

**SAURASHTRA UNIVERSITY**  
Accredited at "A" Level by NAAC (CGPA 3.05)

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**COURSE STRUCTURE & SYLLABUS**  
**FOR**  
**UNDERGRADUATE PROGRAMME**  
**IN**

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**MICROBIOLOGY**

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**(CORE COURSE FOR SEMESTER I & II)**  
(As per Choice Based Credit System as recommended by UGC)

**Effective from June – 2019**

## PREFACE

Timely revision of the Curriculum to encompass new knowledge and information is a prime criterion of IQAC – NAAC and prime need for the college educational systems affiliated to Universities. Under Choice Based Credit system, as advocated by University Grants Commission, a student must be offered latest courses with societal, environmental and economic implications

Microbiology is a foundation subject for Biotechnology, Genetic engineering, Molecular biology, Biochemistry, Bioinformatics and Medical Microbiology and hence holds the central position in the curriculum of these subjects. Looking to the rapid inventions and technological developments in the field of Microbiology as well as keeping in view the recommendations of UGC and Saurashtra University, this syllabus has been formulated by the combined and coordinated efforts of all the faculty members of all the Microbiology Departments of Colleges affiliated to Saurashtra University.

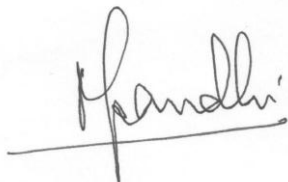
Composition of Curriculum for a particular subject requires following criteria to be considered:

1. Guidelines and Model curriculum given by the UGC and the University
2. Regional needs and Present National and International trends in the subject
3. Geographical parameters of the University and its demographic property
4. Relationship with other related subjects
5. Financial and statutory provisions of the State government
6. Resources of Educational needs.

The content of a syllabus should be such that it maintains continuity with the course content of higher secondary class and post graduate course. The present curriculum is made keeping this in mind and is an effort to impart fundamental knowledge of the subject needed at this level. The curriculum is designed as per the guidelines for Choice Based Credit System and reflects the total credit, teaching hours and question paper style of the paper. The units of the syllabus are well defined and the scope of each is given in detail. A list of reference books is provided at the end of each course. Microbiology being an experimental science, sufficient emphasis is given in the syllabus for training in laboratory skills and instrumentation. Following objectives have been considered while formulation of the curriculum:

1. To provide an updated, feasible and modern syllabus to the students, with equal emphasis on Knowledge and skill, to build up their valuable college educational and job-oriented carrier.
2. To frame syllabus in accordance with the semester system and CBCS system and in consultation with all stake holders.
3. Establishment of 10 Paper statuses up to Graduate level in the Saurashtra University

The authorities of Saurashtra University and the Dean of Science Faculty provided valuable guidelines and facilities for the same for which, the Board of Studies for Microbiology expresses its heartfelt gratitude. The Board wishes all the students pursuing Microbiology a very bright future.



(Dr. Neepa Pandhi)  
Chairman, Board of Studies, Microbiology  
Saurashtra University, Rajkot (Gujarat)  
Date : 21<sup>st</sup> June 2019

