatment strategies and antibiotic selection for infectious diseases.</p> <p><b>CO5</b> Perform and interpret antimicrobial susceptibility tests such as MIC determination and Kirby–Bauer method.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Study of Respiratory, Skin, Gastrointestinal tract and Urinary tract diseases</b></p> <p><b>Study of respiratory tract diseases</b></p> <ul style="list-style-type: none"> <li>• <i>S. pyogenes</i> infections</li> <li>• Pneumonia caused by <i>K. pneumoniae</i></li> </ul> <p><b>Study of skin diseases</b></p> <ul style="list-style-type: none"> <li>• Pyogenic skin infections caused by <i>S.aureus</i></li> <li>• Skin infections caused by <i>Pseudomonas</i></li> </ul> <p><b>Study of gastrointestinal tract diseases</b></p> <ul style="list-style-type: none"> <li>• <i>E coli</i></li> <li>• <i>Salmonella typhi</i></li> </ul> <p><b>Study of Urinary tract diseases and Sexually transmitted disease (Gonorrhoea)</b></p> <p><b>UNIT II Study of Antimicrobial therapy</b></p> <p><b>Chemotherapy for infectious diseases</b></p> <ul style="list-style-type: none"> <li>• Attributes of Chemotherapeutic Agent</li> <li>• Determination MIC</li> <li>• Selection and testing of antibiotics for bacterial isolates by Kirby- Bauer method</li> <li>• Common antibiotics used for treating viral, fungal and parasitic diseases.</li> </ul> <p><b>Mechanism of action of antibiotics</b></p> <p><b>Cell wall</b></p> <ul style="list-style-type: none"> <li>• Beta-lactams- Penicillin</li> </ul>

	<ul style="list-style-type: none"> <li>• Cephalosporins</li> <li>• Carbapenems</li> </ul> <p><b>Protein Synthesis</b></p> <ul style="list-style-type: none"> <li>• Streptomycin</li> <li>• Tetracycline</li> <li>• Chloramphenicol</li> </ul> <p><b>Nucleic acid</b></p> <ul style="list-style-type: none"> <li>• Fluoroquinolones</li> </ul> <p><b>Metabolic Antagonist</b></p> <ul style="list-style-type: none"> <li>• Sulfa drugs</li> <li>• Trimethoprim</li> </ul>																								
10	<p style="text-align: center;"><b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b></p> <p style="text-align: center;"><b>A: External Examination: Semester End External - 30 marks      Time: 1:00 hours</b> <b>Format of Question Paper</b></p> <p><b>Attempt all questions.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Question No</th> <th style="width: 70%;">Nature of Questions</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Q1</td> <td>Attempt any three questions out of six (5 marks each) based on Unit-1</td> <td style="text-align: center;">15</td> </tr> <tr> <td style="text-align: center;">Q2</td> <td>Attempt any three questions out of six (5 marks each) based on Unit-2</td> <td style="text-align: center;">15</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table> <p><b>Note:</b> Equal Weightage is to be given to all the Units.</p> <p style="text-align: center;"><b>B: Internal Examination: Continuous Evaluation - 20 marks</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 75%;">Assessment / evaluation</th> <th style="width: 20%;">Marks</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Overall conduct as a responsible student, attentiveness and attendance</td> <td style="text-align: center;">10</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>20</b></td> </tr> </tbody> </table>	Question No	Nature of Questions	Marks	Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15	Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15	<b>Total</b>		<b>30</b>		Assessment / evaluation	Marks	1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10	2.	Overall conduct as a responsible student, attentiveness and attendance	10	<b>Total</b>		<b>20</b>
Question No	Nature of Questions	Marks																							
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15																							
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15																							
<b>Total</b>		<b>30</b>																							
	Assessment / evaluation	Marks																							
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10																							
2.	Overall conduct as a responsible student, attentiveness and attendance	10																							
<b>Total</b>		<b>20</b>																							
11	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Ananthanarayan, R., Paniker, C. K. J., &amp; Kanungo, R. (Eds.). (2022). Ananthanarayan and Paniker's textbook of microbiology (12th ed.). Universities Press.</li> <li>2. Ananthanarayan, R., Paniker, C. K. J., &amp; Kanungo, R. (Eds.). (2017). Ananthanarayan and Paniker's textbook of microbiology (10th ed.). Universities Press.</li> <li>3. CLSI. Performance Standards for Antimicrobial Susceptibility Testing. 35th ed. CLSI supplement M100. Clinical and Laboratory Standards Institute; 2025.</li> <li>4. Delost, M. D. (2015). Introduction to diagnostic microbiology for the laboratory sciences.</li> </ol>																								

Jones & Bartlett Learning.

5. Microbiology: An Introduction (13th Ed.) By Gerard Tortora, Berdell Funke, and Christine Case
6. Koneman's Color Atlas and Textbook of Diagnostic Microbiology by M.D. Winn, Washington C., Jr. (Editor), Elmer W. Koneman (Editor), Ph.D. Janda, William M.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V  
Vertical – 1**

**Title: Practical in Essentials of Medical  
Microbiology  
Elective-1 (Subject specific)**

**With effect from  
Academic Year 2026-2027**

## Title: Practical in Essentials of Medical Microbiology

Course Code: CHMMICROV7

Sr. No.	Heading	Particulars
1	<b>Description of the Course</b>	This practical course provides hands-on training in clinical microbiology techniques used for diagnosis of infectious diseases. Students learn collection and transport of clinical samples, isolation and identification of bacterial pathogens from different body systems using selective media and biochemical tests, and antimicrobial susceptibility testing by Kirby–Bauer method and MIC determination. The course also introduces basic clinical biochemical analysis through blood glucose estimation by O-toluidine method, enhancing laboratory skills essential for medical microbiology and diagnostic applications.
2	<b>Vertical</b>	Major elective practical
3	<b>Type Teaching Method</b>	Practical
4	<b>Credit</b>	2 credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	<p><b>CO(A)1</b> To provide knowledge of proper clinical sample collection, handling, transportation, and processing techniques used in medical microbiology laboratories.</p> <p><b>CO(A)2</b> To train students in the isolation, cultivation, and identification of pathogenic microorganisms from gastrointestinal, respiratory, urinary tract, and wound infection samples using selective and differential media.</p> <p><b>CO(A)3</b> To develop practical skills in performing and interpreting biochemical tests for identification of clinically important bacterial pathogens.</p> <p><b>CO(A)4</b> To familiarize students with antimicrobial susceptibility testing using the Kirby–Bauer disc diffusion method.</p> <p><b>CO(A)5</b> To enable students to determine the Minimum Inhibitory Concentration (MIC) of antibiotics for bacterial isolates.</p> <p><b>CO(A)6</b> To introduce students to basic clinical biochemical analysis through estimation of blood glucose by the O-toluidine method.</p>

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Collect, transport, and process clinical specimens following standard microbiological procedures.</p> <p><b>CO2</b> Isolate and identify important bacterial pathogens associated with gastrointestinal, respiratory, urinary tract, and wound infections using culture media and biochemical tests.</p> <p><b>CO3</b> Differentiate pathogenic bacteria based on colony morphology, staining characteristics, and biochemical reactions.</p> <p><b>CO4</b> Perform and interpret antimicrobial susceptibility testing using the Kirby–Bauer method.</p> <p><b>CO4</b> Determine and analyse the Minimum Inhibitory Concentration (MIC) of antibiotics against bacterial isolates.</p> <p><b>CO5</b> Conduct blood glucose estimation using the O-toluidine method and interpret the results accurately.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p style="text-align: center;"><b>Practical in Essentials in Medical Microbiology</b></p> <ul style="list-style-type: none"> <li>• Clinical sample collection and transport</li> </ul> <p>Isolation and identification of pathogens using media and key biochemicals</p> <ul style="list-style-type: none"> <li>• Gastro intestinal tract (MacConkey’s agar, XLD agar, NA) <ul style="list-style-type: none"> <li><i>E. coli</i></li> <li><i>Salmonella typhi</i></li> </ul> </li> <li>• Respiratory tract (SIBA, MacConkey’s agar, NA) <ul style="list-style-type: none"> <li><i>Streptococcus pyogenes</i></li> <li><i>Klebsiella pneumoniae</i></li> </ul> </li> <li>• Urinary tract (CLED, MacConkey’s agar, NA) <ul style="list-style-type: none"> <li><i>E. coli</i></li> <li><i>Pseudomonas aeruginosa</i></li> </ul> </li> <li>• Skin and wound infections (SIBA, MacConkey’s agar, NA) <ul style="list-style-type: none"> <li><i>Staphylococcus aureus</i></li> <li><i>Streptococcus pyogenes</i></li> <li><i>Pseudomonas aeruginosa</i></li> </ul> </li> <li>• AST - Kirby Bauer test</li> <li>• Determination of MIC of an antibiotic</li> <li>• Determination of blood glucose by O-toluidine method</li> </ul>

10	<b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b>		
1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination	
2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 2 hours each day (2days)	
3	*Pattern of the end semester practical examination  (25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)		
11	<b>REFERENCES:</b> <ol style="list-style-type: none"> <li>1. Godkar, P. B., &amp; Praful B Godkar, D. P. G. (2003). Textbook of Medical Laboratory Technology. Mumbai: Bhhalani Publishing House.</li> <li>2. Ananthanarayan, R., Paniker, C. K. J., &amp; Kanungo, R. (Eds.). (2022). Ananthanarayan and Paniker’s textbook of microbiology (12th ed.). Universities Press.</li> <li>3. Ananthanarayan, R., Paniker, C. K. J., &amp; Kanungo, R. (Eds.). (2017). Ananthanarayan and Paniker’s textbook of microbiology (10th ed.). Universities Press.</li> <li>4. CLSI. Performance Standards for Antimicrobial Susceptibility Testing. 35th ed. CLSI supplement M100. Clinical and Laboratory Standards Institute; 2025.</li> <li>5. Delost, M. D. (2015). Introduction to diagnostic microbiology for the laboratory sciences. Jones &amp; Bartlett Learning.</li> <li>6. Microbiology: An Introduction (13th Ed.) By Gerard Tortora, Berdell Funke, and Christine Case</li> <li>7. Koneman's Color Atlas and Textbook of Diagnostic Microbiology by M.D. Winn, Washington C., Jr. (Editor), Elmer W. Koneman (Editor), Ph.D. Janda, William M.</li> </ol>		

**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**Third Year B.Sc.**  
**(Microbiology)**

**Semester- V**  
**Vertical – 1**

**Title: Introduction to Biotechnology**  
**Elective-2 (Subject specific)**

**With effect from**  
**Academic Year 2026-2027**

# **Title: Introduction to Biotechnology**

**Course Code: CHMMICROV8**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	Biotechnology is the manipulation of biological organisms to make products that benefit human beings. The subject contributes to such diverse areas as food production, waste disposal, mining and medicine. The subject has existed since ancient times, some of its advances have come in more recent years. When technologies are applied at industrial level, they constitute Bio-industry where they play a dual role of replacing traditional technologies and acting as driving force. The subject is an applied science and has made advances in two major areas, viz. Molecular Biology and production of industrially important biochemicals including enzymes.
<b>2</b>	<b>Vertical</b>	Elective-Subject Specific
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	<p><b>CO(A)1</b> To impart to the learners knowledge of basics of Biotechnology</p> <p><b>CO(A)2</b> To describe different cloning vectors and gene cloning</p> <p><b>CO(A)3</b> To emphasize the scope of biotechnology in agriculture and tissue culture..</p> <p><b>CO(A)4</b> To enable learners understand the potential of recombinant DNA techniques</p> <p><b>CO(A)5</b> To discuss the role of cloning vectors in genetic engineering experiments.</p>

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall historical developments in the field of Biotechnology</p> <p><b>CO2</b> Explain the potential of biotechnology in agriculture, production of biopolysaccharides</p> <p><b>CO3</b> Apply principles of biotechnology to improve crop production , animal farming , bioremediation and healthcare.</p> <p><b>CO4</b> Analyse opportunities in Biotechnology , Gene Amplification through PCR and cloning vectors in rDNA technology</p> <p><b>CO5</b> Evaluate the different vectors for gene cloning and cell culture technique for enhancement of desirable characteristics.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT 1 Basic Techniques in Biotechnology</b></p> <p><b>Cutting and joining of DNA</b></p> <ul style="list-style-type: none"> <li>• Exonucleases, endonucleases, restriction endonucleases – nomenclature, examples and quality</li> <li>• DNA ligases, alkaline phosphatases, and DNA polymerases</li> <li>• Use of linkers and adaptors</li> </ul> <p><b>Cloning vectors</b></p> <ul style="list-style-type: none"> <li>• Properties of a good vector and expression vectors</li> <li>• E. coli vectors – plasmid, cosmid, and bacteriophage vectors</li> <li>• Shuttle vectors, yeast vectors, and vectors for animals and plants</li> </ul> <p><b>Gene cloning</b></p> <ul style="list-style-type: none"> <li>• Steps involved in gene cloning</li> <li>• Introduction of vectors into suitable bacterial hosts by transformation and selection</li> <li>• Screening methods using immunological assays</li> </ul> <p><b>UNIT 2 Major branches of Biotechnology</b></p> <p><b>Bioremediation in biotechnology</b></p> <ul style="list-style-type: none"> <li>• Introduction and types of reactions in bioremediation</li> <li>• Bioremediation of contaminated soil and wastewater</li> <li>• Bioremediation using genetically engineered microbes (GEM)</li> </ul> <p><b>Animal biotechnology</b></p> <ul style="list-style-type: none"> <li>• Transgenic mice – retroviral vector method and DNA microinjection method</li> </ul> <p><b>Industrial and marine biotechnology</b></p> <ul style="list-style-type: none"> <li>• Production of biopolymers – biogums, biopolysaccharides, and bioplastics</li> <li>• Marine microbial habitats and their biotechnologically relevant microorganisms <ul style="list-style-type: none"> <li>• Methods for microbial marine drugs as pharmaceuticals</li> </ul> </li> </ul> <p><b>Plant biotechnology</b></p> <ul style="list-style-type: none"> <li>• Plant transformation using Ti plasmids of Agrobacterium tumefaciens</li> <li>• Ti plasmid-derived vector systems</li> </ul>

- Physical methods of transferring genes into plants

**Healthcare biotechnology**

- Genetic counseling
- Forensic medicine

**10**

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**A: External Examination: Semester End External - 30 marks**

**Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**B: Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11**

**REFERENCES**

1. Elements of Biotechnology, P.K. Gupta, Rastogi Publications, 2nd Edition, 2009.
2. Bernard R. Glick and Jack J. Pasternak, Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition.
3. Primrose et al., Principles of Gene Manipulations, 7th Edition, Blackwell Science, 2004.
4. Peter J. Russell, Genetics – A Molecular Approach, 3rd Edition, 2006.
5. R.C. Dubey, A Textbook of Biotechnology, S. Chand and Company Ltd., 2006.
6. B.D. Singh, Biotechnology, Kalyani Publishers.
7. Prescott and Dunn's Industrial Microbiology, 4th Edition, McMillan Publishers, 1982.
8. Marine Biotechnology in the Twenty-First Century: Problems, Promise, and Products, National Academy Press.
9. Ozcan Konur, Bioenergy and Biofuels, CRC Press, 1st Edition, 2018.
10. Vault Career Guide to Biotechnology (E-Book).
11. U. Satyanarayana, Biotechnology, Books and Allied (P) Ltd., 2004.

