

**KADI SARVA  
VISHWAVIDYALAYA,  
GANDHINAGAR**



**B.Sc. Curriculum as Per NEP  
Microbiology Courses for Semester 2**

**W.E.F. June 2023**



# KADI SARVA VISHWAVIDYALAYA

## Microbiology Major Course -1

### MBM209-1C - MICROBIAL PHYSIOLOGY

#### LEARNING OUTCOMES:

- Thorough knowledge and understanding of concepts of microbiology.
- Understand the concept of nutrition of the bacteria.
- Learning about nutritional types of microbes.
- Develop an understanding of the growth and various parameters affecting to the growth.
- Gain knowledge about methods of microbial control and their inhibition.

#### TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					*CCE	*SEE	
MBM209-1C	Microbial Physiology	4	4	2.5	50	50	100

#### Unit 1: Nutritional requirement and Transport

Teaching Hours: 15 (Weightage 25%)

- Nutritional requirements of micro-organism.
- Nutritional types of bacteria (Phototrophs, Chemotrophs, Autotrophs and Hetrotrophs).
- Classification of bacteria on the basis of growth supporting environmental factors such as Oxygen, Temperature, pH, osmotic pressure, Salt and Hydrostatic pressure.
- Uptake of nutrients by cell
  - Passive and facilitated diffusion,
  - Primary and secondary active transport,
  - Concept of uniport, symport and antiport,
  - Group translocation

#### Unit 2: Microbial Growth

Teaching Hours: 15 (Weightage 25%)

- Microbial Growth: Definition and Introduction.
- Modes of cell division in bacteria.
- Mathematical Expressions of Microbial Growth.
- Normal Growth Cycle of Bacteria, generation time and specific growth rate.
- Batch culture, Continuous culture, synchronous growth, diauxic growth.
- Methods for the Measurement of microbial growth
  - Total cell count,
  - Viable cell count,
  - Biomass determination and Biological assay,
  - Kjeldahal's method (C and N content),
  - ATP Bioluminetry Method.



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## Unit-3: Control of Microorganisms-I

Teaching Hours: 15 (Weightage 25%)

- General principles: Control by killing, inhibition and removal.
- Definition of Terms: Bactericidal, Bacteriostatic, MIC, MLD, LD50, Chemotherapy, Antibiotic, Growth Factor Analogue.
- Concept of sterilization, disinfection, aseptic and sanitation.
- Pattern of Microbial death, Conditions influencing effectiveness of antimicrobial agent activity.
- Physical methods of control- Temperature, radiation, desiccation, osmotic pressure, filtration.

## Unit-4: Control of Microorganisms-II

Teaching Hours: 15 (Weightage 25%)

- Characteristics of ideal disinfectants.
- Modes of action of disinfectants.
- Chemical methods of control- Phenol, alcohol, halogens, heavy metals, dyes, detergents, quaternary ammonium compounds, aldehydes and gaseous chemosterilizers.
- Evaluation of antimicrobial potency of disinfectants and antiseptics- Tube dilution, Agar diffusion. Phenol coefficient.

\***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

\***SEE:** Semester End Evaluation

### Reference Books:

1. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill BookCompany.
2. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
3. Willey, Joanne M; Sherwood, Linda; Woolverton, Christopher J; Prescott, Lansing M. (2008). Prescott Harley Kleins Microbiology. 7th edition. McGraw-Hill Higher Education.
4. Powar CB, Dagainawala HF. (2010). General Microbiology. Himalaya Publishing House.
5. H.A.Modi. (1995). Elementary Microbiology. Ekta Prakashan.



# KADI SARVA VISHWAVIDYALAYA

## Microbiology Major Course -2

### MBM210-1C - MICROBIAL GROWTH AND CONTROL OF MICROORGANISMS

#### LEARNING OUTCOMES:

- Understand the concept of nutrition of the bacteria.
- Develop an understanding of the growth and various parameters affecting to the growth.
- Gain knowledge about the microbial control and their inhibition.

#### TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical Per Week		Hrs.	Max Marks		
					CCE	SEE	
MBM210-1C	Microbial Growth and Control of Microorganisms	8	4	5	50	50	100

#### Unit-1

(Weightage :50%)

1. Safety precautions to work in Microbiology Laboratory.
2. Cultivation techniques- Broth culture, Agar slope culture.
3. Isolation of bacteria: Streak Plate, Pour Plate, Spread Plate technique
4. Enrichment of bacteria by batch culture technique.
5. To study growth curve of *E. coli*.
6. Measurement of microbial growth by Plate count method.
7. Preservation of fungal and bacterial culture – use of mineral oils, use of slant, use of soil.
8. Use of Selective, Differential and Enriched medium.

#### Unit 2

(Weightage :50%)

1. To study effect of U.V. light on Bacteria.
2. To study effect of antibiotics on microbes
3. To study effect of chemicals on microbes
4. To study effect of temperature on bacterial growth.
5. To study effect of pH on bacterial growth.
6. To study effect of osmotic pressure (salt and sugar concentration) on bacterial growth.
7. To study oligodynamic action of heavy metals on bacterial growth.

#### Reference Books:

- Rakesh Patel. Experimental Microbiology. Delhi Aditya Book Centre.
- Stanier. Ingraham et al., (1987). General Microbiology 4th & 5th Ed. Macmillan Education Ltd .
- A.J.Salle. (2007). Fundamental Principles of Bacteriology. Dodo Press.



# KADI SARVA VISHWAVIDYALAYA

## Microbiology Minor Course – Semester 2

### MBE206-1C - FUNDAMENTALS OF MICROBIAL PHYSIOLOGY

#### LEARNING OUTCOMES:

- Thorough knowledge and understanding of concepts of microbiology.
- Understand the concept of nutrition of the bacteria.
- Learning about nutritional types of microbes.
- Develop an understanding of the growth and various parameters affecting to the growth.

#### TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory Per Week	Practical Per week		Hrs.	Max Marks		
						CCE	SEE	
MBE206-1C	Fundamentals of Microbial Physiology	2	4	4	2.5	50	50	100

#### Unit 1: Nutritional requirement and Transport

Teaching Hours: 15

- Nutritional requirements of micro-organism.
- Nutritional types of bacteria (Phototrophs, Chemotrophs, Autotrophs and Hetrotrophs).
- Classification of bacteria on the basis of growth supporting environmental factors such as Oxygen, Temperature, pH, osmotic pressure, Salt and Hydrostatic pressure.
- Uptake of nutrients by cell
  - Passive and facilitated diffusion,
  - Primary and secondary active transport,
  - Concept of uniport, symport and antiport,
  - Group translocation

#### Unit 2: Microbial Growth

Teaching Hours: 15

- Microbial Growth: Definition and Introduction.
- Modes of cell division in bacteria.
- Mathematical Expressions of Microbial Growth.
- Normal Growth Cycle of Bacteria, generation time and specific growth rate.
- Batch culture, Continuous culture, synchronous growth, diauxic growth.
- Methods for the Measurement of microbial growth
  - Total cell count,
  - Viable cell count,
  - Biomass determination and Biological assay,
  - Kjeldahal's method (C and N content),
  - ATP Bioluminetry Method.



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**Practicals:****Teaching Hours: 60**

1. Safety precautions to work in Microbiology Laboratory.
2. Cultivation techniques- Broth culture, Agar slope culture.
3. Isolation of bacteria: Streak Plate, Pour Plate, Spread Plate technique.
4. To study growth curve of *E. coli*.
5. To study effect of temperature on bacterial growth.
6. To study effect of pH on bacterial growth.
7. To study effect of osmotic pressure (salt and sugar concentration) on bacterial growth.

**Reference Books:**

1. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
2. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
3. Willey, Joanne M; Sherwood, Linda; Woolverton, Christopher J; Prescott, Lansing M. (2008). Prescott Harley Kleins Microbiology. 7th edition. McGraw-Hill Higher Education.
4. Powar CB, Daginawala HF. (2010). General Microbiology. Himalaya Publishing House.
5. H.A.Modi. (1995). Elementary Microbiology. Ekta Prakashan.
6. Rakesh Patel. Experimental Microbiology. Delhi Aditya Book Centre.



## Microbiology Multidisciplinary Course – Semester 2

### MDC216-1C - MICROBIAL GROWTH AND ITS CONTROL

#### LEARNING OUTCOMES:

- Thorough knowledge and understanding of concepts of microbiology.
- Understand the concept of nutrition of the bacteria.
- Learning about nutritional types of microbes.
- Develop an understanding of the growth and various parameters affecting to the growth.
- Gain knowledge about methods the microbial control and their inhibition.

#### TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory Per Week	Practical Per week		Hrs.	Max Marks		
						CCE	SEE	
MDC216-1C	Microbial Growth and its Control	2	4	4	2.5	50	50	100

<p><b>Unit 1: Nutritional requirement Microbial Growth</b> <span style="float: right;"><b>Teaching Hours: 15</b></span></p> <ul style="list-style-type: none"> <li>➤ Common Nutrient requirements and Nutritional types of bacteria.</li> <li>➤ Physical conditions required for growth: Oxygen, Temperature, pH, osmotic pressure, Salt and Hydrostatic pressure.</li> <li>➤ Normal growth curve of bacteria.</li> <li>➤ Introduction to growth rate, generation time.</li> </ul>
<p><b>Unit 2: Control of Microorganisms</b> <span style="float: right;"><b>Teaching Hours: 15</b></span></p> <ul style="list-style-type: none"> <li>➤ Overview of microbial control methods: Physical, Chemical, Mechanical</li> <li>➤ Concept of sterilization, disinfection, aseptic and sanitation.</li> <li>➤ Physical methods of control- Temperature, radiation, desiccation, osmotic pressure, filtration.</li> <li>➤ Chemical methods of control Phenol, alcohol, halogens, heavy metals, dyes, detergents, Quaternary ammonium compounds, aldehydes and gaseous chemosterilizer.</li> </ul>
<p><b>Practicals</b> <span style="float: right;"><b>Teaching Hours: 60</b></span></p> <ol style="list-style-type: none"> <li>1. Safety precautions to work in Microbiology Laboratory.</li> <li>2. Cultivation techniques- Broth culture, Agar slope culture.</li> <li>3. Isolation of bacteria: Streak Plate, Pour Plate, Spread Plate technique.</li> <li>4. To study growth curve of <i>E. coli</i>.</li> <li>5. To study effect of chemicals on microbes.</li> <li>6. To study effect of temperature on bacterial growth.</li> <li>7. To study effect of pH on bacterial growth.</li> </ol>



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## Reference Books:

1. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
2. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
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4. Powar CB, Dagnawala HF. (2010). General Microbiology. Himalaya Publishing House.
5. H.A.Modi. (1995). Elementary Microbiology. Ekta Prakashan.
6. Rakesh Patel. Experimental Microbiology. Delhi Aditya Book Centre.





# KADI SARVA VISHWAVIDYALAYA

## Microbiology SEC (Skill Enhancement Course) – Semester 2

### SEC216-1C - BASIC MYCOLOGY

#### LEARNING OUTCOMES:

- Thorough knowledge and understanding of fungus morphology and reproduction.
- Learning about cultivation and economic importance of Fungi.
- To understand interaction of fungi with other organisms.

#### TEACHING AND EVALUATION SCHEME:

Subject Code	Subject Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory Per Week	Practical Per week		Hrs.	Max Marks		
						CCE	SEE	
SEC216-1C	Basic Mycology	2	0	2	2	25	25	50

<b>Unit 1</b> ➤ Introduction and distinguish features of Fungi. ➤ Habitat and Morphology. ➤ Reproduction- Sexual and Asexual reproduction. ➤ Classification of fungi (Chytridiomycota (chytrids), Zygomycota (bread molds), Ascomycota (yeasts and sac fungi), and the Basidiomycota (club fungi)). ➤ Economic importance of Fungi.	<b>Teaching Hours: 15</b>
<b>Unit 2</b> ➤ Ecological imperfect fungi. ➤ Cultivation of Fungi using different media. ➤ Molds and their association with other organisms. <ul style="list-style-type: none"> <li>• Positive interactions: Fungi as symbionts (Lichen, Mycorrhizae).</li> <li>• Negative interactions: Parasitism</li> </ul>	<b>Teaching Hours: 15</b>

#### Reference Books:

1. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
2. Willey, Joanne M; Sherwood, Linda; Woolverton, Christopher J; Prescott, Lansing M. (2008). Prescott Harley Kleins Microbiology. 7th edition. McGraw-Hill Higher Education.
3. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.