**SAURASHTRA UNIVERSITY**

**FACULTY OF SCIENCE**

**CBCS BASED COURSE STRUCTURE FOR SEMESTER 1 TO 6 & SYLLABUS FOR SEMESTER 1 & 2 FOR UNDERGRADUATE**

**PROGRAMME IN MICROBIOLOGY TO BE EFFECTIVE FROM JUNE 2019**

No	Diploma/ Graduate/ Post Graduate	Semester	Title Of Paper	Paper No.	Credits	Internal Marks	External Marks	Practical & Viva Marks	Total Marks	Unique Code No. of Paper							
										Year	Faculty	Subject	Course Group	Level	Semest er	Paper No.	Option
1	Graduate	01	Fundamentals of Microbiology	MB 101	4	30	70	50	150	19	03	05	-	01	01	01	-
2	Graduate	02	Basics of Biochemistry & Microbial Control	MB 201	4	30	70	50	150	19	03	05	-	01	02	02	-
3	Graduate	03	Microbial Diversity	MB 301	4	30	70	50	150	19	03	05	-	01	03	03	-
4	Graduate	04	Applied & Environmental Microbiology	MB 401	4	30	70	50	150	19	03	05	-	01	04	04	-
5	Graduate	05	Immunology	MB 501	4	30	70	50	150	19	03	05	-	01	05	05	-
6	Graduate	05	Bacterial Metabolism	MB 502	4	30	70	50	150	19	03	05	-	01	05	06	-
7	Graduate	05	Molecular Biology and Genetic Engineering	MB 503	4	30	70	50	150	19	03	05	-	01	05	07	-
8	Graduate	06	Fermentation Technology	MB 601	4	30	70	50	150	19	03	05	-	01	06	08	-
9	Graduate	06	Bio - Analytical Techniques	MB 602	4	30	70	50	150	19	03	05	-	01	06	09	-
10	Graduate	06	Clinical and Diagnostic Microbiology	MB 603	4	30	70	50	150	19	03	05	-	01	06	10	-



## TABLE OF CONTENTS

CONTENTS	PAGE
COURSE STRUCTURE FOR UG PROGRAM AND CREDIT SYSTEM	03
SYLLABUS FORMAT OF SEMESTER 1 AND 2	04
INSTRUCTIONS FOR THEORY AND PRACTICAL EXAMINATION	05
SKELETON OF THEORY EXAMINATION	06
SKELETON OF PRACTICAL EXAMINATION	07
INTERNAL EVALUATION SYSTEM	08
LIST OF INSTRUMENTS FOR SEMESTER 1 AND SEMESTER 2	09
SYLLABUS OF MB 101 BASIC ASPECTS OF MICROBIOLOGY (THEORY) WITH LIST OF REFERENCE BOOKS	10
SYLLABUS OF MB 101 BASIC ASPECTS OF MICROBIOLOGY (PRACTICAL) WITH LIST OF REFERENCE BOOKS	13
SYLLABUS OF MB 201 MICROBIAL CHEMISTRY AND MICROBIAL CONTROL (THEORY) WITH LIST OF REFERENCE BOOKS	14
SYLLABUS OF MB 201 MICROBIAL CHEMISTRY AND MICROBIAL CONTROL (PRACTICAL) WITH LIST OF REFERENCE BOOKS	17

# COURSE STRUCTURE FOR UG PROGRAM AND CREDIT SYSTEM

## SKELETON OF COMPLETE COURSE CONTENT OF UNDER GRADUATE MICROBIOLOGY (SEMESTER I TO VI)

SEMESTER	PAPER NO. & CODE	TITLE OF THE PAPER	CREDIT
I	MB-101 (Theory)	<b>Fundamentals of Microbiology</b>	4
	MB-101 (Practical)	-do-	3
II	MB-201 (Theory)	<b>Basics of Biochemistry and Microbial Control</b>	4
	MB-201 (Practical)	-do-	3
III	MB-301 (Theory)	<b>Microbial Diversity</b>	4
	MB-301 (Practical)	-do-	3
IV	MB-401 (Theory)	<b>Applied and Environmental Microbiology</b>	4
	MB-401 (Practical)	-do-	3
V	MB-501 (Theory)	<b>Immunology</b>	4
	MB-501 (Practical)	-do-	3
	MB-502 (Theory)	<b>Bacterial Metabolism</b>	4
	MB-502 (Practical)	-do-	3
	MB-503 (Theory)	<b>Molecular Biology and Genetic Engineering</b>	4
	MB-503 (Practical)	-do-	3
VI	MB-601 (Theory)	<b>Fermentation Technology</b>	4
	MB-601 (Practical)	-do-	3
	MB-602 (Theory)	<b>Bio-Analytical Techniques</b>	4
	MB-602 (Practical)	-do-	3
	MB-603 (Theory)	<b>Clinical and Diagnostic Microbiology</b>	4
	MB-603 (Practical)	-do-	3