**Smt. Chandibai Himathmal Mansukhani College**  
**(Autonomous)**

**Third Year B.Sc.**  
**(Microbiology)**

**Semester- V**  
**Vertical – 1**

**Title: Practical in Introduction to Biotechnology**  
**Elective-2 (Subject specific)**

**With effect from**  
**Academic Year 2026-2027**

## **Title: Practical in Introduction to Biotechnology**

**Course Code: CHMMICROV9**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This practical course provides hands-on training in clinical microbiology techniques used for diagnosis of infectious diseases. Students learn collection and transport of clinical samples, isolation and identification of bacterial pathogens from different body systems using selective media and biochemical tests, and antimicrobial susceptibility testing by Kirby–Bauer method and MIC determination. The course also introduces basic clinical biochemical analysis through blood glucose estimation by O-toluidine method, enhancing laboratory skills essential for medical microbiology and diagnostic applications.
<b>2</b>	<b>Vertical</b>	Major elective practical
<b>3</b>	<b>Type Teaching Method</b>	Practical
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	60 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>  <b>CO(A)1</b> To impart knowledge of techniques used in Molecular biology.  <b>CO(A)2</b> To explain the principles used in extraction and isolation of plasmid DNA and electrophoretic techniques.  <b>CO(A)3</b> To enable the learners to develop skills in performing electrophoretic techniques, use a UV-Vis spectrophotometer  <b>CO(A)4</b> To demonstrate techniques like Western blotting and Southern blotting.  <b>CO(A)5</b> To emphasize the use of restriction enzymes in genetic engineering experiments.	

8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall the principles of isolation of plasmids, gel electrophoresis, estimation of beta galactosidase and proteins.</p> <p><b>CO2</b> Understand the fundamental principles of electrophoresis in protein and nucleic acid separation, production and estimation of microbial polysaccharide</p> <p><b>CO3</b> Apply the skills acquired in genetic engineering experiments, plant tissue culture techniques in agriculture, marine microbial flora for obtaining industrially significant products..</p> <p><b>CO4</b> Compare different methods used in protein estimation, separation of Nucleic acids and proteins by gel electrophoresis, media for plant tissue cultures</p> <p><b>CO5</b> Estimate DNA concentration in the isolated plasmid suspension ,protein concentration by Bradford’s method and the yield of microbial polysaccharide.</p>
9	<p style="text-align: center;"><b>Practical in Introduction to Biotechnology Syllabus</b></p> <p><b>Techniques in genetic engineering</b></p> <ul style="list-style-type: none"> <li>• Isolation of plasmid DNA from E. coli</li> <li>• Checking the purity of plasmid DNA using UV spectrophotometer</li> <li>• Gel electrophoresis of DNA</li> <li>• Transformation of E. coli with plasmid (Demonstration)</li> <li>• Restriction digestion of DNA</li> <li>• Study of restriction gene mapping and problem solving</li> <li>• Southern blotting (Demonstration)</li> </ul> <p><b>Techniques for protein estimation and separation</b></p> <ul style="list-style-type: none"> <li>• Beta-galactosidase assay</li> <li>• Estimation of proteins by Bradford’s method</li> <li>• Separation of proteins by SDS-PAGE</li> <li>• Western blotting (Demonstration)</li> </ul> <p><b>Tissue and cell culture techniques</b></p> <ul style="list-style-type: none"> <li>• Study of media for plant tissue culture</li> <li>• Seed and explant sterilization</li> <li>• Inoculation of explants for callus formation</li> </ul> <p><b>Study of animal cell culture media</b></p> <ul style="list-style-type: none"> <li>• Trypsinization of tissue</li> <li>• Determination of cell viability by Trypan blue staining method</li> <li>• Techniques for industrial and marine biotechnology</li> <li>• Isolation of marine microbial flora</li> <li>• Production of microbial polysaccharides and determination of yield using Azotobacter and Rhizobium</li> <li>• Isolation and identification of <i>Bacillus thuringiensis</i></li> </ul>

10

**Scheme of Examination and Assessment Pattern  
Paper – 50 Marks**

1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 2 hours each day (2days)
3	*Pattern of the end semester practical examination  (25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)	

11

**REFERENCES:**

1. R. C. Dubey, *A Textbook of Biotechnology*, S. Chand and Company, New Delhi, 2005.
2. Prescott and Dunn's *Industrial Microbiology*, 4th Edition, McMillan Publishers, 1982.
3. Ian Freshney, *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications*.
4. *Marine Biotechnology in the Twenty-First Century: Problems, Promise, and Products*, National Academy Press.
5. Glick, B.R. & Pasternak, J.J., *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, 3rd Edition, ASM Press, Washington, USA, 2003.
6. Ratledge & B. Kristiansen, *Basic Biotechnology*, 2nd Edition, Cambridge University Press, 2006.
7. Crueger, W. and Crueger, A., *Biotechnology – A Textbook of Industrial Microbiology*, 2000.
8. H.K. Das, *Textbook of Biotechnology*, 2nd and 3rd Editions.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V**

**Vocational Skill Course (VSC)**

**Vertical 4**

**Title: Techniques in Industrial Microbiology  
Practical**

**With effect from  
Academic Year 2026-2027**

# Title: Techniques in Industrial Microbiology

Course Code: CHMMICROV11

Sr. No.	Heading	Particulars
1	Description of the Course	This practical course provides training in important techniques employed in industrial microbiology and bioprocess technology. It focuses on enzyme immobilization, microbial fermentation, and biodegradation of aromatic compounds, antibiotic screening, and sterilization validation. Students gain experience in the cultivation and application of industrial microorganisms, particularly <i>Saccharomyces cerevisiae</i> , for enzyme production and alcohol fermentation. In addition, learners are introduced to the use of artificial intelligence tools in industrial microbiology, enabling them to integrate modern technological approaches with microbiological applications and process optimization.
2	Vertical	Vocational Skill Course(VSC)
3	Type Teaching Method	Practical
4	Credit	2 credits
5	Hours allotted	60 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	<p><b>CO(A)1</b> To understand the principles and applications of enzyme immobilization and microbial fermentation processes.</p> <p><b>CO(A)2</b> To develop practical skills in the isolation, cultivation, and screening of industrially important microorganisms.</p> <p><b>CO(A)3</b> To perform analytical and microbiological techniques used in biodegradation and fermentation studies.</p> <p><b>CO(A)4</b> To understand sterilization validation procedures and their significance in industrial microbiology.</p> <p><b>CO(A)5</b> To explore the applications of artificial intelligence in microbiological research and industrial processes.</p>

<p>8</p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Perform immobilization of microbial cells and evaluate factors influencing enzyme activity and kinetics.</p> <p><b>CO2</b> Isolate, cultivate, and characterize microorganisms involved in biodegradation and industrial fermentation.</p> <p><b>CO3</b> Apply standard analytical methods for the estimation of phenol, sugars, and alcohol and interpret experimental results.</p> <p><b>CO4</b> Conduct screening of antibiotic-producing microorganisms and validate sterilization processes using biological indicators.</p> <p><b>CO5</b> Utilize AI-based tools and microbiological techniques for process analysis, optimization, and problem-solving in industrial microbiology.</p>
<p>9</p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>Immobilization of <i>Saccharomyces cerevisiae</i> to study the kinetics of the enzyme invertase</b></p> <ul style="list-style-type: none"> <li>• Induction of invertase production in <i>S. cerevisiae</i> using activation media.</li> <li>• Preparation of inoculum for immobilization and determination of initial cell count.</li> <li>• Immobilization of invertase using the alginate entrapment method.</li> <li>• Study of the effect of substrate concentration and contact time on immobilized invertase activity.</li> </ul> <p><b>Study of aromatic compound-degrading microorganisms</b></p> <ul style="list-style-type: none"> <li>• Enrichment and isolation of phenol-degrading microorganisms from different sources.</li> <li>• Chemical estimation of phenol by the 4-aminoantipyrine (4-AAP) method.</li> </ul> <p><b>Study of alcohol fermentation by <i>Saccharomyces cerevisiae</i></b></p> <ul style="list-style-type: none"> <li>• Determination of alcohol tolerance of the production strain.</li> <li>• Determination of sugar tolerance of the production strain.</li> <li>• Preparation of fermentation medium and inoculum.</li> <li>• Estimation of sugar by Cole's method.</li> <li>• Estimation of alcohol by the dichromate method.</li> <li>• Evaluation of the efficiency of alcohol fermentation.</li> </ul> <p><b>Validation of sterilization procedures using biological indicators for autoclave</b></p> <p><b>Application of Artificial Intelligence (AI) tools in industrial microbiology</b></p>

10

**Scheme of Examination and Assessment Pattern**  
**Paper – 50 Marks**

1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 3 hours each day (2days)
3	*Pattern of the end semester practical examination  (25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)	

11

**REFERENCES:**

1. Casida, L. E. (2009). *Industrial Microbiology*. New Age International (P) Ltd., New Delhi.
2. McNeil, B., & Harvey, L. M. (2008). *Practical Fermentation Technology*. John Wiley & Sons, Ltd.
3. Stanbury, P. F., Whitaker, A., & Hall, S. J. (2017). *Principles of Fermentation Technology* (3rd ed.). Butterworth-Heinemann.
4. Wilson, K., & Walker, J. M. (Eds.). (2018). *Principles and Techniques of Biochemistry and Molecular Biology* (8th ed.). Cambridge University Press.
5. Peppler, H. J., & Perlman, D. (1979). *Microbial Technology* (Vols. 1 & 2). Academic Press.
6. Cappuccino, J. G., & Welsh, C. T. (2020). *Microbiology: A Laboratory Manual* (12th ed.). Pearson Education.
7. Dubey, R. C. (2005). *A Textbook of Biotechnology*. S. Chand and Company Ltd., New Delhi.
8. Crueger, W., & Crueger, A. (2000). *Biotechnology: A Textbook of Industrial Microbiology* (2nd ed.). Panima Publishing Corporation.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V**

**Community Engagement Programme  
(CEP)/Field Project**

**Vertical-6**

**Course Code: CHMMICROV12**

**With effect from  
Academic Year 2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- V  
Vertical – 2**

**Title: Microbiology of Air and Water  
Minor Course**

**With effect from  
Academic Year 2026-2027**

**Title: Microbiology of Air and water**  
**Course Code: CHMMICROV10**

Sr. No.	Heading	Particulars
1	<b>Description of the Course</b>	The course examines microorganisms present in air and water environments and their effects on human health. It covers topics such as bio aerosols, mechanisms that enable microbial survival, and the body's respiratory defence systems. It also addresses waterborne microbes, the factors influencing their growth, and key indicators of pollution. Students are introduced to techniques for detecting and assessing microbiological contamination in air and water. In addition, the course explores wastewater treatment methods, including biological, natural, and chemical approaches. Overall, it builds a foundational understanding of monitoring and controlling microbial pollution in the environment.
2	<b>Vertical</b>	Minor Course
3	<b>Type Teaching Method</b>	Theory
4	<b>Credit</b>	2 credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<p><b>Course Objectives:</b></p> <p><b>CO(A)1</b> Explain the role of air and water as natural habitats for microorganisms and identify the factors that influence their survival and distribution.</p> <p><b>CO(A)2</b> Describe the formation, composition, and health effects of bio aerosols and waterborne microorganisms.</p> <p><b>CO(A)3</b> Discuss the body's defence mechanisms against airborne pathogens and assess microbial risks in air and water environments.</p> <p><b>CO(A)4</b> Examine techniques for the detection, monitoring, and microbiological assessment of air and water pollution, including the identification of toxins and allergens.</p> <p><b>CO(A)5</b> Differentiate between physical, biological, and chemical wastewater treatment methods and evaluate their efficiency in reducing microbial contamination.</p>	
8	<p><b>Course Outcomes:</b></p> <p>On completion of this course, the learner will be able to:</p> <p><b>CO1.</b> List the environmental factors that influence microbial survival in air and water, and</p>	

	<p>explain their adaptive strategies.</p> <p><b>CO2.</b> Recognize key bio aerosols and waterborne microorganisms and evaluate their potential impact on human health.</p> <p><b>CO3.</b> Utilize microbiological methods to assess air and water quality, including sampling, culturing, and molecular techniques.</p> <p><b>CO4.</b> Analyse microbiological standards and regulations related to air quality, drinking water, and wastewater systems.</p> <p><b>CO5.</b> Assess and recommend suitable wastewater treatment approaches (natural, biological, and chemical) to control microbial pollution.</p> <p><b>CO6.</b> Design and conduct experiments to evaluate the microbiological quality of indoor and outdoor air.</p>
9	<p style="text-align: right;"><b>Syllabus</b></p> <p><b>UNIT 1: Microbiology of Air</b>  Air environment of microorganisms</p> <ul style="list-style-type: none"> <li>• Adaptation of microorganisms to the air environment</li> <li>• Resting forms of bacteria</li> <li>• Biological bio aerosols and their size</li> <li>• Microorganisms suspended in air as a colloidal system</li> <li>• Mechanisms protecting lungs against bio aerosols</li> <li>• Survival and spread of bio aerosols</li> <li>• Factors influencing the survival of microorganisms – relative humidity, temperature, and solar radiation (overview)</li> <li>• Biological aerosols as a source of human hazards</li> <li>• Investigation of microbiological air pollution</li> <li>• Microbiological evaluation of air pollution</li> </ul> <p><b>UNIT 2: Microbiology of Water</b>  Water – definition</p> <ul style="list-style-type: none"> <li>• Groups of water organisms – plankton, periphyton, and benthos</li> <li>• Factors limiting the growth of microorganisms in water</li> <li>• Abiotic factors and biotic factors</li> <li>• Characterization of water microorganisms</li> <li>• Bacteria, water fungi, blue-green algae, algae, and water protozoa – overview</li> <li>• Polluted water organisms</li> <li>• Water health standards</li> <li>• Concept of indicator organisms</li> <li>• Total coliforms</li> <li>• Most Probable Number (MPN) test – overview</li> <li>• Presumptive test</li> <li>• Confirmatory test</li> </ul>

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**A: External Examination: Semester End External - 30 marks**

**Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**B: Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

11

**REFERENCES:**

1. Maier, R.M., Pepper, I.L., & Gerba, C.P., *Environmental Microbiology*, 2nd Edition.
2. Kolwzan & Raina, *Environmental Microbiology*, 2nd Edition.
3. R.C. Dubey & D.K. Maheshwari, *A Textbook of Microbiology*, S. Chand, 2003.
4. WHO Guidelines for Drinking Water Quality.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Second Year B. Com.**

**Semester- III**

**Title: Field project**

**Vertical - 6  
Field Project 2 Credits**

**with effect from  
Academic Year 2025-2026**

## Title: Field Project

Course code:

Sr. No.	Heading	Particulars
1	<b>Description the Course:</b>	The Field Project course, introduced under CHM Autonomy in alignment with the NEP 2020, aims to bridge theoretical knowledge with practical experience. It provides students with hands-on exposure to real-world socio-economic contexts through field visits, observation, and analysis in both urban and rural settings. By engaging directly with development-related issues, students enhance their research, problem-solving, and analytical skills while fostering social responsibility and environmental awareness. The course ultimately prepares learners for employability and active participation in nation-building.
2	<b>Vertical 6</b>	Field Project
3	<b>Type &amp; Teaching Methods</b>	Field work
4	<b>Credit</b>	2 Credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>	
	1. To connect theoretical learning with real-world socio-economic contexts through practical field experiences.	
	2. To develop analytical, problem-solving, and teamwork skills in addressing contemporary social issues.	
	3. To cultivate an appreciation for research and its role in promoting societal and national development.	
8	<b>Learning Outcomes:</b> <b>students will be able to:</b>	
	<b>LO1:</b> Apply classroom knowledge to analyze real-life socio-economic challenges effectively.	
	<b>LO2:</b> Demonstrate critical thinking, teamwork, and decision-making skills through field-based activities.	
	<b>LO3:</b> Reflect on the relevance of research and experiential learning in contributing to social and national progress.	

