SAURASHTRA UNIVERSITY

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

COURSE STRUCTURE & SYLLABUS

FOR

UNDERGRADUATE PROGRAMME

IN

MICROBIOLOGY

(CORE COURSE FOR SEMESTER III & IV)

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

Effective from June – 2020

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 Agriculture, Biochemistry, Bioinformatics, Biotechnology, Genetic engineering, Medical Microbiology, Molecular biology, and many allied subjects. Therefore, it holds a central position in the curriculum of these subjects. Looking to the rapid innovations and technological advancements 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 across the region.

Composition of Curriculum is made considering the following criteria

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 unit in every 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 formulating the curriculum:

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

The Registrar, Academic Department and the Dean, Faculty of Science, Saurashtra University have provided valuable guidelines and facilities for the framing of this curriculum. The Board of Studies for Microbiology expresses its heartfelt gratitude to all concerned for their cooperation. 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 : 21st June 2019

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SAURASHTRA UNIVERSITY

FACULTY OF SCIENCE

CBCS BASED COURSE STRUCTURE FOR SEMESTER 1 TO 6 & SYLLABUS FOR SEMESTER 3 & 4 FOR UNDERGRADUATE PROGRAMME IN MICROBIOLOGY TO BE EFFECTIVE FROM JUNE 2019 AND JUNE 2020 RESPECTIVELY

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	Semester	Paper No.	Option
1	Graduate	01	Fundamentals of Microbiology	MB 101	4	30	70	50	150	2019	03	05	-	01	01	01	-
2	Graduate	02	Basics of Biochemistry & Microbial Control	MB 201	4	30	70	50	150	2019	03	05	-	01	02	02	-
3	Graduate	03	Microbial Diversity	MB 301	4	30	70	50	150	2020	03	05	-	01	03	03	-
4	Graduate	04	Applied & Environmental Microbiology	MB 401	4	30	70	50	150	2020	03	05	-	01	04	04	-
5	Graduate	05	Immunology	MB 501	4	30	70	50	150	2021	03	05	-	01	05	05	-
6	Graduate	05	Bacterial Metabolism	MB 502	4	30	70	50	150	2021	03	05	-	01	05	06	-
7	Graduate	05	Molecular Biology and Genetic Engineering	MB 503	4	30	70	50	150	2021	03	05	-	01	05	07	
8	Graduate	06	Fermentation Technology	MB 601	4	30	70	50	150	2021	03	05	-	01	06	08	-
9	Graduate	06	Bio - Analytical Techniques	MB 602	4	30	70	50	150	2021	03	05	-	01	06	09	-
10	Graduate	06	Clinical and Diagnostic Microbiology	MB 603	4	30	70	50	150	2021	03	05	-	01	06	10	-

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)	**Fundamentals of Microbiology**	4
	MB-101 (Practical)	**-do-**	3
II	MB-201 (Theory)	**Basics of Biochemistry and Microbial Control**	4
	MB-201 (Practical)	**-do-**	3
III	MB-301 (Theory)	**Microbial Diversity**	4
	MB-301 (Practical)	**-do-**	3
IV	MB-401 (Theory)	**Applied and Environmental Microbiology**	4
	MB-401 (Practical)	**-do-**	3
V	MB-501 (Theory)	**Immunology**	4
	MB-501 (Practical)	**-do-**	3
	MB-502 (Theory)	**Bacterial 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)	**Fermentation Technology**	4
	MB-601 (Practical)	**-do-**	3
	MB-602 (Theory)	**Bio-Analytical Techniques**	4
	MB-602 (Practical)	**-do-**	3
	MB-603 (Theory)	**Clinical and Diagnostic Microbiology**	4
	MB-603 (Practical)	**-do-**	3

SYLLABUS FORMAT OF SEMESTER 3 AND 4

Stream	Paper	Unit	Title of Unit	Credit	Lectures	Marks		
						External		Internal
B.Sc. Sem-3 (UG) Paper-301	MB-301- MICROBIAL DIVERSITY THEORY CREDIT (06)	1	INTRODUCTION TO MICROBIAL DIVERSITY	0.8	12	70	14	30
		2	PROKARYOTIC DIVERSITY	0.8	12		14	
		3	DIVERSITY OF SOME UNUSVAL PROKARYOTES	0.8	12		14	
		4	EUKARYOTIC DIVERSITY	0.8	12		14	
		5	AKARYOTIC DIVERSITY (VIRUS)	0.8	12		14	
	Total			**4**	**60**	**100**		
	MB301 PRACTICAL CREDIT (03)		ISOLATION, CHARACTERIZATION AND MICROSCOPIC OBSERVATIONS	03	30	35		15
	Total			**03**	**30**	**50**		
B.Sc. Sem-4 (UG) Paper-401	MB- 401 APPLIED AND ENVIRONMENTAL MICROBIOLOGY THEORY CREDIT (06)	1	SOIL MICROBIOLOGY	0.8	12	70	14	30
		2	FOOD MICROBIOLOGY	0.8	12		14	
		3	MILK MICROBIOLOGY	0.8	12		14	
		4	MICROBIOLOGY OF DRINKING WATER AND WASTE WATER	0.8	12		14	
		5	ENVIRONMENTAL MICROBIOLOGY	0.8	12		14	
	Total			**4**	**60**	**100**		
	MB401 PRACTICAL CREDIT (03)		QUALITATIVE AND QUANTITATIVE ANALYSIS OF SOIL, FOOD, MILK, WATER AND AIR	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 – III and IV: MB 301 and MB 401

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: 301 AND MB: 401 (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 301 AND MB 401 (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 3 AND 4