## SYLLABUS FORMAT OF SEMESTER 1 AND 2

Stream	Paper	Unit	Title of Unit	Credit	Lectures	Marks		
						External	Internal	
B.Sc. Sem-1 (UG) Paper- 101	<b>MB-101- FUNDAMENTALS OF MICROBIOLOGY THEORY CREDIT (04)</b>	1	<b>SCOPE AND HISTORY OF MICROBIOLOGY</b>	0.8	12	70	14	30
		2	<b>MICROSCOPY AND STAINING</b>	0.8	12		14	
		3	<b>MORPHOLOGY OF BACTERIA</b>	0.8	12		14	
		4	<b>CULTIVATION OF BACTERIA</b>	0.8	12		14	
		5	<b>REPRODUCTION AND GROWTH OF BACTERIA</b>	0.8	12		14	
	<b>Total</b>			<b>04</b>	<b>60</b>	<b>100</b>		
	<b>MB101 PRACTICAL CREDIT (03)</b>		<b>INSTRUMENTATION, STAINING, ISOLATION, ENUMERATION AND GROWTH CURVE OF BACTERIA</b>		03	30	35	15
<b>Total</b>			<b>03</b>	<b>30</b>	<b>50</b>			
B.Sc. Sem-1 (UG) Paper- 201	<b>MB- 201 BASICS OF BIOCHEMISTRY AND MICROBIAL CONTROL THEORY CREDIT (04)</b>	1	<b>REVIEW OF BASIC CHEMISTRY</b>	0.8	12	70	14	30
		2	<b>INTRODUCTION TO BIOMOLECULES</b>	0.8	12		14	
		3	<b>ENZYMES</b>	0.8	12		14	
		4	<b>CONTROL OF MICROORGANISMS BY PHYSICAL AND CHEMICAL AGENTS</b>	0.8	12		14	
		5	<b>ANTIBIOTICS AND THEIR MODE OF ACTION</b>	0.8	12		14	
	<b>Total</b>			<b>04</b>	<b>60</b>	<b>100</b>		
	<b>MB201 PRACTICAL CREDIT (03)</b>		<b>QUALITATIVE AND QUANTITATIVE ANALYSIS OF BIOMOLECULES, ENZYME ASSAY, ANTIMICROBIAL ACTIVITY, TOTAL YEAST COUNT</b>		03	30	35	15
<b>Total</b>			<b>03</b>	<b>30</b>	<b>50</b>			

## GENERAL INSTRUCTIONS

- 1) The Medium of Instruction will be English for Theory and practical course
- 2) There will be 6 Lectures / Week / Theory Paper / Semester.
- 3) Each Lecture (Period) will be of 55 Mins. (1 Period = 55 Mins).
- 4) There will be 2 Practical / Week / Paper / Batch. Each Practical will be of 3 Periods (1 Period 55 Mins.).
- 5) Each Semester Theory Paper will be of FIVE Units. There will be 60 Hrs. of Theory teaching / Paper / Semester.
- 6) Each Theory Paper / Semester will be of 100 Marks. There will be 30 marks for internal evaluation and 70 marks for external evaluation. Each Practical Paper / Semester will be of 50 Marks. So, Total Marks of Theory and Practical for each Paper will be 150. (100+50 = 150)

### **Instructions to the Candidates for Practical Examination:**

- 1) The practical examination will be conducted for TWO (2) days.
- 2) The Time duration of practical examination will be of FOUR (4) hrs on both the days.
- 3) All the students have to remain present at the examination centre 15 minutes before the scheduled time for examination.
- 4) Students have to carry with them Certified journal, I-card or examination receipt, Slide box, Apron and all other necessary requirements for examination.
- 5) Candidate should not leave the laboratory without the permission of examiner.
- 6) Use of calculator is allowed but the use of Mobile phones is strictly prohibited.
- 7) The candidate has to leave the laboratory only after the submission of all the answer sheets of the exercises performed.