## Guidelines for Field Project

Following are the general guidelines for the conduct of Field Project (Semester III & IV)

### Head of the Department (HOD)/ Field Project Co-ordinator

1. To ensure that FP program aligns with departmental and academic objectives as per NEP Structure within syllabus framework.
2. Appointment of field project incharges from the faculty of the department for group of Students.
3. To conduct orientation of FP Supervisor and decide the time line of the project.
4. To support the student for Filed Project.

### FP Supervisor:

1. To give Guidelines for the field project.
2. To monitor student progress and provide guidance.

### Project (Dissertation) Report:

Students are required to submit a report of the field project at the end of the semester in following suggested format.

The project should be typed on A4 sheets  
 Font Size 12, Times New Roman, 1.5 line Spacing  
 The project report shall have student details with signature of Field Project Incharge and photographs if any and it should be of minimum of 10 pages.

10

### Scheme of Examination and Assessment Pattern



**External Examination: Semester End External - 30 marks**  
**Format of Question Paper**


Nature of Evaluation	Marks
Field Project Report	30
<b>Total 30</b>	

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Involvement in Survey of Field Project /	05
2.	Field visit participation & completion	10
3.	Overall Impression	05
<b>Total 20</b>		

<p>11</p>	<p style="text-align: center;"><b>Appendix I</b></p> <p style="text-align: center;"><b>Attendance of the Student: Active Participation</b></p> <p>I, the undersigned Ms / Mr. _____ Roll No. ___ studying in the _____ Year of _____ Full-time Course is doing my project work under the guidance of Dr./Ms./Mr. _____, I wish to state that I have met my Internal guide on the following dates mentioned below for Project Guidance: -</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sr.No.</th> <th style="text-align: center;">Date</th> <th style="text-align: center;">Signature of the Internal Guide</th> </tr> </thead> <tbody> <tr> <td style="height: 100px;"> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Signature of the Candidate Supervisor</b></p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Signature of Field Project Supervisor</b></p>	Sr.No.	Date	Signature of the Internal Guide			
Sr.No.	Date	Signature of the Internal Guide					
	<p style="text-align: center;"><b>Appendix II</b></p> <p style="text-align: center;"><b>Name of the Department/College/Institute</b></p> <p style="text-align: center;"><b>Certificate</b></p> <p>I hereby certify that Mr./Ms. _____ Student of _____ studying in _____, has completed a project titled _____ in the area of _____ specialization for the academic year 2025-2026 to the best of my knowledge the work of the student is original and the information included in the project is correct.</p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Field Project Supervisor</b></p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><b>Head of the Department/Principal</b></p>						

   
**Board of Examination**

  
**Principal & Chief Controller**  
**Board of Examination**



# **Bachelor of Science (Microbiology) (Aided)**

**Semester– VI**

**Choice Based and Credit Based syllabus as  
per NEP 2020 with effect from the Academic  
Year 2026-2027**

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Concept of Operons and Mechanisms of Gene  
transfer  
Major Course I**

**With effect from  
Academic Year 2026-2027**

# Title: Concept of Operons and Mechanisms of Gene transfer

## Course Code: CHMMICROVI1

Sr. No.	Heading	Particulars
1	Description of the Course	This course introduces third-year Microbiology students to the molecular mechanisms governing gene expression in bacteria. It focuses on the molecular basis of gene regulation through operon systems, examining the structure and function of key components such as the promoter, operator, and structural genes in controlling transcription. The course also explores major mechanisms of bacterial genetic exchange, including conjugation, transformation, and transduction. Furthermore, it evaluates the role of horizontal gene transfer in driving bacterial evolution, enhancing genetic diversity, and enabling environmental adaptation. By the end of the course, students will gain a deeper understanding of microbial genetics and its significance in microbial physiology and biotechnology.
2	Vertical	Major Course I
3	Type Teaching Method	Theory
4	Credit	2 credits
5	Hours allotted	30 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	
	CO(A)1	To explain how bacteria regulate gene expression to survive changing environmental conditions, and how they acquire new genetic information through mechanisms such as horizontal gene transfer to enhance genetic diversity.
	CO(A) 2	To define a bacterial operon and identify its key components, including the promoter, operator, and structural genes.
	CO(A) 3	To develop an understanding of the roles of repressors, activators, and inducers in modulating gene expression, particularly within operon systems.
	CO(A)4	To describe the mechanisms of Horizontal Gene Transfer, which include conjugation, transformation, and transduction.

	<p><b>CO(A) 5</b> To discuss how bacteria incorporate foreign DNA into their genomes and use these techniques for bacterial mapping</p>
<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Understand the genes that make up an operon and explain how each one helps control its regulation</p> <p><b>CO2</b> Evaluate how attenuation and riboswitches control the completion of transcription and translation, and describe the three main ways genes are transferred between organisms</p> <p><b>CO3</b> Understand how operons help bacteria coordinate enzyme production for related metabolic pathways, saving energy and resources, and how this idea is used in gene manipulation experiments</p> <p><b>CO4</b> Able to distinguish between inducible (e.g., lac operon) and repressible (e.g., trp operon) systems.</p> <p><b>CO5</b> To evaluate the contribution of genetic exchange to bacterial evolution, enabling rapid adaptation to new environments or stressors.</p> <p><b>CO6</b> Understand the mechanisms of gene transfer- conjugation, transformation and transduction.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Operon concept</b></p> <ul style="list-style-type: none"> <li>• Lac operon - Lac operon of <i>E.coli</i>.</li> <li>• Experimental Evidence for the Regulation of lac genes.</li> <li>• Jacob and Monad's Operon model.</li> <li>• Regulation of lac operon.</li> <li>• Tryptophan operon in <i>E.coli</i> - Gene organization.</li> <li>• Regulation of trp operon.</li> <li>• Molecular model of attenuation.</li> </ul> <p><b>UNIT II Mechanisms of gene transfer</b></p> <p><b>Transformation</b></p> <ul style="list-style-type: none"> <li>• Introduction and historical background.</li> <li>• Development of Competence and role of different competence genes.</li> <li>• Natural transformation in <i>Bacillus subtilis</i> and <i>Haemophilus influenzae</i>.</li> <li>• Mapping of bacterial genes using transformation.</li> </ul> <p><b>Conjugation</b></p> <ul style="list-style-type: none"> <li>• Discovery of conjugation in bacteria.</li> <li>• Physical structure and Properties of F plasmid.</li> <li>• The conjugation machinery - Transfer of the DNA, Surface exclusion.</li> <li>• Conjugation of F plus and F minus cells.</li> <li>• Formation of HFR, Conjugation of HFR and F minus cells, Formation of F prime cells,</li> </ul>

Conjugation of F prime and F minus cells.

- Mapping of bacterial genes using conjugation - Wolman and Jacob experiment.

**Transduction**

- Introduction and History, Lytic and Lysogenic cycle, Generalized transduction.
- Use of generalized transduction for mapping genes.
- Specialized transduction - HFT and LFT.

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

11

**REFERENCES:**

1. Peter J. Russell (2006), "I Genetics-A molecular approach", 2nd edition.
2. Benjamin A. Pierce (2008), "Genetics a conceptual approach", 3rd edition, W. H. Freeman and company.
3. R. H. Tamarin, (2004), "Principles of genetics", Tata McGraw Hill.
4. Robert Weaver, "Molecular biology", 3rd edition. Mc Graw Hill international edition.
5. Nancy Trun and Janine Trempy, (2004), "Fundamental bacterial genetics", Blackwell Publishing
6. Snustad, Simmons, "Principles of genetics", 3rd edition. John Wiley & sons, Inc.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Applied Immunology  
Major Course II**

**With effect from  
Academic Year 2026-2027**

**Title: Applied Immunology**  
**Course Code: CHMMICROVI2**

Sr. No.	Heading	Particulars
1	<b>Description of the Course</b>	Immunology is a key part of Medical Microbiology. This course is designed for TYBSc Microbiology students and assumes they already have a basic understanding of immunity. It helps students understand, in a clear and logical way, how the humoral and cell-mediated immune systems protect the body from pathogens. The course focuses on immune mechanisms, antigen–antibody interactions, and vaccination. It also explains blood group systems. Overall, the course is relevant to clinical diagnostics, vaccination, immunotherapy, and biomedical research. It is closely connected with microbiology, biochemistry, genetics, and biotechnology, making it highly interdisciplinary.
2	<b>Vertical</b>	Major Course II
3	<b>Type Teaching Method</b>	Theory
4	<b>Credit</b>	2 credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b> <p><b>CO(A) 1</b> To understand the basic concepts of host defense mechanisms and components of the immune system.</p> <p><b>CO(A) 2</b> To apply the knowledge of immune responses to understand immune reactions and their consequences.</p> <p><b>CO(A) 3</b> To describe the principles of antigen–antibody interactions and the significance of blood group antigens and antibodies.</p> <p><b>CO(A) 4</b> To evaluate the role of immunological principles, including vaccination, in disease prevention and practical applications.</p> <p><b>CO(A) 5</b> To identify immune cells and explain their roles in protecting the body against invading pathogens.</p>	

8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Comment on the concept of Humoral Immunity &amp; Cell Mediated Immunity.</p> <p><b>CO2</b> Correlate the Human blood group systems, role of the immune system in disease: Unregulated response resulting in Hypersensitivity, mechanism of Antigen-Antibody interaction.</p> <p><b>CO3</b> Apply the concept of immunity to prevention of disease by development of vaccines.</p> <p><b>CO4</b> Differentiate between Humoral Immunity &amp; Cell Mediated Immunity (effector responses).</p> <p><b>CO5</b> Analyze the significance of Antigen-Antibody interaction in diagnosis.</p> <p><b>CO6</b> Correlate the role of the immune system in disease prevention and treatment, and Design strategies for vaccine development using the concept of immunity.</p>
9	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Immune cells and effector mechanisms</b></p> <p><b>B cells</b></p> <ul style="list-style-type: none"> <li>• Receptors structure &amp; organization.</li> <li>• B cell activation and differentiation.</li> <li>• Thymus dependent and independent antigens.</li> <li>• Role of Th cells in Humoral response, formation of T – B conjugates, CD40 / CD40L interaction.</li> </ul> <p><b>Humoral Response</b></p> <ul style="list-style-type: none"> <li>• Primary and secondary responses.</li> <li>• In vivo sites for induction of Humoral response.</li> <li>• Germinal centers and antigen induced B cell Differentiation.</li> <li>• Cellular events within germinal centers- Overview.</li> <li>• Affinity maturation, somatic hyper-mutation and class switching. Generation of plasma cells and memory cells.</li> </ul> <p><b>T cells</b></p> <ul style="list-style-type: none"> <li>• Receptors, structure (alpha-beta, gamma-delta TcR).</li> <li>• TcR-CD3 complex structure &amp; functions. Accessory molecules.</li> <li>• T cell activation - Costimulatory molecules and superantigen induced T- cell activation</li> <li>• T cell differentiation (memory &amp; effector cell)</li> </ul>

**Cell mediated effector response**

- General properties of effector T cells.
- Cytotoxic T cells and destruction of target cell by perforin/granzyme pathway and Fas pathway.
- Killing mechanism of NK cells.
- Antibody mediated cell cytotoxicity (ADCC).

**UNIT II Diagnostic Immunology****Vaccines**

- Active and Passive Immunization.
- Types of vaccines - Inactivated or Killed Vaccines, Live Attenuated vaccines, Purified macromolecules as vaccines, DNA vaccines, Recombinant viral vector vaccines.
- Use of adjuvants in vaccine.
- Ideal vaccine.
- Route of vaccine administration, Vaccination schedule, Failures in vaccination (examples vaccine failure)

**Immunoematology**

- Human blood group systems: ABO blood group typing, Secretors and Non secretors, Bombay Blood group. Rhesus system and list of other blood group systems.
- Haemolytic disease of newborns.
- Coombs test.

**Antigen-Antibody reactions**

- Precipitation, Agglutination,
- Passive agglutination, Agglutination inhibition,
- Radioimmunoassay (RIA)
- Enzyme immunoassays (EIA)
- Immunofluorescence
- Western blot technique

**10****Scheme of Examination and Assessment Pattern****Paper – 50 Marks****External Examination: Semester End External - 30 marks Time: 1:00 hours****Format of Question Paper****Attempt all questions.**

<b>Question No</b>	<b>Nature of Questions</b>	<b>Marks</b>
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	<b>Assessment / evaluation</b>	<b>Marks</b>
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11****REFERENCES:**

1. Kuby Immunology, 4<sup>th</sup> and 6<sup>th</sup> edition, W H Freeman and Company
2. Introduction to diagnostic microbiology for lab Science Maria Dannessa Delost 2015
3. Prescott's microbiology 10<sup>th</sup> edition 2017
4. Jawetz, Melnick and Adelberg's Medical Microbiology, 26<sup>th</sup> edition, Lange publication
5. Pathak & Palan, Immunology: Essential & Fundamental, 1<sup>st</sup> & 3<sup>rd</sup> edition, Capital Publishing Company
6. Fahim Khan, Elements of Immunology, Pearson Education

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Metabolism and Control of Major Biomolecules**

**Major Course III**

**With effect from  
Academic Year 2026-2027**

# Title: Metabolism and Control of Major Biomolecules

Course Code: CHMMICROVI3

Sr. No.	Heading	Particulars
1	Description of the Course	This course explores the metabolism of carbohydrates, lipids and proteins, offering a deep dive into cellular energy production and utilization. Students will build a solid foundation in bioenergetics and metabolic regulation to understand how complex biochemical pathways are integrated and controlled. This course also provides an understanding of the molecular mechanisms that regulate enzyme activity, including inhibition, allosteric control, feedback regulation, and covalent modification. It also explores global regulatory systems and the regulation of central metabolic pathways such as glycolysis, the TCA cycle, and the pyruvate dehydrogenase complex. Ultimately, this foundational knowledge translates directly into practical applications across medicine, clinical diagnostics, nutrition, biotechnology, and pharmaceutical research.
2	Vertical	Major Course III
3	Type Teaching Method	Theory
4	Credit	2 credits
5	Hours allotted	30 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	
	CO(A)1	Classify major lipids and describe their diverse biological functions.
	CO(A)2	Outline the catabolic and anabolic pathways of lipids, amino acids, and proteins, identifying crucial enzymes and intermediates.
	CO(A)3	Trace the metabolic pathways of amino acids and categorize them as either glucogenic or ketogenic.
	CO(A)4	Calculate the ATP yield and construct an energy balance sheet for the $\beta$ -oxidation of fatty acids.

