SAURASHTRA UNIVERSITY

Accredited at "A" Level by NAAC (CGPA 3.05)

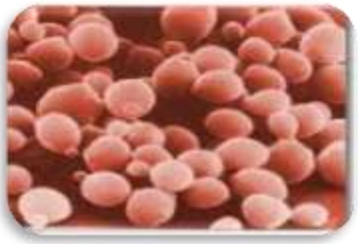
COURSE STRUCTURE & SYLLABUS

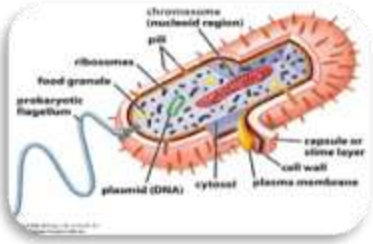
FOR

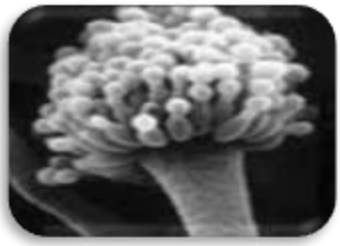
UNDERGRADUATE PROGRAMME

IN

MICROBIOLOGY







(CORE COURSE FOR SEMESTER I & II)

(As per Choice Based Credit System as recommended by UGC)

Effective from June – 2016

PREFACE

Updating and revision of the Curriculum at regular interval of time is a prime criterion of IQAC – NAAC and prime need for the college educational systems affiliated to Universities. University Grants Commission has advocated the implementation of Choice Based Credit System in undergraduate and post graduate levels for better teaching learning process and evaluation of the candidate.

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 statuary 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 and thereby to build up their valuable college educational and job-oriented carrier.
2. To frame syllabus in accordance with the semester system and CBCS system.
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. Mehul P. Dave)
Chairman, Board of Studies, Microbiology
Saurashtra University, Rajkot (Gujarat)
Date : 15h March 2016

TABLE OF CONTENTS

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)	**Basic Aspects of Microbiology**	4
	MB-101 (Practical)	**-do-**	3
II	MB-201 (Theory)	**Microbial Chemistry and Microbial Control**	4
	MB-201 (Practical)	**-do-**	3
III	MB-301 (Theory)	**Microbial Systematics and Environmental Microbiology**	4
	MB-301 (Practical)	**-do-**	3
IV	MB-401 (Theory)	**Applied Microbiology**	4
	MB-401 (Practical)	**-do-**	3
V	MB-501 (Theory)	**Immunology and Medical Microbiology**	4
	MB-501 (Practical)	**-do-**	3
	MB-502 (Theory)	**Prokaryotic Metabolism**	4
	MB-502 (Practical)	**-do-**	3
	MB-503 (Theory)	**Molecular Biology and Genetic Engineering**	4
	MB-503 (Practical)	**-do-**	3
VI	MB-601 (Theory)	**Bioprocess Technology**	4
	MB-601 (Practical)	**-do-**	3
	MB-602 (Theory)	**Analytical Techniques and Bioinformatics**	4
	MB-602 (Practical)	**-do-**	3
	MB-603 (Theory)	**Clinical and Diagnostic Microbiology**	4
	MB-603 (Practical)	**-do-**	3

SYLLABUS FORMAT OF SEMESTER 1 AND SEMESTER 2

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

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**
TOTAL MARKS : 70 TOTAL TIME : 2½ HOURS		

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	1st Day
5	Viva-voce	04	1st / 2nd Day
6	Certified Journal	03	1st / 2nd Day
	Total Marks	17	

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	1st / 2nd Day
3	Spotting	04	1st / 2nd Day
4	Viva-voce	04	1st / 2nd Day
	Total Marks	18	

INTERNAL EVALUATION FOR MB 101 AND MB 201 (THEORY)

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

INTERNAL EVALUATION FOR MB 101 AND MB 201 (PRACTICAL)

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

LIST OF INSTRUMENTS FOR MICROBIOLOGY SEMESTER 1 AND 2

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

SAURASHTRA UNIVERSITY, RAJKOT
SYLLABUS FOR MICROBIOLOGY SEMESTER - I
(With effect from June 2016)
MB-101- BASIC ASPECTS OF MICROBIOLOGY (THEORY)