## SKELETON OF THEORY EXAMINATION (EXTERNAL)

QUESTION 1 – UNIT 1		
Q 1 A	Objective type questions	4 Marks
Q 1 B	Answer in brief (Any 1 out of 2)	2 Marks
Q 1 C	Answer in detail (Any 1 out of 2)	3 Marks
Q 1 D	Write a note on (Any 1 out of 2)	5 Marks
QUESTION 2 – UNIT 2		
Q 2 A	Answer in brief (Any 1 out of 2)	4 Marks
Q 2 B	Answer in brief (Any 1 out of 2)	2 Marks
Q 2 C	Answer in detail (Any 1 out of 2)	3 Marks
Q 2 D	Write a note on (Any 1 out of 2)	5 Marks
QUESTION 3 – UNIT 3		
Q 3 A	Objective type questions	4 Marks
Q 3 B	Answer in brief (Any 1 out of 2)	2 Marks
Q 3 C	Answer in detail (Any 1 out of 2)	3 Marks
Q 3 D	Write a note on (Any 1 out of 2)	5 Marks
QUESTION 4 – UNIT 4		
Q 4 A	Objective type questions	4 Marks
Q 4 B	Answer in brief (Any 1 out of 2)	2 Marks
Q 4 C	Answer in detail (Any 1 out of 2)	3 Marks
Q 4 D	Write a note on (Any 1 out of 2)	5 Marks
QUESTION 5 – UNIT 5		
Q 5 A	Objective type questions	4 Marks
Q 5 B	Answer in brief (Any 1 out of 2)	2 Marks
Q 5 C	Answer in detail (Any 1 out of 2)	3 Marks
Q 5 D	Write a note on (Any 1 out of 2)	5 Marks
<b>TOTAL MARKS : 70 TOTAL TIME : 2½ HOURS</b>		

# SKELETON OF PRACTICAL EXAMINATION (EXTERNAL)

SEMESTER – I and II: MB 101 and MB 201

## SECTION- I: EXAMINER –I (EXTERNAL)

Ex. No.	Detail of Exercise	Marks	Day to begin the exercise
1	Perform any one from the given list of exercises as per the instruction of the examiner exercise	10	1 <sup>st</sup> Day
5	Viva-voce	04	1 <sup>st</sup> / 2 <sup>nd</sup> Day
6	Certified Journal	03	1 <sup>st</sup> / 2 <sup>nd</sup> Day
<b>Total Marks</b>			<b>17</b>

## SECTION- II: EXAMINER –II (INTERNAL)

Ex. No.	Detail of Exercise	Marks	Day to begin the exercise
2	Perform any one from the given list of exercises as per the instruction of the examiner exercise	10	1 <sup>st</sup> / 2 <sup>nd</sup> Day
3	Spotting	04	1 <sup>st</sup> / 2 <sup>nd</sup> Day
4	Viva-voce	04	1 <sup>st</sup> / 2 <sup>nd</sup> Day
<b>Total Marks</b>			<b>18</b>

**INTERNAL EVALUATION FOR MB 101 AND MB 201  
(THEORY)**

<b>No.</b>	<b>Pattern of Internal Evaluation</b>	<b>Marks</b>
<b>1</b>	<b>Assignment</b>	<b>10</b>
	<b>MCQ Test</b>	<b>10</b>
	<b>Seminar/Presentation</b>	<b>10</b>
<b>OR</b>		
<b>2</b>	<b>MCQ Test</b>	<b>30</b>
<b>OR</b>		
<b>3</b>	<b>Assignment</b>	<b>10</b>
	<b>MCQ Test</b>	<b>20</b>
<b>OR</b>		
<b>4</b>	<b>Seminar/Presentation</b>	<b>10</b>
	<b>MCQ Test</b>	<b>20</b>