	<p><b>CO(A) 5</b> Explain the fundamental mechanisms underlying enzyme activity regulation</p> <p><b>CO(A) 6</b> To study global and metabolic regulatory mechanisms in microorganisms</p>
8	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Identify the major classes of lipids and explain their biological functions.</p> <p><b>CO2</b> Outline the primary metabolic pathways of lipids, amino acids, and nucleotides within microorganisms.</p> <p><b>CO3</b> Calculate the energy yield of fatty acid oxidation by applying core bioenergetic principles.</p> <p><b>CO4</b> Analyze the metabolic destinations of amino acids and the interplay between their synthetic (anabolic) and degradative (catabolic) pathways.</p> <p><b>CO5</b> Assess the mechanisms governing enzyme activity and evaluate how transcriptional control regulates overall metabolism.</p> <p><b>CO6</b> Construct a comprehensive energy balance sheet to determine the ATP yield from the beta oxidation of fatty acids.</p> <p><b>CO7</b> Interpret the regulation of cellular metabolism and global regulatory networks</p>
9	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Metabolism of Lipids, Proteins &amp; Amino acids</b></p> <p><b>Introduction to Lipids</b></p> <ul style="list-style-type: none"> <li>• Lipids –Definition, classification &amp; functions</li> <li>• Types and role of fatty acids found in bacteria</li> <li>• Common phosphoglycerides in bacteria</li> </ul> <p><b>Catabolism of Fatty Acids and PHB</b></p> <ul style="list-style-type: none"> <li>• Oxidation of saturated fatty acid by <math>\beta</math> oxidation pathway</li> <li>• Energetics of <math>\beta</math> oxidation of Palmitic acid</li> <li>• Oxidation of propionyl CoA by acrylyl- CoA pathway</li> <li>• PHB as a food reserve and its degradation</li> </ul> <p><b>Anabolism of Fatty Acids &amp; Lipids</b></p> <ul style="list-style-type: none"> <li>• Biosynthesis of straight chain even carbon saturated fatty acid (palmitic acid)</li> <li>• Biosynthesis of PHB</li> </ul> <p><b>Catabolism of protein &amp; amino acids</b></p> <ul style="list-style-type: none"> <li>• Enzymatic degradation of proteins</li> <li>• General reactions of amino acids catalyzed by Amino acid decarboxylases</li> </ul>

Amino acid transaminases

Amino acid racemases

- Metabolic fate of amino acids
- Fermentation of single amino acid -Glutamic acid by *Clostridium tetanomorphum*
- Stickland reaction - Fermentation of a pair of amino acids (Glycine and Alanine)

#### **Anabolism of amino acids**

- Schematic representation of amino acid families

Biosynthesis of amino acids of Serine family (Serine, Glycine and Cysteine)

### **UNIT II Metabolic regulation**

#### **Definition of terms and major modes of regulation**

##### **Regulation of enzyme activity**

- Noncovalent enzyme inhibition
- Allosteric enzymes and feedback inhibition
- Patterns of FBI, combined activation and inhibition
- Covalent modification of enzymes
- Monocyclic cascades
- Examples of covalent modification (without structures)
- Regulation of Glutamine synthetase

##### **Global regulatory mechanisms**

- Global control & catabolite repression
- Stringent response

**Regulation of EMP and TCA cycle** - (Schematic and Regulation of Pyruvate Dehydrogenase Complex)

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

11

**REFERENCES:**

1. Conn, E. E., Stumpf, P. K., Bruening, G., & Doi, R. Y. (1987). *Outlines of Biochemistry* (5th ed.). John Wiley & Sons.
2. Gottschalk, G., (1985), *Bacterial Metabolism*, 2nd edition, Springer Verlag
3. Madigan, M. T., Martinko, J. M., Stahl, D., & Clark, D. P. (2012). *Brock Biology of Microorganisms* (13th Global ed.). Pearson International.
4. Moat, A. G., Foster, J. W., & Spector, M. P. (2002). *Microbial physiology* (4th ed.). Wiley-Liss
5. Nelson, D.L., & Cox, M. M. (2005). *Lehninger: Principles of Biochemistry* (4th ed.). W.H. Freeman & Co.
6. Nelson, D. L., & Cox, M. M. (2008). *Lehninger principles of biochemistry* (5th ed.). W.H. Freeman & Co
7. Stanier, R. Y., M. Doudoroff and E. A. Adelberg. *General Microbiology*, 5th edition, The Macmillan press Ltd
8. Voet, D., & Voet, J. (2016). *Fundamentals of Biochemistry* (5th ed.). Wiley.
9. White, D., (1995), *The Physiology and Biochemistry of Prokaryotes*, 3rd edition
10. Zubay, G., Parson, W. W., & Vance, D. E. (1995). *Principles of Biochemistry*. Wm. C. Brown Publishers

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Essentials of Cell Biology**

**Major Course IV**

**With effect from  
Academic Year 2026-2027**

# **Title: Essentials of Cell Biology**

## **Course Code: CHMMICROVI4**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This course offers an in-depth study of essential cell biology principles, exploring cytoskeletal organization, eukaryotic cell cycle regulation, and cellular membrane structure. Students will examine key components — including microtubules, intermediate filaments, microfilaments, cilia, flagella, and the bacterial cytoskeleton — and their roles in shaping cell function. The course also investigates membrane transport mechanisms such as passive transport, facilitated diffusion, and active transport, emphasizing their role in cellular homeostasis. Additionally, learners will explore the processes of mitosis and meiosis, understanding their significance in cell division and genetic continuity.
<b>2</b>	<b>Vertical</b>	Major Course IV
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	
	<b>CO(A) 1</b>	To develop a fundamental understanding of cell structure and organization in prokaryotic and eukaryotic systems
	<b>CO(A) 2</b>	To understand the molecular basis and regulation of the eukaryotic cell cycle.
	<b>CO(A) 3</b>	To interpret mechanisms of membrane transport and their physiological significance.
	<b>CO(A) 4</b>	To build analytical ability to correlate structure–function relationships in cellular processes.
	<b>CO(A) 5</b>	To strengthen the conceptual foundation for advanced studies in cell biology, molecular biology, and biomedical sciences.

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall the structure and function of different cytoskeletal components</p> <p><b>CO2</b> Discuss the phases and regulatory mechanisms of the eukaryotic cell cycle and analyze checkpoints controlling cell division.</p> <p><b>CO3</b> Illustrate the structural organization of plasma membranes.</p> <p><b>CO4</b> Correlate membrane fluidity and transport mechanisms with physiological and pathological conditions.</p> <p><b>CO5</b> Evaluate the role of different phases of Mitosis and Meiosis as well as Sodium-Potassium ATPases</p> <p><b>CO6</b> Elaborate on the various transport mechanisms in bacteria.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Cytoskeleton and Cell Cycle</b></p> <p><b>Introduction to cytoskeleton</b></p> <ul style="list-style-type: none"> <li>• Overview of the major functions of the cytoskeleton</li> <li>• Microtubules: structure and functions</li> <li>• Composition of microtubules</li> <li>• Microtubule-associated proteins (MAPs)</li> <li>• Microtubules as structural supports, cellular organizers, and mediators of intracellular motility</li> <li>• Intermediate filaments: types, functions, assembly, and disassembly</li> <li>• Microfilaments: structure, functions, assembly, and disassembly</li> </ul> <p><b>Cell cycle</b></p> <ul style="list-style-type: none"> <li>• Overview of the eukaryotic cell cycle</li> <li>• Mitosis and meiosis</li> </ul> <p><b>UNIT II Cellular Membrane and Membrane Transport</b></p> <p><b>Introduction to the plasma membrane</b></p> <ul style="list-style-type: none"> <li>• Chemical composition of the cell membrane</li> <li>• Membrane lipids</li> <li>• Nature and importance of the lipid bilayer</li> <li>• Asymmetry of membrane lipids</li> <li>• Membrane proteins</li> <li>• Integral membrane proteins</li> <li>• Peripheral membrane proteins</li> <li>• Fluid mosaic model of the cell membrane</li> </ul>

**Introduction to membrane transport**

- Diffusion of substances through the membrane and the semipermeable nature of the cell membrane
- Concept of osmosis, hypertonic, hypotonic, isotonic solutions, and aquaporins
- Facilitated diffusion and passive diffusion
- Active transport and electrochemical gradients
- Role of ion gradients in secondary active transport
- Co-transport across the plasma membrane: uniport, antiport, and symport
- ATPases and transport with special reference to Na<sup>+</sup>-K<sup>+</sup> ATPase
- Shock-sensitive transport systems and the role of binding proteins
- Group translocation and the phosphotransferase system (PTS)

**10**

**Scheme of Examination and Assessment Pattern  
Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours  
Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11****REFERENCES:**

1. Karp's Cell Biology, Janet Iwasa and Wallace Marshall, 8<sup>th</sup> Edition, Global Edition, Wiley.
2. Molecular Biology of the Cell, Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter, 4<sup>th</sup> Edition, Garland Science, Taylor & Francis.
3. Cells, Benjamin Lewin, Lynne Cassimeris, Vishwanath R. Lingappa, and George Plopper, Jones and Bartlett Publishers.
4. Cell Biology, Thomas D. Pollard, William C. Earnshaw, and Jennifer Lippincott-Schwartz, 2<sup>nd</sup> Edition, Elsevier.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Basics of Virology**

**Major Course V**

**With effect from  
Academic Year 2026-2027**

# Title: Basics of Virology

## Course Code: CHMMICROVI5

Sr. No.	Heading	Particulars
1	Description of the Course	Learners study different viral cultivation methods and cell culture, alongside enumeration techniques like plaque and hemagglutination assays. The course covers classical viruses like TMV and bacteriophages, and emerging pathogens like SARS-CoV-2, Ebola, Zika, and Dengue. Core microbiological aspects include viral pathogenesis, host–virus interactions, tissue tropism, and diagnostic tools like PCR, RT-PCR, ELISA, and immunofluorescence. By combining theory with laboratory practice, it prepares graduates to meet the growing demand for virology expertise in healthcare and industry. With strong connections to microbiology, immunology, molecular biology, and biotechnology, the program equips graduates to gain skills for careers in research, diagnostics, epidemiology, pharmaceuticals, and public health , meeting the growing demand for virology expertise in tackling global health challenges.
2	Vertical	Major Course V
3	Type Teaching Method	Theory
4	Credit	2 credits
5	Hours allotted	30 Hours
6	Marks allotted	50 Marks
7	Course Objectives:	
	CO(A)1	To understand viral morphology, genome organization, and classification systems
	CO(A) 2	To acquire knowledge of viral cultivation and enumeration through microbiological techniques
	CO(A) 3	To study viral pathogenesis, including entry routes, tissue tropism, and host–virus interactions
	CO(A) 4	To get a basic understanding of modern diagnostic methods—PCR, RT-PCR, ELISA, and immunofluorescence

	<p><b>CO(A) 5</b> To connect virology with medical, agricultural, and industrial microbiology, highlighting its applications.</p>
<p><b>8</b></p>	<p><b>Course Outcomes:</b>  Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall the general properties, genome organization, structure, and classification of viruses.</p> <p><b>CO2</b> Understand viroids and prions as unique infectious agents, and the various techniques used for virus cultivation and enumeration.</p> <p><b>CO3</b> Apply animal inoculation, embryonated egg inoculation, cell culture, plaque assays, and hemagglutination assays for the cultivation and enumeration of viruses.</p> <p><b>CO4</b> Analyze advanced viral diagnostic methods, including PCR, RT-PCR, ELISA, and immunofluorescence, along with their applications in disease detection.</p> <p><b>CO5</b> Assess the structure, medical significance, and prevention of major animal viruses and emerging viral infections such as SARS-CoV-2, Ebola, Zika, and Dengue viruses.</p> <p><b>CO6</b> Explain the mechanisms of viral pathogenesis, diagnosis, prevention, and control of viral diseases.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Structure, Classification and Cultivation of Viruses</b></p> <p><b>General Properties</b></p> <ul style="list-style-type: none"> <li>• General properties of viruses (revision)</li> <li>• Classification of viruses</li> </ul> <p><b>Cultivation and enumeration of viruses</b></p> <ul style="list-style-type: none"> <li>• Cell culture: basic requirements and overview</li> <li>• Animal inoculation and embryonated egg inoculation</li> <li>• Plaque assay</li> <li>• Hemagglutination assay</li> </ul> <p><b>Structure and significance of bacterial, plant viruses, and subviral agents</b></p> <ul style="list-style-type: none"> <li>• T4 bacteriophage</li> <li>• Tobacco Mosaic Virus (TMV)</li> <li>• General introduction to viroids and prions</li> </ul> <p><b>UNIT II Medical Virology</b></p> <p><b>Structure and significance of animal viruses</b></p> <ul style="list-style-type: none"> <li>• Influenza virus: structure and medical symptoms</li> <li>• Human Immunodeficiency Virus (HIV): structure and medical symptoms</li> <li>• Human Papillomavirus (HPV): structure and medical symptoms</li> </ul> <p><b>Emerging viral infections and their medical symptoms</b></p> <ul style="list-style-type: none"> <li>• SARS-CoV-2</li> <li>• Ebola virus</li> <li>• Zika virus</li> <li>• Dengue virus</li> </ul>

**Viral pathogenesis and diagnosis**

- Routes of viral entry and tissue tropism
- Diagnosis of viral infections using PCR, RT-PCR, ELISA, and immunofluorescence techniques

**10**

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11**

**REFERENCES:**

1. Wagner, E., & Hewlett, M. (2005). *Basic Virology* (2nd ed.). Blackwell Publishing.
2. Shors, T. (2009). *Understanding Viruses*. Jones & Bartlett Publishers.
3. Prescott, L. M., Harley, J. P., & Klein, D. A. (2008). *Microbiology* (7th ed.). McGraw Hill International Edition.
4. Madigan, M., Martinko, J., & Parker, J. (2009). *Brock Biology of Microorganisms* (12th ed.). Pearson Education International.
5. Flint, S. J., Enquist, L. W., Racaniello, V. R., Rall, G. F., & Skalka, A. M. (2015). *Principles of Virology* (4th ed., Vols. 1–2). ASM Press.
6. Willey, J. M., Sandman, K. M., & Wood, D. H. (2023). *Prescott's Microbiology* (12th ed.). McGraw Hill.
7. Ennaji, M. M. (Ed.). (2020). *Emerging and Reemerging Viral Pathogens: Volume 1 – Fundamental and Basic Virology Aspects of Human, Animal and Plant Pathogens*. Elsevier.
8. Jerome, K. R. (Ed.). (2010). *Lennette's Laboratory Diagnosis of Viral Infections* (4th ed.). Springer.
9. Carter, J. B., & Saunders, V. (2012). *Virology: Principles and Applications* (2nd ed.). Wiley-Blackwell.
10. Khare, P., & Jain, A. (Eds.). (2022). *Immunopathology, Diagnosis, and Treatment of HPV-Induced Malignancies*. Academic Press.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Bioprocess Technology**

**Major Course VI**

**With effect from  
Academic Year 2026-2027**

**Title: Bioprocess Technology**  
**Course Code: CHMMICROVI6**

Sr. No.	Heading	Particulars
1	<b>Description of the Course</b>	This course provides a comprehensive understanding of upstream and downstream processes involved in industrial fermentation technology. It covers strain improvement techniques, preservation of industrially important microorganisms, inoculum development, sterilization methods, and monitoring and control of critical fermentation parameters. The course further emphasizes recovery and purification of fermentation products through various downstream processing techniques. Learners gain insight into the production of commercially important products such as beer, wine, penicillin, and vitamin B12, along with their process requirements. The course also introduces quality assurance, quality control, Good Manufacturing Practices (GMP), documentation, and regulatory aspects essential for modern bioprocess industries.
2	<b>Vertical</b>	Major Course VI
3	<b>Type Teaching Method</b>	Theory
4	<b>Credit</b>	2 credits
5	<b>Hours allotted</b>	30 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b> <b>CO(A)1</b> To understand the principles and methodologies involved in strain improvement, preservation, and inoculum development of industrially important microorganisms. <b>CO(A)2</b> To explain sterilization strategies and the monitoring and control of critical parameters during fermentation processes. <b>CO(A)3</b> To acquire knowledge of downstream processing techniques used for recovery, purification, and stabilization of fermentation products. <b>CO(A)4</b> To understand the production processes of industrially important fermentation products and their commercial significance. <b>CO(A)5</b> To develop an understanding of quality assurance, quality control, GMP, documentation, and regulatory requirements in bioprocess industries.	