UNIT 1 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

SCOPE AND HISTORY OF MICROBIOLOGY

1.1 Microbiology as a field of Biology
1.2 The Place of Microorganisms in the living world
1.3 Introduction to Groups of Microorganisms
1.4 Distribution of Microorganisms in Nature
1.5 Applied areas of Microbiology
1.6 Spontaneous generation versus Biogenesis
1.7 Germ Theory of disease
1.8 Eminent scientists 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 Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
4. Stanier, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5 Edition. MacMillan Press Ltd., London.
5. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

UNIT 2 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

MICROSCOPY AND STAINING

2.1 Bright field Microscopy – Principle, Construction and Working
2.2 Dark field Microscopy - Principle, Construction and Working
2.3 Fluorescent Microscopy - Principle, Construction and Working
2.4 Phase Contrast Microscopy - Principle, Construction and

Working

2.5 Electron Microscopy – Types, working and Limitations

2.6 Introduction to Confocal Microscopy

2.7 Introduction to Stains, Mordents, Decolorizers and Fixatives

2.8 Preparations for Light Microscope Examinations

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-6th Edition, Agrobios Publications, Delhi.

UNIT 3 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

MORPHOLOGY OF BACTERIA

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 intracellula 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 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

CULTIVATION OF BACTERIA

4.1 Nutritional requirements of bacteria
4.2 Nutritional types of Bacteria
4.3 Bacteriological Media
4.4 Physical conditions required for growth
4.5 Gaseous requirements and oxygen toxicity
4.6 Selective methods
4.7 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 Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
4 Stanier, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5 Edition. MacMillan Press Ltd., London.
5 Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

UNIT 5 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

REPRODUCTION AND GROWTH OF BACTERIA

5.1 Reproduction of Bacteria : Modes of cell division and new cell formation
5.2 Growth of Bacteria: Generation time, Growth rate
5.3 Bacterial Growth Curve
5.4 Synchronous growth and Continuous culture of Bacteria

REFERENCE BOOKS (SEMESTER 1 UNIT 5)

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

MB-101- BASIC ASPECTS OF MICROBIOLOGY (PRACTICAL)

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

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) **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 2016)
MB-201- MICROBIAL CHEMISTRY AND MICROBIAL CONTROL (THEORY)

UNIT 1 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

SCOPE AND HISTORY OF MICROBIOLOGY

1.1 Chemicals, Elements and structure of Atoms
1.2 Molecules and Chemical bonds
1.3 Chemical reactions
1.4 Water and pH
1.5 The essence of biochemistry for microbiologist

REFERENCE BOOKS (SEMESTER 2 UNIT 1)

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

UNIT 2 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

INTRODUCTION TO BIOMOLECULES

2.1 Classification, Structures and Biological function of Carbohydrates
2.2 Classification, Structures and Biological function of Lipids
2.3 Classification, Structures and Biological function of Proteins
2.4 Classification, Structures and Biological function of Nucleic acids

REFERENCE BOOKS (SEMESTER 2 UNIT 2)

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

UNIT 3 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

ENZYMES

3.1 Characteristics of Enzymes, Chemical & Physical Properties of Enzymes
3.2 Classification and Nomenclature of Enzymes
3.3 Enzyme activity: Nature & Mechanism of enzyme activity, Inhibition of enzymes
3.4 Mechanism and Regulation of Enzymes Activity
3.5 Mechanism and Regulation of Enzymes Synthesis
3.6 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 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 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

CONTROL OF MICROORGANISMS BY PHYSICAL AND CHEMICAL AGENTS

4.1 Fundamentals of Microbial Control
Principle and Types, 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 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-6th Edition, Agrobios Publications, Delhi.

UNIT 5 (CREDIT-0.8, TEACHING HOURS-12, MARKS-14)

ANTIBIOTICS AND THEIR MODE OF ACTION

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 Microbiological assay of antibiotics
5.6 Nonmedical uses of antibiotics

REFERENCE BOOKS (SEMESTER 2 UNIT 5)

1. Atlas. R.M., Microbiology, 2 nd Edition. Wm. C. Brown Publishers
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Powar and Daginawala, 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-6th Edition, Agrobios Publications, Delhi.

MB-201 MICROBIAL CHEMISTRY AND MICROBIAL CONTROL (PRACTICAL)

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

Total Credit – 3

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) **Assay of Alpha – Amylase by iodometric method**
7) **Effect of Chemicals on growth of bacteria**
9) **Effect of Antibiotics on growth of bacteria : Agar ditch method and Agar cup Method.**
10) **Total count of yeast by microscopic method using Haemocytometer**
11) **Measurement of size of microorganisms by Micrometry (Demonstration)**

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
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