**INTERNAL EVALUATION FOR MB 101 AND MB 201  
(PRACTICAL)**

<b>No.</b>	<b>Pattern of Internal Evaluation</b>	<b>Marks</b>
<b>1</b>	<b>Reagent Preparation/Calculation</b>	<b>05</b>
<b>2</b>	<b>Practical Performance/Test</b>	<b>05</b>
<b>3</b>	<b>Viva</b>	<b>05</b>

**LIST OF INSTRUMENTS FOR  
MICROBIOLOGY SEMESTER 1 AND 2**

<b>No.</b>	<b>Name of Instrument</b>
<b>1</b>	<b>Compound Microscopes</b>
<b>2</b>	<b>Autoclave</b>
<b>3</b>	<b>Incubator</b>
<b>4</b>	<b>Hot air oven</b>
<b>5</b>	<b>Vortex mixer</b>
<b>6</b>	<b>Water bath</b>
<b>7</b>	<b>Heating mantle</b>
<b>8</b>	<b>Magnetic stirrer</b>
<b>9</b>	<b>UV chamber</b>
<b>10</b>	<b>Inoculation chamber</b>
<b>11</b>	<b>pH meter</b>
<b>12</b>	<b>Colony counter</b>
<b>13</b>	<b>Refrigerator</b>
<b>14</b>	<b>Bunsen burner</b>
<b>15</b>	<b>Micrometer (stage and ocular)</b>
<b>16</b>	<b>Colorimeter</b>
<b>17</b>	<b>Membrane filter set</b>
<b>18</b>	<b>Centrifuge</b>
<b>19</b>	<b>Electronic shaker Incubator</b>
<b>20</b>	<b>Electronic Analytical Balance</b>
<b>21</b>	<b>Double-pan Analytical Balance</b>
<b>22</b>	<b>Spectrophotometer</b>
<b>23</b>	<b>Computers</b>
<b>24</b>	<b>Water distillation system</b>
<b>25</b>	<b>Haemocytometers</b>
<b>26</b>	<b>Inspissator</b>

**SAURASHTRA UNIVERSITY, RAJKOT**  
**SYLLABUS FOR MICROBIOLOGY SEMESTER - I**  
**(With effect from June 2019)**  
**MB-101- FUNDAMENTALS OF MICROBIOLOGY**  
**(THEORY)**

**UNIT 1: SCOPE AND HISTORY OF MICROBIOLOGY**

**(Credit-0.8, Teaching Hours-12, Marks-14)**

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- 1.1 Microbiology as a field of Biology
- 1.2 Historical developments in Microbiology
- 1.3 The Place of Microorganisms in the living world: Groups of Microorganisms and their distribution in Nature
- 1.4 Spontaneous generation versus Biogenesis: germ Theory of diseases
- 1.5 Applied areas of Microbiology

**REFERENCE BOOKS (SEMESTER 1 UNIT 1)**

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Modi, H.A. Elementary Microbiology - Vol –I & II, Akta Prakashan, Nadiyad.
3. Powar and Dagainawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
4. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5<sup>th</sup> Edition. MacMillan Press Ltd., London.
5. Purohit, S.S., Microbiology-Fundamentals and Applications-6<sup>th</sup> Edition, Agrobios Publications, Delhi.

**UNIT 2: MICROSCOPY AND STAINING**

**(Credit-0.8, Teaching Hours-12, Marks-14)**

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- 2.1 Microscopy: Introduction and Types
- 2.2 Principle, Construction and working of : Bright field Microscopy, Dark field Microscopy, Fluorescent Microscopy, Phase Contrast Microscopy
- 2.3 Introduction to Advanced Microscopic techniques: Confocal Microscopy, Electron Microscopy, Preparation of sample for Electron Microscopy
- 2.4 Introduction to Stains: Natural, Acidic & Basic Stains, Chromophore & Auxochrome groups, Leuco compounds
- 2.5 Theories and types of Staining

## REFERENCE BOOKS (SEMESTER 1 UNIT 2)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Salle, S.J. (1974). Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Purohit, S.S., Microbiology-Fundamentals and Applications-6<sup>th</sup> Edition, Agrobios Publications, Delhi.