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Explain the principles of strain improvement, microbial preservation, and inoculum development for industrial applications.</p> <p><b>CO2</b> Analyze sterilization methods and process control strategies employed in fermentation technology.</p> <p><b>CO3</b> Evaluate various downstream processing techniques used for recovery and purification of fermentation products.</p> <p><b>CO4</b> Describe the production processes and industrial applications of selected fermentation products such as beer, wine, penicillin, and vitamin B12.</p> <p><b>CO5</b> Apply quality assurance, quality control, GMP, and regulatory concepts to ensure product quality and process compliance in biotechnological industries.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Upstream Processing</b></p> <p><b>Strain improvement of industrially important organisms</b></p> <ul style="list-style-type: none"> <li>• Definition of strain improvement</li> <li>• Need for strain improvement</li> <li>• Methods of strain improvement</li> <li>• Mechanisms controlling biosynthesis in microorganisms: feedback inhibition and feedback repression</li> <li>• Selection of induced mutants synthesizing improved levels of primary metabolites</li> <li>• Mutants with altered permeability</li> <li>• Use of auxotrophs for production of primary metabolites and their isolation</li> <li>• Aspartate family as an example of primary metabolite production</li> <li>• Isolation of analogue-resistant mutants</li> <li>• Isolation of revertant mutants</li> <li>• Isolation of induced mutants producing improved levels of secondary metabolites</li> </ul> <p><b>Preservation of industrially important organisms and Inoculum Development</b></p> <ul style="list-style-type: none"> <li>• Preservation of industrially important organisms</li> <li>• Development of master culture bank (MCB), Quality control of preserved stocks, Variability test to ensure reproducibility of MCB</li> <li>• Development of inoculum for bacterial and fungi( One example of each)</li> </ul> <p><b>Introduction to Sterilization</b></p> <ul style="list-style-type: none"> <li>• Media sterilization (Concept of nabl factor)</li> <li>• Design of batch sterilization -Methods of batch sterilization for media, fermenter.</li> </ul>

- Design of continuous sterilization-
- Heat- Spiral heat exchanger, Steam injection flash cooling
- Filter sterilization of fermentation media, Filter sterilization of air

**Control of variables**

- Types of sensors used in a fermentor
- Sensing & Control of pH, Temperature, Foam, Oxygen

**UNIT II Downstream processing**

**Recovery and purification of fermentation products**

- Choice of recovery process
- Outline of the recovery process for fermentation products
- Filtration: filter aids, batch filters (plate and frame filter), and continuous filters (rotary vacuum filter)
- Centrifugation: basket centrifuge and disc bowl centrifuge
- Cell aggregation and flocculation
- Cell disruption by physical, chemical, and biological methods
- Whole broth processing
- Chromatography
- Solvent recovery
- Drying and crystallization

**Industrial fermentations**

Each fermentation should include strains used for production, biosynthesis, raw materials, inoculum development, production process, recovery, and storage of the final product

- Beer: ale and lager
- Wine: red wine, white wine, and champagne
- Penicillin and semi-synthetic penicillin
- Vitamin B12 production using *Pseudomonas* and *Propionibacterium*

**Quality assurance and quality control**

- Terminologies in quality assurance and quality control
- Good Manufacturing Practices (GMP) for chemical and pharmaceutical production
- Quality control and quality assurance with respect to raw materials, manufacturing methods, in-process items, finished products, labels and labelling, and packaging materials
- Brief overview of documentation and regulations

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each)	15

	based on Unit-1	
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11**

**REFERENCES:**

1. Casida, L. E. (1968). *Industrial Microbiology*. Wiley Eastern Limited.
2. Modi, H. A. (2009). *Fermentation Technology* (Vols. 1 & 2). Pointer Publishers, Jaipur, India.
3. Patel, A. H. (1984). *Industrial Microbiology*. Macmillan India Limited.
4. Peppler, H. J., & Perlman, D. (Eds.). (1979). *Microbial Technology: Fermentation Technology* (2nd ed., Vol. 2). Academic Press.
5. Prescott, S. C., & Dunn, C. G. (1982). *Industrial Microbiology* (4th ed.). Macmillan Publishers.
6. Stanbury, P. F., Whitaker, A., & Hall, S. J. (1995). *Principles of Fermentation Technology* (2nd ed.). Butterworth-Heinemann.
7. Stanbury, P. F., Whitaker, A., & Hall, S. J. (2017). *Principles of Fermentation Technology* (3rd ed.). Butterworth-Heinemann.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Techniques in Analytical Microbiology**

**Major Course VII  
Practical**

**With effect from  
Academic Year 2026-2027**

## Title: Techniques in Analytical Microbiology

**Course Code: CHMMICROVI7**

Sr. No.	Heading	Particulars
1	<b>Description of the Course</b>	This practical course is designed to provide hands-on experience in advanced microbiological, immunological, and bioinformatics techniques. It covers bacteriophage enrichment and quantification, microbiological bioassays, serological testing, sterility evaluation, and microbial mutant isolation. The course introduces the use of bioinformatics resources for nucleotide and protein sequence analysis, phylogenetic studies, restriction mapping, and protein structure visualization. The course strengthens analytical, technical, and data interpretation skills essential for microbiological research.
2	<b>Vertical</b>	Major Course VII
3	<b>Type Teaching Method</b>	Practicals
4	<b>Credit</b>	2 credits
5	<b>Hours allotted</b>	60 Hours
6	<b>Marks allotted</b>	50 Marks
7	<b>Course Objectives:</b>  CO(A)1 To develop practical skills in microbiological, virological, immunological, and molecular biology techniques. CO(A)2 To understand the principles and applications of bacteriophage assays, bioassays, serological tests, and sterility testing. CO(A)3 To gain proficiency in microbial isolation, mutant selection, and quantitative analysis of biological samples. CO(A)4 To utilize bioinformatics databases and computational tools for sequence analysis and protein characterization. CO(A)5 To develop scientific skills for data interpretation, experimental design, and laboratory problem-solving.	

8	<p><b>Course Outcomes:</b> Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Perform bacteriophage enrichment, detection, and quantification using standard microbiological methods.  <b>CO2</b> Conduct microbiological bioassays, serological tests, and sterility assessments accurately.  <b>CO3</b> Apply techniques for isolation and characterization of microbial mutants.  <b>CO4</b> Analyze nucleotide and protein sequences using bioinformatics tools and databases.  <b>CO5</b> Interpret experimental results and utilize computational approaches for biological data analysis and protein structure studies.</p>
9	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>Enrichment and detection of coliphages from sewage sample</b></p> <ul style="list-style-type: none"> <li>• Enrichment of coliphages from sewage samples</li> <li>• Qualitative assay: spot assay</li> <li>• Quantitative assay: determination of phage titre</li> </ul> <p><b>Microbiological bioassay</b></p> <ul style="list-style-type: none"> <li>• Quantitative estimation of antibiotic potency (Penicillin/Ampicillin)</li> <li>• Quantitative estimation of vitamin B12 (Cyanocobalamin) by agar well diffusion method</li> </ul> <p><b>Serological tests</b></p> <ul style="list-style-type: none"> <li>• Qualitative detection of blood group antigens and Rh typing</li> <li>• Detection of incomplete antibodies using the antiglobulin (Direct and Indirect Coombs) test</li> <li>• Determination of isoagglutinin titre</li> <li>• Qualitative Widal test</li> </ul> <p><b>Bioinformatics applications</b></p> <ul style="list-style-type: none"> <li>• Visit to NCBI and EMBL databases</li> <li>• Exploration of resources and databases</li> <li>• Retrieval and analysis of nucleotide and protein sequences using FASTA</li> <li>• BLAST analysis</li> <li>• Multiple sequence alignment</li> <li>• Phylogenetic tree construction</li> <li>• Restriction site analysis</li> <li>• Traditional and AI-based tools for mRNA translation analysis and protein structure prediction</li> <li>• Exploration of the Protein Data Bank (PDB)</li> <li>• Three-dimensional protein structure visualization</li> </ul> <p><b>Sterility testing of injectable preparations</b></p> <ul style="list-style-type: none"> <li>• Evaluation of sterility using appropriate microbiological technique and culture media</li> </ul> <p><b>Visit to a research laboratory/ diagnostic laboratory/ pharmaceutical industry/ CETP plant or related facility</b></p>

<b>10</b>	<b>Scheme of Examination and Assessment Pattern Paper – 50 Marks</b>	
1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 3 hours each day (2days)
3	*Pattern of the end-of-semester practical examination  (25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)	
<b>11</b>	<b>REFERENCES :</b> <ol style="list-style-type: none"> <li>1. Cappuccino, J. G., &amp; Welsh, C. T. (2020). Microbiology: A Laboratory Manual (12th ed.). Pearson Education.</li> <li>2. Tille, P. M. (2021). Bailey &amp; Scott's Diagnostic Microbiology (15th ed.). Elsevier.</li> <li>3. Miller, J. H. (1992). A Short Course in Bacterial Genetics: A Laboratory Manual and Handbook for Escherichia coli and Related Bacteria. Cold Spring Harbor Laboratory Press.</li> <li>4. Lesk, A. M. (2023). Introduction to Bioinformatics (6th ed.). Oxford University Press.</li> <li>5. Mount, D. W. (2021). Bioinformatics: Sequence and Genome Analysis (2nd ed.). Cold Spring Harbor Laboratory Press.</li> </ol>	

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Concepts in Food Microbiology  
Elective -1 (Subject-specific)**

**With effect from  
Academic Year 2026-2027**

# **Title: Concepts in Food Microbiology**

**Course Code: CHMMICRO8**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This course provides a broad understanding of the role of microorganisms in food, their beneficial and harmful effects, and the principles of food quality and safety. It covers the factors influencing microbial growth in foods, food spoilage, foodborne diseases, and the applications of beneficial microorganisms, including probiotics. The course introduces conventional and rapid methods for microbiological examination of foods and discusses various food preservation techniques used to enhance shelf life and safety. Emphasis is placed on food safety systems such as GMP and HACCP, food control regulations, and emerging technologies, including artificial intelligence-based smart packaging systems for monitoring food quality, safety, and traceability in modern food industries.
<b>2</b>	<b>Vertical</b>	Elective 1
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>	
	<b>CO(A) 1</b> To provide knowledge of the diversity and significance of microorganisms associated with foods.	
	<b>CO(A) 2</b> To understand the causes of food spoilage and foodborne diseases and their impact on public health.	
	<b>CO(A) 3</b> To explain the principles and applications of microbiological methods used in food analysis.	
	<b>CO(A) 4</b> To familiarize learners with food preservation techniques and modern technologies used to ensure food quality and safety.	
	<b>CO(A) 5</b> To develop an understanding of food safety systems, regulatory frameworks, and emerging trends in food control.	

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Describe the role of microorganisms in food, including beneficial, spoilage, and pathogenic microorganisms.</p> <p><b>CO2</b> Analyze factors affecting microbial growth and their influence on food quality and shelf life.</p> <p><b>CO3</b> Apply appropriate microbiological methods for the examination and assessment of food products.</p> <p><b>CO4</b> Evaluate food preservation techniques and their effectiveness in maintaining food safety and quality.</p> <p><b>CO5</b> Explain the principles of GMP, HACCP, food regulations, and emerging technologies used in food safety management.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Microorganisms in Food</b></p> <p><b>Introduction to Food Microbiology and scope</b></p> <p><b>Food as a substrate</b></p> <ul style="list-style-type: none"> <li>• Intrinsic factors affecting microbial growth in foods</li> <li>• Extrinsic factors affecting microbial growth in foods</li> </ul> <p><b>Microorganisms in food</b></p> <ul style="list-style-type: none"> <li>• Bacteria associated with foods</li> <li>• Yeasts and molds associated with foods</li> </ul> <p><b>Food spoilage</b></p> <ul style="list-style-type: none"> <li>• Spoilage of fruits and vegetables</li> <li>• Spoilage of meat and fish</li> </ul> <p><b>Bacterial food poisoning</b></p> <ul style="list-style-type: none"> <li>• Food intoxication caused by <i>Staphylococcus aureus</i></li> <li>• Food infection caused by <i>Salmonella</i> species</li> </ul> <p><b>Beneficial microorganisms in food</b></p> <ul style="list-style-type: none"> <li>• Introduction to beneficial microorganisms in foods</li> <li>• Beneficial microorganisms in food preservation</li> <li>• Production of organic acids, enzymes, and vitamins by microorganisms</li> <li>• Probiotics and their health benefits</li> </ul> <p><b>UNIT II Food analysis, preservation and control</b></p> <p><b>Methods of microbial examination of foods</b></p>

- Homogenization of food samples
- Methods for microbial examination of foods- Standard Plate Count (SPC), Spiral plating method, Membrane filtration method
- Surface examination methods: swab rinse method and contact plate method
- Applications of rapid and specialized methods
- Impedance method, Microcalorimetry, Thermostable nuclease test, Limulus Amebocyte Lysate (LAL) test, Polymerase Chain Reaction (PCR), Whole animal assay, Ligated loop technique

**Overview of food preservation methods**

- Low-temperature preservation methods
- High-temperature preservation methods
- Drying methods
- Chemical methods of preservation
- Food irradiation
- Latest methods of food preservation (tabulation)
- Utilization of Artificial Intelligence in smart packaging systems for food quality control and safety

**Food safety**

- Safe process design
- Good Manufacturing Practices (GMP)
- Hazard Analysis and Critical Control Point (HACCP)

**Food control agencies**

- National food control agencies and legislation
- International food control agencies and legislation

**10**

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

<b>Question No</b>	<b>Nature of Questions</b>	<b>Marks</b>
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

**11****REFERENCES:**

1. Adams, M. R., Moss, M. O., & McClure, P. J. (2016). *Food Microbiology* (5th ed.). Royal Society of Chemistry, Cambridge, UK.
2. Frazier, W. C., & Westhoff, D. C. (2008). *Food Microbiology* (4th ed.). Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Vijaya Ramesh, K. (2007). *Food Microbiology*. MJP Publishers, Chennai, India.
4. Manay, N. S., & Shadaksharaswamy, M. (2008). *Foods: Facts and Principles* (3rd ed.). New Age International Publishers, New Delhi.
5. Jay, J. M., Loessner, M. J., & Golden, D. A. (2005). *Modern Food Microbiology* (7th ed.). Springer Science & Business Media.
6. Ray, B., & Bhunia, A. (2014). *Fundamental Food Microbiology* (5th ed.). CRC Press.
7. Madhu, B.. 2025. "AI-Driven Food Packaging Systems: A New Frontier in Intelligent Food Safety and Shelf-Life Management." *Journal of Food Science*90, no. 12: e70716. <https://doi.org/10.1111/1750-3841.70716>

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Practicals in Concepts in Food Microbiology  
Elective -1 (Subject specific)**

**With effect from  
Academic Year 2026-2027**

# Title: Practicals in Concepts in Food Microbiology

## Course Code: CHMMICROVI9

Sr. No.	Heading	Particulars
1	Description of the Course	This practical course introduces students to fundamental techniques in food microbiology, food safety, and food quality assessment. The course covers the isolation and identification of food-borne pathogens, detection of food adulterants, enumeration of probiotic microorganisms, and assessment of microbial contamination in foods and food-handling environments. Students gain hands-on experience in food preservation through jam preparation and in evaluating the antimicrobial properties of spices. The course also provides exposure to yeast isolation from food samples and mushroom cultivation.
2	Vertical	Elective
3	Type Teaching Method	Practical
4	Credit	2 credits
5	Hours allotted	60 Hours
6	Marks allotted	50 Marks
7	<b>Course Objectives:</b> CO(A)1 To develop practical skills in the isolation, identification, and enumeration of microorganisms associated with foods. CO(A)2 To perform microbiological analyses for assessing food quality and contamination. CO(A)3 To evaluate the antimicrobial potential of natural food ingredients and preservation techniques. CO(A)4 To gain knowledge of food adulteration detection and probiotic microorganisms in food products. CO(A)5 To familiarize learners with the process of cultivation of Mushroom	
8	<b>Course Outcomes:</b> Upon completion of the course, student will be able to: CO1 Isolate and identify selected food-borne pathogens and food-associated microorganisms. CO2 Assess microbial contamination in food samples, food handlers, and food preparation surfaces. CO3 Apply microbiological methods for evaluating food quality, safety, and probiotic content.	

	<p><b>CO4</b> Perform tests for detection of common food adulterants and study natural antimicrobial agents.</p> <p><b>CO5</b> Demonstrate practical skills in food preservation, fermentation-related techniques, and basic mushroom cultivation.</p>	
<b>9</b>	<b>Syllabus</b>	
	<ul style="list-style-type: none"> <li>• Isolation and identification of food-borne pathogens (<i>Staphylococcus aureus</i> and <i>Salmonella</i> spp.)</li> <li>• Preparation of jam and its preservation</li> <li>• Isolation of yeasts from food samples (fruits and fruit juices)</li> <li>• Study of antimicrobial properties of spices by agar diffusion method</li> <li>• Determination of microbial load in street-vended foods</li> <li>• Detection of adulteration in food samples (milk, oils, and spices)</li> <li>• Rapid assessment of microbial contamination on food handlers' hands using chromogenic medium.</li> <li>• Enumeration of probiotic microorganisms in fermented dairy products</li> <li>• Mushroom cultivation (demonstration)</li> </ul>	
<b>10</b>	<b>Scheme of Examination and Assessment Pattern</b> <b>Paper – 50 Marks</b>	
	1	<p>Internal Continuous Assessment: 40%</p> <p style="text-align: right;">External, Semester End Examination 60% Individual Passing in Internal and External Examination</p>
	2	<p>Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )</p> <p style="text-align: right;">As per pattern given below* 3 hours each day (2days)</p>
	3	<p style="text-align: center;">*Pattern of the end-of-semester practical examination</p> <p style="text-align: center;">(25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)</p>

**REFERENCES:**

1. Harrigan, W. F. (1998). *Laboratory Methods in Food Microbiology* (3rd ed.). Academic Press.
2. APHA. (2015). *Compendium of Methods for the Microbiological Examination of Foods* (5th ed.). American Public Health Association, Washington, D.C.
3. U.S. Food and Drug Administration (FDA). *Bacteriological Analytical Manual (BAM)*. U.S. Food and Drug Administration, USA.
4. Aneja, K. R. (2018). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Microbial Biotechnology* (5th ed.). New Age International Publishers, New Delhi.
5. Cappuccino, J. G., & Welsh, C. T. (2020). *Microbiology: A Laboratory Manual* (12th ed.). Pearson Education.
6. Adams, M. R., Moss, M. O., & McClure, P. J. (2016). *Food Microbiology* (5th ed.). Royal Society of Chemistry, Cambridge, UK.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Introduction to Clinical and Diagnostic Methods  
Elective -2 (Subject specific)**

**With effect from  
Academic Year 2026-2027**

# **Title: Introduction to Clinical and Diagnostic Methods**

**Course Code: CHMMICROVI10**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Description of the Course</b>	This course introduces learners to hematology and routine tests used in a diagnostic laboratory in the first module. It describes hematological diseases and its types. Specimen collection and treatment of glassware for hematological studies has also been included. The second module comprises serological laboratory procedures including tests for syphilis, rheumatoid arthritis, Streptococcal infections, pregnancy and advanced techniques eg.RIA and ELISA.
<b>2</b>	<b>Vertical</b>	Elective Subject Specific
<b>3</b>	<b>Type Teaching Method</b>	Theory
<b>4</b>	<b>Credit</b>	2 credits
<b>5</b>	<b>Hours allotted</b>	30 Hours
<b>6</b>	<b>Marks allotted</b>	50 Marks
<b>7</b>	<b>Course Objectives:</b>  <b>CO(A)1</b> To introduce learners to hematology, and routine laboratory and serological procedures.  <b>CO(A)2</b> To develop essential skills in specimen collection for hematological studies as well as serological tests.  <b>CO(A)3</b> To impart knowledge in basic medical laboratory technology.  <b>CO(A)4</b> To explain principles of immunological reactions and sero diagnosis.  <b>CO(A)5</b> To train learners in treatment of glassware to be used in hematology and serology  <b>CO(A)6</b> To apprise learners to interpret immunological reactions and diagnose medical disorders	

<p><b>8</b></p>	<p><b>Course Outcomes:</b></p> <p>Upon completion of the course, student will be able to:</p> <p><b>CO1</b> Recall components of blood, hematopoietic systems of the body, hematological diseases, various types of anemia and agglutination tests.</p> <p><b>CO2</b> Explain principles of specimen collection for hematological studies and serodiagnostic tests.</p> <p><b>CO3</b> Apply principles of hematology and serological tests to diagnose diseases.</p> <p><b>CO4</b> Analyze various types of hematological abnormalities and immunological reactions</p> <p><b>CO5</b> Critically evaluate blood components and results of serological tests of patients.</p> <p><b>CO6</b> Develop serological test kits based on principles of immunological reactions studied.</p>
<p><b>9</b></p>	<p style="text-align: center;"><b>Syllabus</b></p> <p><b>UNIT I Introduction to Routine Laboratory techniques</b></p> <p>Human Healthcare and Safety Regulations</p> <ul style="list-style-type: none"> <li>• Basic causes of accident</li> <li>• Common types of laboratory accidents.</li> <li>• First aid in laboratory</li> <li>• Importance of Biomedical Waste. NABL and SOP</li> <li>• Functional components of clinical laboratories</li> </ul> <p><b>Introduction to Haematology and Routine tests</b></p> <ul style="list-style-type: none"> <li>• Components of blood and their functions</li> <li>• Haematopoietic systems of the body</li> </ul> <p><b>Haematological Diseases - Anaemia and its various types</b></p> <ul style="list-style-type: none"> <li>• Thalassemias</li> <li>• Polycythemia</li> <li>• Leukemia</li> <li>• Hemolytic disease of new born</li> <li>• Multiple myeloma</li> </ul> <p><b>UNIT II Serology: Introduction &amp; Serological Laboratory Procedures</b></p> <ul style="list-style-type: none"> <li>• Antigens, antibodies, structure and classes of antibodies,</li> <li>• Monoclonal antibodies and its uses.</li> <li>• Antigen-Antibody Interactions : Precipitation reaction</li> <li>• Immunodiffusion test, counter current Immuno electrophoresis, complement fixation tests, Widal test, VDRL test, Weil Felix reaction, Western Blotting.</li> <li>• Overview on rapid detection methods for detection of pathogens.</li> </ul> <p><b>Agglutination tests</b></p> <ul style="list-style-type: none"> <li>• C-reactive protein test (CRP)</li> <li>• Rheumatoid arthritis test (RA)</li> </ul>

- Serodiagnosis of streptococcal infection
- Serological test for syphilis (STS)

10

**Scheme of Examination and Assessment Pattern**

**Paper – 50 Marks**

**External Examination: Semester End External - 30 marks Time: 1:00 hours**

**Format of Question Paper**

**Attempt all questions.**

Question No	Nature of Questions	Marks
Q1	Attempt any three questions out of six (5 marks each) based on Unit-1	15
Q2	Attempt any three questions out of six (5 marks each) based on Unit-2	15
		<b>Total 30</b>

**Note:** Equal Weightage is to be given to all the Units.

**Internal Examination: Continuous Evaluation - 20 marks**

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles/Assignment)	10
2.	Overall conduct as a responsible student, attentiveness and attendance	10
		<b>Total 20</b>

11

**REFERENCES:**

1. Estridge, B. H., Reynolds, A. P., & Walters, N. J. (2019). *Basic Medical Laboratory Techniques* (7th ed.). Cengage Learning.
2. Fischbach, F. T., & Dunning, M. B. (2021). *A Manual of Laboratory and Diagnostic Tests* (11th ed.). Wolters Kluwer.
3. Godkar, P. B., & Godkar, D. P. (2020). *Textbook of Medical Laboratory Technology* (3rd ed.). Bhalani Publishing House.
4. Mukherjee, K. L. (2019). *Medical Laboratory Technology* (Vols. 1, 2 & 3). Tata McGraw-Hill Education.
5. Powar, C. B. (2012). *Essentials of Cytology* (3rd ed.). Himalaya Publishing House.
6. Talib, V. H. (2007). *Handbook of Medical Laboratory Technology* (2nd ed.). CBS Publishers & Distributors.
7. Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (1996). *Mackie and McCartney Practical Medical Microbiology* (14th ed., Vols. 1 & 2). Churchill Livingstone.
8. Ludlam, C. A., Keeling, D. M., & Mehta, A. B. (2006). *Concise Haematology* (formerly *Clinical Haematology*) (1st ed.). Elsevier.

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 1**

**Title: Techniques in Clinical and Diagnostic Methods  
Elective -2 (Subject specific)**

**With effect from  
Academic Year 2026-2027**

# Title: Techniques in Clinical and Diagnostic Methods

Course Code: CHMMICROVI11

No.	Heading	Particulars
1	Description of the Course	This practical course introduces students to clinical and diagnostic laboratory techniques, including blood specimen collection, serum and plasma separation, microscopic study of cells, biochemical analysis of blood constituents, blood grouping, hematological investigations, and serological tests. It develops essential skills in laboratory procedures, disease diagnosis, data interpretation, and quality laboratory practices.
2	Vertical	Elective Subject Specific
3	Type Teaching Method	Practical
4	Credit	2 credits
5	Hours allotted	60 Hours
6	Marks allotted	50 Marks
7	<b>Course Objectives:</b>  CO(A)1 To introduce learners to routine blood tests and blood grouping.  CO(A)2 To estimate blood uric acid, cholesterol and sugar level  CO(A)3 To explain differential WBC count in blood.  CO(A)4 To perform qualitative and quantitative Widal tests to diagnose Salmonella infections.  CO(A)5 To determine PCV, ESR, RBC count and platelet count	
8	<b>Course Outcomes:</b>  Upon completion of the course, student will be able to:  CO1 Recall the structure of nucleus of different types of WBC in Differential staining of blood smear, as well as the normal percentage of each cell type in blood.  CO2 Understand the principles of methods used in determination of uric acid, cholesterol, glucose, SGPT and SGOT in blood / serum/ plasma.  CO3 Use the normal values of various blood components in order to diagnose various diseases  CO4 Differentiate between the different cell types in blood smear	

**CO5** Estimate the concentration of uric acid, cholesterol, SGPT and SGOT used in diagnoses of various health conditions.

**CO6** Prepare for routine tests to be performed and diagnose medical problems by applying a battery of blood and serum tests.

9

### Syllabus

#### Specimen Collection

- Specimen collection for hematological and serological studies
- Cleaning and Sanitisation of Laboratory glassware in testing laboratories
- To separate the plasma and serum from given blood sample

#### Study of cells

- Study of Epithelial, Muscle, Nerve and mammalian blood cells through permanent or temporary cells

#### Study of Essential substances in the blood /serum

- Estimation of blood sugar level of plasma (or serum) GOD-POD method
- Determination of serum alkaline phosphatase
- Determination of serum glutamate pyruvate transaminase (SGPT) and serum glutamate Oxaloacetate transaminase (SGOT)
- Estimation of Uric Acid in blood plasma

#### Blood grouping and blood counts

- Qualitative test for ABO grouping with antisera by slide method
- Qualitative test for Determination of D(Rho) antigen on human red blood cells by slide method
- Determination of total erythrocyte (RBC) count
- Determination of leukocyte (WBC) count
- Determination of erythrocyte sedimentation rate (ESR)

#### Serological tests

- Diagnosis of Salmonella infections by Widal test (Qualitative)
- Diagnosis of Salmonella infections by Widal test (Quantitative)
- Test for Rheumatoid arthritis test (RA)

10

### Scheme of Examination and Assessment Pattern Paper – 50 Marks

1	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination
2	Continuous Evaluation through: experiment /Viva/ Assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks (Any two from the above list )	As per pattern given below* 3 hours each day (2days)

	3	<p>*Pattern of the end-of-semester practical examination</p> <p>(25 marks ONE Major experiment OR TWO Minor experiments(15 Marks and 10 Marks) + 5 Marks for Journal = 30 Marks)</p>
11	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>1. Estridge, B. H., Reynolds, A. P., &amp; Walters, N. J. (2019). <i>Basic Medical Laboratory Techniques</i> (7th ed.). Cengage Learning.</li> <li>2. Mukherjee, K. L. (2019). <i>Medical Laboratory Technology</i> (Vols. 1, 2 &amp; 3). Tata McGraw-Hill Education.</li> <li>3. Collee, J. G., Fraser, A. G., Marmion, B. P., &amp; Simmons, A. (1996). <i>Mackie and McCartney Practical Medical Microbiology</i> (14th ed., Vols. 1 &amp; 2). Churchill Livingstone.</li> <li>4. Godkar, P. B., &amp; Godkar, D. P. (2020). <i>Textbook of Medical Laboratory Technology</i> (3rd ed.). Bhalani Publishing House.</li> <li>5. Fischbach, F. T. (2000). <i>A Manual of Laboratory and Diagnostic Tests</i> (6th ed.). Lippincott Williams &amp; Wilkins.</li> </ol>	

**Smt. Chandibai Himathmal Mansukhani College  
(Autonomous)**

**Third Year B.Sc.  
(Microbiology)**

**Semester- VI  
Vertical – 6**

**Title: ON JOB TRAINING**

**Course Code: CHMMICROVI12**

**With effect from  
Academic Year 2026-2027**

Website – mu.ac.in  
Email id - dr.aams@fort.mu.ac.in  
aams3@mu.ac.in



Academic Authorities,  
Meetings & Services (AAMS)  
Room No. 128, M. G. Road, Fort,  
Mumbai – 400 032.  
Tel. 022-68320033

Re- accredited with A ++ Grade (CGPA 3.65) by NAAC  
Category- I University Status awarded by UGC

No. 2026/MAY/AAMS/C-127/46536

Date: 28<sup>th</sup> May, 2026

## CIRCULAR:-

All the Principals of the Affiliated Colleges, all Academic Heads of University Departments, the Directors of the Recognized Institutions/Centers, Director, Centre for Distance & Online Education, Director, Dharmaveer Anand Dighe Thane Sub-Campus, Co-ordinator, School of Engineering and Applied Sciences, Kalyan Sub-Campus, Director, Chitrakar Padmabhusan Dr. Dhananjay Keer Ratnagiri Sub-Campus, Director, Sindhudurg Sub-Campus, Principal, Vishwabhusan Bharatratna Dr. B. A. Ambedkar College, Ambadave, Ratnagiri and Principal, V.V. Dalvie College, Talere, Sindhudurg are hereby informed that the recommendations made by the Committee under the Convenorship of Director, Career Training and Placement Cell at its meeting held on 16<sup>th</sup> March, 2026 and subsequently passed by the Board of Deans at its meeting held on 17<sup>th</sup> March, 2026 vide item No. 10.1 have been accepted by the Academic Council at its meeting held on 25<sup>th</sup> March, 2026 vide item No. 10.1. In accordance therewith **Guidelines for the On-Job-Training (OJT) (Vertical 6) as per NEP 2020 for U.G. Programme** is introduced as per appendix with effect from the academic year 2026-27.