## UNIT 3: MORPHOLOGY OF BACTERIA

(Credit-0.8, Teaching Hours-12, Marks-14)

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- 3.1 Size, Shape and Arrangement of Bacteria
- 3.2 Bacterial Structures – External to Cell Wall : Capsule, Flagella, Pili, Prostheca, Sheath & Stalk
- 3.3 The cell wall of Bacteria – Structure and chemical composition of Gram negative and Gram positive Bacterial cell wall
- 3.4 Bacterial Structures – Internal to Cell Wall : Cell Membrane, Protoplast, Spheroplast, Membranous intrusions and intracellular membrane system, Cytoplasm, Cytoplasmic inclusions and Vacuoles, Nuclear Material
- 3.5 Bacterial Spores and Cyst – Types of spore, Structure and formation of Endospores (Sporogenesis).

## REFERENCE BOOKS (SEMESTER 1 UNIT 3)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Modi, H.A. Elementary Microbiology - Vol –I & II, Akta Prakashan, Nadiyad.
3. Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.
4. Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.

## UNIT 4: CULTIVATION OF BACTERIA

(Credit-0.8, Teaching Hours-12, Marks-14)

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- 4.1 Nutritional requirements and types of Bacteria,
- 4.2 Chemical and Physical requirement of Growth – Bacteriological Media & their Types, Air, pH & Temperature, Cultivation of Anaerobes
- 4.3 Natural Microbial Population ( Mixed Cultures), Selective methods to obtain Pure Cultures
- 4.4 Isolation and Preservation of pure cultures
- 4.5 Cultural Characteristics

## REFERENCE BOOKS (SEMESTER 1 UNIT 4)

- 1 Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
- 2 Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.

- 3 Powar and Dagainawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
- 4 Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5<sup>th</sup> Edition. MacMillan Press Ltd., London.
- 5 Purohit, S.S., Microbiology-Fundamentals and Applications-6<sup>th</sup> Edition, Agrobios Publications, Delhi.

## **UNIT 5: REPRODUCTION AND GROWTH OF BACTERIA**

**(Credit-0.8, Teaching Hours-12, Marks-14)**

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- 5.1 Introduction and Definition of Growth, Modes of Cell division in prokaryotes
- 5.2 Septum Formation
- 5.3 Bacterial Growth Curve
- 5.4 Synchronous culture & Continuous Growth of Bacteria
- 5.5 Measurement of Bacterial Growth

### **REFERENCE BOOKS (SEMESTER 1 UNIT 5)**

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5<sup>th</sup> Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Frobisher M., Hinsdill, Crabtree and Goodherat Fundamentals of Microbiology, 9<sup>th</sup> Edition. W.B Saunders Co. USA.
3. Purohit, S.S., Microbiology-Fundamentals and Applications-6<sup>th</sup> Edition, Agrobios Publications, Delhi.
4. Mani, A., Selwaraj, A.M., Narayanan L.M., and Arumngam, N., Microbiology, Saras Publication, Delhi