(The said circular is available on the University's website [www.mu.ac.in](http://www.mu.ac.in)).

MUMBAI – 400 032  
28<sup>th</sup> May, 2026

(Dr. Prasad Karande)  
REGISTRAR

To,

All the Principals of the Affiliated Colleges, all Academic Heads of University Departments, the Directors of the Recognized Institutions/Centers, Director, Centre for Distance & Online Education, Director, Dharmaveer Anand Dighe Thane Sub-Campus, Co-ordinator, School of Engineering and Applied Sciences, Kalyan Sub-Campus, Director, Chitrakar Padmabhusan Dr. Dhananjay Keer Ratnagiri Sub-Campus, Director, Director, Sindhudurg Sub-Campus, Principal, Vishwabhusan Bharatratna Dr. B. A. Ambedkar College, Ambadave, Ratnagiri and Principal, V.V. Dalvie College, Talere, Sindhudurg.

## A.C/10.1/25/03/2026

Copy forwarded with Compliments for information to:-

- 1) The Chairman, Board of Deans,
- 2) The Deans, All Faculties,
- 3) The Chairman, Board of Studies,
- 4) The Director, Board of Examinations and Evaluation,
- 5) The Director, Department of Students Development,
- 6) The Director, Department of Information & Communication Technology,
- 7) The Director, Centre for Distance and Online Education (CDOE), Vidyanagari,
- 8) The Deputy Registrar, Admissions, Enrolment, Eligibility & Migration Department (AEM)

<b>Copy forwarded for information and necessary action to :-</b>	
1	The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Dept)(AEM), <a href="mailto:dr@eligi.mu.ac.in">dr@eligi.mu.ac.in</a>
2	The Deputy Registrar, Result unit, Vidyanagari <a href="mailto:drresults@exam.mu.ac.in">drresults@exam.mu.ac.in</a>
3	The Deputy Registrar, Marks and Certificate Unit,. Vidyanagari <a href="mailto:dr.verification@mu.ac.in">dr.verification@mu.ac.in</a>
4	The Deputy Registrar, Appointment Unit, Vidyanagari <a href="mailto:dr.appointment@exam.mu.ac.in">dr.appointment@exam.mu.ac.in</a>
5	The Deputy Registrar, CAP Unit, Vidyanagari <a href="mailto:cap.exam@mu.ac.in">cap.exam@mu.ac.in</a>
6	The Deputy Registrar, College Affiliations & Development Department (CAD), <a href="mailto:deputyregistrar.uni@gmail.com">deputyregistrar.uni@gmail.com</a>
7	The Deputy Registrar, PRO, Fort, (Publication Section), <a href="mailto:Pro@mu.ac.in">Pro@mu.ac.in</a>
8	The Deputy Registrar, Executive Authorities Section (EA) <a href="mailto:eau120@fort.mu.ac.in">eau120@fort.mu.ac.in</a> He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
9	The Deputy Registrar, Research Administration & Promotion Cell (RAPC), <a href="mailto:rapc@mu.ac.in">rapc@mu.ac.in</a>
10	The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA) dy.registrar.tau.fort.mu.ac.in <a href="mailto:ar.tau@fort.mu.ac.in">ar.tau@fort.mu.ac.in</a>
11	The Deputy Registrar, College Teachers Approval Unit (CTA), <a href="mailto:concolsection@gmail.com">concolsection@gmail.com</a>
12	The Deputy Registrars, Finance & Accounts Section, fort <a href="mailto:draccounts@fort.mu.ac.in">draccounts@fort.mu.ac.in</a>
13	The Deputy Registrar, Election Section, Fort <a href="mailto:drelection@election.mu.ac.in">drelection@election.mu.ac.in</a>
14	The Assistant Registrar, Administrative Sub-Campus Thane, <a href="mailto:thanesubcampus@mu.ac.in">thanesubcampus@mu.ac.in</a>
15	The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan, <a href="mailto:ar.seask@mu.ac.in">ar.seask@mu.ac.in</a>
16	The Assistant Registrar, Ratnagiri Sub-centre, Ratnagiri, <a href="mailto:ratnagirisubcentar@gmail.com">ratnagirisubcentar@gmail.com</a>
17	The Director, Centre for Distance and Online Education (CDOE), Vidyanagari, <a href="mailto:director@idol.mu.ac.in">director@idol.mu.ac.in</a>
18	Director, Innovation, Incubation and Linkages, Dr. Sachin Laddha <a href="mailto:pinkumanno@gmail.com">pinkumanno@gmail.com</a>
19	Director, Department of Lifelong Learning and Extension (DLLE), <a href="mailto:dlleuniversityofmumbai@gmail.com">dlleuniversityofmumbai@gmail.com</a>

<b>Copy for information :-</b>	
1	P.A to Hon'ble Vice-Chancellor, <a href="mailto:vice-chancellor@mu.ac.in">vice-chancellor@mu.ac.in</a>
2	P.A to Pro-Vice-Chancellor <a href="mailto:pvc@fort.mu.ac.in">pvc@fort.mu.ac.in</a>
3	P.A to Registrar, <a href="mailto:registrar@fort.mu.ac.in">registrar@fort.mu.ac.in</a>
4	P.A to all Deans of all Faculties
5	P.A to Finance & Account Officers, (F & A.O), <a href="mailto:camu@accounts.mu.ac.in">camu@accounts.mu.ac.in</a>

**To,**

1	The Chairman, Board of Deans <a href="mailto:pvc@fort.mu.ac.in">pvc@fort.mu.ac.in</a>
2	<p><b>Faculty of Humanities,</b></p> <p><b>Offg. Dean</b></p> <p>1. Prof.Anil Singh <a href="mailto:Dranilsingh129@gmail.com">Dranilsingh129@gmail.com</a></p> <p><b>Offg. Associate Dean</b></p> <p>2. Prof.Manisha Karne <a href="mailto:mkarne@economics.mu.ac.in">mkarne@economics.mu.ac.in</a></p> <p>3. Dr.Suchitra Naik <a href="mailto:Naiksuchitra27@gmail.com">Naiksuchitra27@gmail.com</a></p> <p><b>Faculty of Commerce &amp; Management,</b></p> <p><b>Offg. Dean,</b></p> <p>1 Prin.Ravindra Bambardekar <a href="mailto:principal@model-college.edu.in">principal@model-college.edu.in</a></p> <p><b>Offg. Associate Dean</b></p> <p>2. Dr.Kavita Laghate <a href="mailto:kavitalaghate@jbims.mu.ac.in">kavitalaghate@jbims.mu.ac.in</a></p> <p>3. Prin.Kishori Bhagat <a href="mailto:kishoribhagat@rediffmail.com">kishoribhagat@rediffmail.com</a></p>

	<p><b>Faculty of Science &amp; Technology</b></p> <p><b>Offg. Dean</b>  1. Prof. Shivram Garje  <a href="mailto:ssgarje@chem.mu.ac.in">ssgarje@chem.mu.ac.in</a></p> <p><b>Offg. Associate Dean</b>  2. Dr. Madhav R. Rajwade  <a href="mailto:Madhavr64@gmail.com">Madhavr64@gmail.com</a>  3. Prin. Deven Shah  <a href="mailto:sir.deven@gmail.com">sir.deven@gmail.com</a></p>
	<p><b>Faculty of Inter-Disciplinary Studies,</b></p> <p><b>Offg. Dean</b>  1. Dr. Anil K. Singh  <a href="mailto:aksingh@trcl.org.in">aksingh@trcl.org.in</a></p> <p><b>Offg. Associate Dean</b>  2. Prin. Chadrashekhhar Ashok Chakradeo  <a href="mailto:cachakradeo@gmail.com">cachakradeo@gmail.com</a>  3. Dr. Kunal Ingle  <a href="mailto:drkunalingle@gmail.com">drkunalingle@gmail.com</a></p>
3	Chairman, Board of Studies,
4	The Director, Board of Examinations and Evaluation, <a href="mailto:dboee@exam.mu.ac.in">dboee@exam.mu.ac.in</a>
5	The Director, Board of Students Development, <a href="mailto:dsd@mu.ac.in">dsd@mu.ac.in</a> <b>DSW</b> <a href="mailto:direcotr@dsw.mu.ac.in">direcotr@dsw.mu.ac.in</a>
6	The Director, Department of Information & Communication Technology, <a href="mailto:director.dict@mu.ac.in">director.dict@mu.ac.in</a>

**AC – 25/03/2026**  
**Item No. – 10.1**

**As Per NEP 2020**

# **University of Mumbai**



**Guidelines for On-Job Training (OJT)**  
**(For Undergraduate Programmes under NEP 2020)**

**With effect from 2026-27**

## Index

1. Introduction
2. Objectives
3. Outcomes
4. Types of OJTs
5. Indicative list of areas for OJT
6. Credit Structure
7. Institutional Structure
8. Roles and Responsibilities
9. Assessment and Evaluation
10. OJT Report
11. Documentation
12. Student Welfare and Workplace Safety
13. General Guidelines
14. Appendix I: Student Undertaking for OJT
15. Appendix II: Outreach Letter to Organisation
16. Appendix III: Resume Template
17. Appendix IV: Relieving Letter
18. Appendix V: Student Attendance Sheet
19. Appendix VI: Student Feedback on OJT
20. Appendix VII: Supervisor Evaluation of Intern
21. Appendix VIII: Consolidated Mark sheet for On-Job Training
22. Appendix IX: Proforma for OJT Completion Certificate
23. Appendix X: Format for OJT Report
24. OJT Guidelines Draft Committee

# Guidelines for On-Job Training (OJT)

## 1. Introduction

Experiential learning through **On-Job Training (OJT)** is an essential component of higher education under the **National Education Policy (NEP) 2020** and the **UGC National Credit Framework**. OJT programmes enable learners to engage with real-world professional environments and apply theoretical knowledge in practical settings.

In accordance with the Government Resolutions issued by the **Higher and Technical Education Department, Government of Maharashtra**, higher education institutions are required to facilitate structured OJT opportunities for students through collaboration with industries, businesses, research institutions, governmental organisations, and civil society bodies.

It is with this backdrop that the University of Mumbai has crafted its OJT policy in light of the NEP 2020 framework as well as the guidelines provided by the Higher and Technical Education Department, Government of Maharashtra (2024) and UGC Guidelines for Internship/Research Internship for Undergraduate Students **2023**.

These guidelines define the framework for the **organisation, implementation, and evaluation of OJT** in undergraduate programmes

These guidelines define the framework for the **organisation, implementation, and evaluation of OJT** in undergraduate and postgraduate programmes.

## 2. Objectives

The OJT programme aims to:

1. Provide learners with **experiential learning opportunities** in professional and research environments.
2. Enable learners to **apply academic knowledge to real-world contexts**.
3. Develop **professional competencies** such as communication, teamwork, time management, and problem-solving.
4. Foster **ethical awareness and professional responsibility** in workplace settings.
5. Facilitate **career exploration and employability development**.
6. Establish meaningful **linkages between higher education institutions and industry/society**.

### 3. Learning Outcomes

On completion of the OJT course, the learner will be able to:

1. Apply disciplinary knowledge in practical workplace situations.
2. use and appreciate the use of emerging technologies and their applications, enhancing their technological literacy and adaptability.
3. Demonstrate organisational, decision-making, and problem-solving skills.
4. Exhibit professional communication and teamwork abilities.
5. Reflect on workplace practices and evaluate potential career pathways.

### 4. Types of OJT:

Learners may undertake OJTs in the following categories:

#### I. Industrial

Engagement with industries, companies, commercial organisations, banks, MSMEs, or public sector institutions.

#### II. Social

Work with NGOs, community organisations, social enterprises, governmental or semi-governmental institutions.

#### III. Research

Participation in research projects, laboratories, academic centres, or think-tanks.

Institutions may approve additional organisations relevant to the learners' discipline.

### 5. Indicative List of Areas<sup>1</sup> OJT

- Trade and Agriculture
- Economy & Banking Financial Services and Insurance
- Logistics, Automotive & Capital Goods
- Fast Moving Consumer Goods & Retail
- Information Technology/Information Technology Enabled Services & Electronics
- Handcraft, Art, Design & Music
- Healthcare & Life Science
- Sports, Wellness and Physical Education
- Tourism & Hospitality
- Digitization & Emerging Technologies (Internet of Things/Artificial
- Intelligence/Machine Learning/Deep Learning/Augmented Reality/Virtual Reality etc.)
- Humanitarian, Public Policy and Legal Services

---

<sup>1</sup> The area of OJT should align with the learner's Major subject

- Communication
- Education
- Sustainable Development
- Environment
- Commerce, Medium and Small-Scale Industries

It may please be noted: This is only an indicative list and not an exhaustive one.

## 6. Credit Structure

OJTs shall be credited as per NEP 2020 and Government Resolutions.

Programme Stage	Credits	Workload
Third Year UG	4 Credits	120 Hours
Fourth Year UG	4 Credits	120 Hours

### Credit Norm:

1 Credit = 30 hours of OJT engagement.

## 7. Institutional Structure

### OJT Cell<sup>2</sup>

Each College / Institute/Centre/ University Department shall establish an **OJT Cell** responsible for coordinating OJT activities. The Cell shall have the following composition:

- Head: Principal / Director / Head of Department
- Nodal Officer: Training and Placement Officer or nominated faculty member
- Department Coordinators: One faculty member per department
- Student Coordinators: At least two student representatives per department

### Functions of the OJT Cell

The OJT Cell shall:

- Identify and develop **OJT opportunities** across sectors.
- Establish **institutional collaborations and MoUs** with organisations.
- Communicate OJT opportunities and guidelines to students.
- Validate **self-acquired OJTs** to ensure relevance to the programme.
- Facilitate interaction between **students, faculty mentors, and organisations.**
- Organise **skill development workshops**, including:

---

<sup>2</sup> The OJT Cell shall be reviewed periodically by the institutional head.