## **MB-101- FUNDAMENTALS OF MICROBIOLOGY (PRACTICAL)**

**Practical Hours – 3hrs/day for 2 days/Week**

**Total Credit – 3**

**Total 6 hours/Week**

- 1) Principles, working and uses of the following laboratory instruments :
  - a) Microscope
  - b) Incubator
  - c) pH meter
  - d) Refrigerator
  - e) Colorimeter
  - f) Colony counter
- 2) Principles, working and uses of the following sterilizers:
  - a) Autoclave
  - b) Hot air oven
  - c) Steam sterilizer
  - d) Inspissator
  - e) Bacteriological filters.
- 3) Preparation of glassware for sterilization and disposal of laboratory media and cultures.
- 4) Preparation of Stains and Staining Reagents.
- 5) Study of Permanent Slides of Bacteria, Fungi, Algae and Protozoa.
- 6) Study of bacterial motility by hanging drop method.
- 7) Monochrome Staining:
  - a) Negative Staining
  - b) Positive Staining
- 8) Differential Staining : Gram's Staining
- 9) Special staining of bacteria:
  - a) Capsule staining – Hiss's method
  - b) Cell wall staining – Webb's method
  - c) Spore staining – Schaeffer's method
  - d) Metachromatic granule staining – Albert's method
  - e) Spirochete staining – Harrie's method
- 10) Isolation of bacteria by streak plate/pour plate and spread plate technique
- 11) Study of liquid/solidified culture media
- 12) Enumeration of bacterial number by viable count technique.
- 13) Total count of yeast by microscopic method using Haemocytometer
- 14) Measurement of size of microorganisms by Micrometry (Demonstration)
- 15) Growth curve of Bacteria by colorimetric method and determination of Generation time and Growth rate of *E. coli* by colorimetric method.

### **REFERENCE BOOKS (SEMESTER 1 PRACTICALS)**

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi
4. Konika Sharma, Manual of Microbiology – Tools and Techniques, Ane books, Delhi



**SAURASHTRA UNIVERSITY, RAJKOT**  
**SYLLABUS FOR MICROBIOLOGY SEMESTER - II**  
**(With effect from June 2019)**  
**MB-201 BASICS OF BIOCHEMISTRY AND MICROBIAL CONTROL**  
**(THEORY)**

**UNIT 1: REVIEW OF BASIC BIOCHEMISTRY**

**(Credit-0.8, Teaching Hours-12, Marks-14)**

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- 1.1 Introduction to Atoms, Elements & Molecules
- 1.2 Major Chemical bonds in biological system: Ionic Bonds, Covalent Bonds, Hydrogen Bonds, Van der Waals interactions, Hydrophobic interactions
- 1.3 Introduction and importance of to pH
- 1.4 Major Chemical reactions: Acid Base, Redox, Condensation-Hydrolysis Reactions
- 1.5 Water and its important properties

**REFERENCE BOOKS (SEMESTER 2 UNIT 1)**

1. Atlas. R.M., Microbiology, 2<sup>nd</sup> Edition. Wm. C. Brown Publishers
2. Satyanarayana. U., Biochemistry, Books and allied Pvt. Ltd.
3. Mathew, Van Holde & Ahern, Biochemistry, 3<sup>rd</sup> Edition. Pearson Education (Singapore) Pte. Ltd. India Branch, New Delhi

**UNIT 2: INTRODUCTION TO BIOMOLECULES**

**(Credit-0.8, Teaching Hours-12, Marks-14)**

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- 2.1 Introduction and types of Biomolecules
- 2.2 Classification, Structures and Biological function of Carbohydrates
- 2.3 Classification, Structures and Biological function of Lipids
- 2.4 Classification, Structures and Biological function of Proteins
- 2.5 Classification, Structures and Biological function of Nucleic acids

**REFERENCE BOOKS (SEMESTER 2 UNIT 2)**

1. Atlas. R.M., Microbiology, 2<sup>nd</sup> Edition. Wm. C. Brown Publishers
2. Satyanarayana. U., Biochemistry, Books and allied Pvt. Ltd.
3. Mathew, Van Holde & Ahern, Biochemistry, 3<sup>rd</sup> Edition. Pearson Education (Singapore) Pte. Ltd. India Branch, New Delhi

## UNIT 3: ENZYMES

(Credit-0.8, Teaching Hours-12, Marks-14)

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- 3.1 Definition and Chemical & Physical Properties of Enzymes
- 3.2 Classification and Nomenclature of Enzymes
- 3.3 Enzyme activity: Nature & Mechanism of enzyme activity, Inhibition of enzymes action
- 3.4 Mechanism and Regulation of Enzymes Activity and Enzymes Synthesis
- 3.5 Differences between Prokaryotic & Eukaryotic Enzyme Regulation

### REFERENCE BOOKS (SEMESTER 2 UNIT 3)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5<sup>th</sup> Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Powar and Daginawala, General Microbiology Vol-I. Himalaya Publishing House, Mumbai.
3. Satyanarayana. U., Biochemistry, Books and allied Pvt. Ltd.

## UNIT 4: CONTROL OF MICROORGANISMS BY PHYSICAL AND CHEMICAL AGENTS

(Credit-0.8, Teaching Hours-12, Marks-14)

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- 4.1 Fundamentals of Microbial Control  
Principle, Types and Definition of Sterilization, Disinfectant, Antiseptic, Sanitizer, Germicide, Bactericide and Bacteriostasis.
- 4.2 Characteristics, Evaluation and Selection of Ideal antimicrobial agent
- 4.3 Physical Agents of Microbial Control –  
High Temperature, Low temperature, Desiccation, Osmotic Pressure, Radiation, Ultraviolet lights, X- rays, Gamma rays, Cathode rays, surface tension and interfacial tension, filtration.
- 4.4 Chemical Agents of Microbial Control –  
Phenol and phenolic compound, Alcohol, Halogen, Heavy metals and their compounds, Dyes, Detergents, Quaternary ammonium compounds, Aldehydes, Gaseous sterilization
- 4.5 Phenol Coefficient Method for the evaluation of chemical antimicrobial agents

### REFERENCE BOOKS (SEMESTER 2 UNIT 4)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5<sup>th</sup> Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Powar and Daginawala, General Microbiology Vol-I. Himalaya Publishing House, Mumbai.
3. Purohit, S.S., Microbiology-Fundamentals and Applications-6<sup>th</sup> Edition, Agrobios Publications, Delhi.

## UNIT 5: ANTIBIOTICS AND THEIR MODE OF ACTION

(Credit-0.8, Teaching Hours-12, Marks-14)

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- 5.1 Chemotherapeutic agents and Chemotherapy
- 5.2 Characteristics of ideal chemotherapeutic agent
- 5.3 Antibiotics and their mode of action: Inhibition of cell wall synthesis, Damage to cytoplasmic membrane, Inhibition of nucleic acid and protein synthesis, Inhibition of specific enzyme system
- 5.4 Antifungal, antiviral and antitumor chemotherapeutic agents
- 5.5 Nonmedical uses of antibiotics

### REFERENCE BOOKS (SEMESTER 2 UNIT 5)

1. Atlas, R.M., Microbiology, 2<sup>nd</sup> Edition. Wm. C. Brown Publishers
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5<sup>th</sup> Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Powar and Dagainawala, General Microbiology Vol-I. Himalaya Publishing House, Mumbai.
4. Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi
5. Purohit, S.S., Microbiology-Fundamentals and Applications-6<sup>th</sup> Edition, Agrobios Publications, Delhi.

**MB-201 MB-201 BASICS OF BIOCHEMISTRY AND MICROBIAL CONTROL  
(PRACTICAL)**

**Practical Hours – 3hrs/day for 2 days/Week      Total Credit – 3      Total 6 hours/Week**

- 1) Qualitative analysis of Amino acids and Proteins
- 2) Qualitative analysis of Carbohydrates
- 3) Colorimetric estimation of Protein by Folin and Lowry's method
- 4) Titrimetric estimation of reducing Sugars by Cole's method
- 5) Colorimetric estimation of reducing sugar by DNSA method
- 6) Effect of Chemicals on growth of bacteria by disc method
- 7) Effect of Alcohols on growth of bacteria by Disc method
- 8) Effect of Heavy metal on growth of bacteria – oligo dynamic action
- 9) Effect of Antibiotics on growth of bacteria: Agar ditch method and Agar cup Method.
- 10) Assay of Alpha – Amylase by iodometric method
- 11) Study of effect of Temperature on Enzyme activity
- 12) Study of effect of pH on Enzyme activity

**REFERENCE BOOKS (SEMESTER 2 PRACTICAL)**

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi
4. Konika Sharma., manual of Microbiology – Tools & Techniques, Ane Books, Delhi.