- communication skills
- report writing
- interview preparation
- professional etiquette
- Maintain records of OJTs and monitor progress.
- Address student queries and grievances during OJT.

## 8. Roles and Responsibilities

### Institution<sup>3</sup>

- Facilitate communication between students and organisations.
- Provide academic guidance through **faculty mentors**.
- Ensure fair and transparent OJT processes.
- Maintain OJT records and evaluation documentation.
- Address issues relating to student welfare and workplace concerns.

### Head of the Department (HOD):

- Conduct an orientation session to familiarize students with the OJT purpose and process.
- Establish the code of conduct for the training period and guide students.
- Assign department faculty members as mentors to OJT students.
- Ensure the OJT program aligns with departmental and institutional academic objectives.
- To Provide resources, training, or assistance to ensure effective supervision.

### OJT Coordinator<sup>4</sup>:

- To oversee the quality and effectiveness of the OJT program.
- To establish mechanisms for evaluating the program and making improvements.
- To act as a liaison between the department, students, faculty mentors and OJT supervisors.

### Student Coordinator<sup>5</sup>:

To assist the OJT coordinator in pre-, during and post-OJT activities.

### Faculty Mentor<sup>6</sup>:

- To assist in identifying OJT opportunities

---

<sup>3</sup> College/Institute/Centre or University Department where the learner is pursuing their degree programme

<sup>4</sup> A faculty member from a college/university department who has been appointed to coordinate the OJT Cell activities

<sup>5</sup> A minimum of one student studying in the fifth semester (UG) appointed by the Head of the department to assist the OJT coordinator

<sup>6</sup> A faculty member from a college/University department who has been assigned to mentor a a group of students in their pre- OJT, During OJT and Post OJT phases

- To monitor student progress and provide guidance
- To review and approve OJT plans
- To collect and review progress reports
- To evaluate OJT documentation including reports, presentations, or other required deliverables (if applicable)

#### Student<sup>7</sup>

- Complete the required **120 hours of OJT**.
- Obtain approval for a self-acquired OJT from the Department.
- Follow the rules and work culture of the host organisation.
- Maintain an **OJT logbook/attendance record**.
- Prepare and submit an **OJT report** after completion.
- Participate in **presentation or viva-voce evaluation**.
- Adhere to professional conduct and institutional guidelines.

#### Host Organisation<sup>8</sup>

- Provide meaningful work exposure to students.
- Nominate a **supervisor** for the intern.
- Maintain attendance and monitor performance.
- Provide a **performance evaluation** at the end of the OJT.
- Inform the institution of OJT details including:
  1. role description
  2. duration
  3. stipend (if any)
  4. selection process.

#### OJT Supervisor<sup>9</sup> (Host Institution/organization):

- To guide and direct interns/OJT students
- To provide students with hands-on training and skill development
- To provide feedback and performance evaluation
- To enhance networking and exposure

## 9. Assessment and Evaluation

The OJT course shall be evaluated out of **100 marks**

Component	Marks
Internal Assessment (Report + Presentation/Viva)	60
External Evaluation (Industry Supervisor)	40

<sup>7</sup> 5<sup>th</sup> Semester student who will take OJT

<sup>8</sup> The organization/institute/industry that offers OJT to students

<sup>9</sup> Person who is designated by the host organization/industry to supervise a student/group of students during their OJT.

### Internal Evaluation Criteria

Sr. No.	Parameter for Assessment	Marks
1.	Quality of presentation and communication	10
2.	Practical understanding and application of knowledge	20
3.	Relevance and diversity of learning experience	20
4.	OJT report	10
	<b>TOTAL</b>	<b>60</b>

**Please Note:** The learner shall be eligible for internal assessment only on successful completion of 120 hours of OJT and a minimum score of 40% in the external evaluation.

### External Evaluation Criteria

Sr. No.	Parameters for Assessment	Marks
1.	Completion of minimum 120 hours	15
2.	Performance during OJT	15
3.	Punctuality and regularity	10
	<b>TOTAL</b>	<b>40</b>

### 10. OJT Report<sup>10</sup>

Each student needs to prepare and submit a report to their respective departments after completing OJT. A minimum word limit for the report is 1500 words.

### 11. Documentation

The OJT process shall include the following documents:

- I. Outreach Letter to Organisations
- II. Relieving/Permission Letter
- III. Student Undertaking
- IV. Attendance Record
- V. Student Feedback Form
- VI. Supervisor Evaluation Form
- VII. Consolidated Marksheet

---

<sup>10</sup> See Appendix X for the format of OJT Report.

All completed documents must be submitted to the respective department before evaluation.

## 12. Student Welfare and Workplace Safety<sup>11</sup>

Institutions shall ensure that:

- OJT Orientation Session/s include(s) **workplace ethics and professional conduct** for students.
- Mechanisms exist for reporting **harassment or workplace exploitation**.
- Interns have access to institutional support through the **OJT Cell or Nodal Officer**.
- Host organisations follow applicable **workplace safety and anti-harassment regulations**.

## 13. General Guidelines

- OJT is a **mandatory component of the curriculum**.
- Only Learners eligible for Semester V, may undertake OJTs:
  - during semester breaks
  - OR
  - During semester, after college hours and on non-working days
- Self-acquired OJTs are valid only with **prior college/ departmental approval**.
- OJT reports and documents must be submitted **before the evaluation deadline**.
- Marks will be uploaded to the **university examination portal** after assessment.

---

<sup>11</sup> Refer to safety measures guidelines issued by the University of Mumbai

## Appendix I

### Student Undertaking for OJT

1	Student Name	
2	UID	
3	Class and Subject	
4	Email ID	
5	Mobile number	
6	Name of Organisation where Interning	
7	Location of work	
8	Dates of OJT	

I confirm that I have read and agree with the terms, conditions, and requirements of the OJT Policy. I assure the OJT Cell that I will make the utmost efforts in fulfilling the requirements of work laid down by the Organisation.

I understand and agree that the responsibility of professional conduct, commitment to my work and my safety at the workplace is solely my responsibility. I shall hold the College/Department responsible/liable or the same.

I confirm that I have duly informed my Parents/Guardian of the above and am accepting the OJT opportunity of my own will.

Name:

Name of Parent/Guardian Signature:

Signature:

Signature:

Date:

Date:

## Appendix II

### Outreach Letter to Organisation

To

\_\_\_\_\_  
\_\_\_\_\_

Date:

Subject: Request for OJT of 120 hours for students pursuing UG course

Dear Sir/Ma'am,

Greetings from (Concerned College)!

(College Name), is a \_\_\_\_\_ educational institute accredited NAAC (grade) in the \_\_\_\_\_ cycle. As part of the requirements for the undergraduate program in \_\_\_\_\_ our students are required to undertake a short-term On-Job training or research project. This On-Job training is scheduled to take place from \_\_\_\_\_ to \_\_\_\_\_, with a minimum requirement of 120 hours. It is a mandatory component of their curriculum, and upon completion, students will prepare a report on their experience and findings.

This is to certify that the following is/are bona fide student/s of (Concerned College), Mumbai

Sr. No.	UID	Name	Roll no.	Year	Department

We would be grateful if you could provide them with an opportunity to work in your esteemed organisation to fulfil this OJT requirement. The resume/s is/are being attached for your reference. A response at your earliest convenience would be greatly appreciated. We kindly request that the students be given at least one week to join the training after receiving confirmation from your end.

Warm regards,

[Signature and Name of the Head of Department/Nodal Officer/TPO]

## Appendix III

### Resume Template<sup>12</sup>

Name

Contact Number and Email ID:

Education

HEI Name

Degree / Specialization: CGPA: Year

HEI Name: <bachelor's degree> Degree / Specialization: Year

CGPA:

Internship / Work Experience

Organization Project: Brief: Year

Academic Experience

Semester Project: Brief: Year

- Emphasize accomplishments that are relevant to the field
- Be specific—omit unnecessary words and sentences
- Start your sentence with an action verb, not a passive one-Use past-tense verb to show what you have accomplished Quantify results as much as possible
- Use keywords that will catch a recruiter's eye

Other Achievements and Personal Interests

- List other achievements also in reverse chronological order
- Leadership positions held outside your formal work environment
- Personal interests and accomplishments that will distinguish you from other applicants
- Volunteer service/Social Work

Languages known (Mention the level of Proficiency)

Computer Proficiency (Mention the skills you possess)

---

<sup>12</sup> To be attached with the Outreach letter

**Appendix IV**  
**Relieving Letter<sup>13</sup>**

To

\_\_\_\_\_

\_\_\_\_\_

Subject: Relieving letter of the student

Dear Sir/Madam/Mr./Ms \_\_\_\_\_,

Kindly refer to your letter/e-mail dated...on the above cited subject. As permitted, the following students will undergo Industrial/Research OJT in your esteemed organisation under your sole guidance and direction.

Sr. No.	Name	UID	Year	Department

This training being an essential part of the curriculum, the following guidelines have been prescribed in the curriculum for the training. You are therefore requested to please issue the following guidelines to the concerned student mentor.

- Each student is required to prepare an OJT diary and report. Kindly check the OJT diary of the student on a regular basis.
- Issue instructions regarding working hours during training and maintenance of the attendance record.
- You are requested to evaluate the student's performance using the evaluation/grading sheet provided to you.

The performance report may please be forwarded to the undersigned on completion of training in a sealed envelope. Your efforts in training and evaluation will positively enhance the knowledge and practical skills of our students. We sincerely appreciate your cooperation in this regard.

The students will abide by the rules and regulations of the organisation and will maintain an appropriate level of discipline and a positive work ethic during their OJT. The students will report to you along with a copy of this letter.

Yours sincerely,

(Signature with date)

Name and Designation - HOD/Nodal Officer/TPO

\_\_\_\_\_

<sup>13</sup> To be issued after receiving Confirmation from the organization offering OJT.

## Appendix V

### Student Attendance Sheet

(To be Certified by the Supervisor at the Interning Organisation)

1	Student Name	
2	UID	
3	Class and Subject	
4	Name of Organisation where Interning	
5	Date of Commencement of OJT	
6	Date of Completion of OJT	

Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1						
2						
3						
4						
5						
6						
7						
8						
9						

<b>10</b>						
<b>11</b>						
<b>12</b>						

Holidays should be marked in Red Ink. Absence should be marked as 'Ab'

Signature with Date:

Name of OJT Supervisor:

Stamp/Seal of Organisation:

## Appendix VI

### Student Feedback on OJT

(To be filled by student after OJT completion)

1	Student Name	
2	UID	
3	Class and Subject (2024-25)	
4	Email ID	
5	Mobile Number	
6	Name of Organisation where Interning	
7	Dates of OJT	
8	Designation of Internee	
9	Supervisor Name and Designation	
10	Supervisor email and mobile	

Give a brief description of your OJT work (title and tasks for which you were responsible):

---

Was your OJT experience related to your major area of study?

- Yes, to a large degree
- Yes, to a slight degree
- No, not related at all

Indicate the degree to which you agree or disagree with the following statements.

This experience has:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Given me the opportunity to explore a career field					
Allowed me to apply classroom theory to practice					
Helped me develop my problem-solving skills					
Expanded my knowledge about the work world prior to permanent employment					
Helped me develop my written and oral communication skills					
Provided a chance to develop or use leadership skills					
Expanded my sensitivity to the ethical implications of the work involved					
Made it possible for me to be more confident in new situations					
Given me a chance to improve my interpersonal skills					

Helped me learn to handle responsibility and use my time wisely					
Helped me discover new aspects of myself that I did not know existed before					
Helped me develop new interests and abilities					
Helped me clarify my career goals					

What improvements would you suggest for the OJT programme at the institution level?

---



---

Describe a key challenge you faced during the OJT and how you addressed it.

---



---

Name & Signature of Student

Date:

## Appendix VII

### Supervisor Evaluation of Intern

Academic Year: \_\_\_\_\_

1	Student Name	
2	UID	
3	Class and Subject	
4	Name and organization where Interning	
5	Dates of OJT	
6	Designation of Intern	
7	Supervisor Name and Designation	
8	Supervisor email and mobile	

Please evaluate the intern along the following parameters.

Sr. No.	Parameters	Marks
1.	Completion of minimum 120 hours	15
2.	Performance during OJT	15
3.	Punctuality and regularity	10
	<b>TOTAL</b>	<b>40</b>

Additional comments, if any:

Name and Signature of Industry/Organisation Supervisor

Name and Signature of HR Manager/Head

Stamp/Seal of Organisation

## Appendix VIII

### Consolidated Mark sheet for On-Job Training

Name:

UID No:

Class:

Academic Year:

Course Code:

<b>Internal Marks</b> (Internal Examiner) Out of 60 marks	<b>External Marks</b> (Industry Supervisor) Out of 40 marks	<b>TOTAL MARKS</b> Out of 100 marks

Overall Grade:

Signature of Examiner

Date:

Signature of Head of Department

Stamp:

## **Appendix IX**

### **Proforma for OJT COMPLETION CERTIFICATE**

The student should attach OJT completion certificate, duly signed by the industry/organization supervisor to his/her report. A representative format for the OJT completion certificate is as given below:

### **CERTIFICATE**

(On Company/Institute/Organization Letterhead)

This is to certify that Ms./Mr. \_\_\_\_\_, TY\_\_ student of \_\_\_\_\_

(Name of the College/ Institute/ Centre) has successfully completed the On-Job training in the

\_\_\_\_\_, from \_\_\_\_\_ to \_\_\_\_\_ under the supervision of \_\_\_\_\_

Authorized signature

## Appendix X

### Format of OJT Report












#### **Title Page should include:**

- Full Name
- UID
- Class
- Academic Year
- Duration of OJT (Start date- End date)
- Name of Organisation/Company
- Location of Work
- Designation and Role
- Date of Submission:

The following is a suggested outline. However, the students are advised to consult their respective OJT Mentors.

- Introduction
- Company Overview
- Training Objectives
- Description of tasks and responsibilities
- Skills Developed & Key Learning Outcomes
- Value addition/s to domain knowledge, professional capacities, and personal growth
- Challenges Faced
- Lessons Learned
- Conclusion
- Appendices (such as Geo-tagged photos, )
- References

**Board of Studies (BOS) Microbiology**

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sandhya Mulchandani	BOS-Chairperson, Associate Professor Smt. CHM College, Ulhasnagar	
2.	Dr. Sejal Rathod	Subject Expert (Nominated by Academic Council) K.C.College HSNC University	
3.	Dr. Pratibha Shah	Subject Expert (Nominated by Academic Council) K.C.College HSNC University	
4.	Dr. Ranjana Khade	Subject Expert ( Nominated by the Vice Chancellor) R.K. Talreja College, Ulhasnagar	
5.	Dr. Sharddha Ratnaparkhe	Industry Representative (Nominated by Principal) Galaxy surfactants Ltd	
6.	Dr. Anand S. Maurya	Alumni Representative (Nominated by Principal) Executive officer Serum Institute of India	
7.	Dr. Rasika Pawar	Assistant Professor Smt. CHM College, Ulhasnagar	
8.	Dr. Pranali Shete	Assistant Professor Smt. CHM College, Ulhasnagar	
9.	Dr. Ashish Jain	Associate Professor Smt. CHM College, Ulhasnagar	
10.	Dr. Nitin Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
11.	Dr. Renu Jaisinghani	Assistant Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: Dr. Sandhya Mulchandani



Name & Signature of the Dean: Dr. Neena Anand