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 - III
(With effect from June 2020)
MB-301- MICROBIAL DIVERSITY
(THEORY)

UNIT 1: INTRODUCTION TO MICROBIAL DIVERSITY

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

1.1 Biodiversity- Microbial evolution and types of diversity
1.2 Introduction and overview of microbial taxonomy, taxonomic ranks of microorganisms and classification systems (Phenetic, phylogenetic and polyphasic classification)
1.3 Major characteristics used in taxonomy: classical and molecular characteristics
1.4 Major divisions of life and groups of microorganisms: study of different classifications and place of microbes
1.5 Introduction and overview of Metagenomics and its applications

REFERENCE BOOKS (SEMESTER 3 UNIT 1)

1. Frazier, W.C., Westhoff, D.C. (1978). Food Microbiology. Tata McGraw-Hill Publishing Company.
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Salle, S.J. (1974).Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
4. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

UNIT 2: PROKARYOTIC DIVERSITY

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

2.1 Introduction and overview of Bergey's Manual and Habitat and distinguishing features of Gram negative & positive bacteria
2.2 Aerobic/ Microaerophilic Gram negative bacteria:
  2.2.1 Motile, helical & vibrioid
  2.2.2 Non-motile curved bacteria
  2.2.3 Rods and cocci
2.3 Facultative anaerobic Gram negative bacteria:
  2.3.1 Rods, curved and helical bacteria
  2.3.2 Dissimilatory Sulfate reducers
2.4 Anaerobic Gram negative bacteria:
  2.4.1 Anaerobic cocci
  2.4.2 Phototrophic bacteria (Anoxygenic and oxygenic phototrophs)
2. 5 Gram positive bacteria – General features of:
  2.5.1 Endospore forming rods and cocci
  2.5.2 Asporogenous rods and cocci
  2.5.3 Mycobacteria and Actinomycetes

REFERENCE BOOKS (SEMESTER 3 UNIT 2)

1. Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5th Edition. New York: WCB Mc GrawHill publication.
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Salle, S.J. (1974).Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
4. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.
5. Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.

UNIT 3: DIVERSITY OF SOME UNUSVAL PROKATYOTES

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

3.1 Bacteria with unusual morphology
- 3.1.1 Budding and appendaged bacteria
- 3.1.2 Sheathed Bacteria
- 3.1.3 Mycoplasma

3.2 Bacteria with gliding motility

3.3 Rickettsia and Chlamydia

3.4 Archaeabacteria
- 3.4.1 Introduction and general features of archaea
- 3.4.2 Types of Extremophilic Microorganisms: over view of Thermophiles, Halophiles, Acidophiles, Alkalophiles, Barophiles and Methanogens

3.5 Importance of prokaryotic microorganisms

REFERENCE BOOKS (SEMESTER 3 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.
5. Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. **General Microbiology, 5th Edition**. MacMillan Press Ltd., London.
6. Salle, S.J. Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi

UNIT 4: EUKARYOTIC DIVERSITY

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

A: FUNGI

4.1 General characteristics, occurrence, Structure, Reproduction (Mucor and Aspergillus)

4.2 Economic importance of fungi

B: ALGAE

4.3 General Characteristics, Occurrence & Ultra- Structure

4.4 Economic importance of Algae

C: PROTOZOA

4.5 General Characteristics, Occurrence, Ultra- Structure & Economic importance of Protozoa

REFERENCE BOOKS (SEMESTER 3 UNIT 4)

1 Dubey, R.C.and Maheshwari, D.K., **A Text Book of Microbiology**, S. Chand Publications, New Delhi.

2 Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.

3 Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.

4 Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.

5 Stanier, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.

6 Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

UNIT 5: AKARYOTIC DIVERSITY

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

5.1 Introduction, General Characteristics and Classification (overview of different classifications)

5.2 Cultivation of Viruses

5.3 Bacterial Viruses: general structure (T4 phage), Lytic life cycle (T4 phage), lysogenic life cycle with genetics (Lambda phage)

5.4 Introduction to Animal Viruses: Structure (HIV), Cytocidal effects, Viruses and Cancer, Prions

5.5 Introduction to Plant Viruses: Structure of TMV, Economic importance, Viroids

REFERENCE BOOKS (SEMESTER 3 UNIT 5)

1. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5th Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
2. Frobisher M., Hinsdill, Crabtree and Goodherat Fundamentals of Microbiology, 9th 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
5. Prescott, Healey and Klein., Microbiology-5th International Edition, Tata-McGraw Hill publications, Delhi
6. Atlas. R.M., Principles of Microbiology- 2nd Edition

MB-301- MICROBIAL DIVERSITY (PRACTICAL)

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

1) Isolation of Gram negative bacteria from the given sample.
2) Identification of Gram negative bacteria from the given pure culture using biochemical media (*E.coli, Entrobacter aerogens, Proteus, Salmonella)*
3) Isolation of Gram positive bacteria from the given sample.
4) Identification of Gram positive bacteria from the given pure culture using biochemical media (*Bacillus megaterium, Bacillus subtilis, staphylococcus aureus, Streptococcus*)
5) Identification of Fungi on the basis of Morphological Characteristics.
6) Cultivation of yeast from different natural samples and its morphological characterization using microscopic observation.
7) Microscopic observation of different algae from the given samples.
8) Microscopic observation of different protozoa from the given sample.
9) Isolation and cultivation of bacteriophage of *E.coli* from the given sewage sample.
10) Cultivation of Extremophile (Halophile/thermophile/acidophile/alkalophile/psychophile)

REFERENCE BOOKS (SEMESTER 3 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 - IV
(With effect from June 2020)
MB-401- APPLIED AND ENVIRONMENTAL MICROBIOLOGY (THEORY)

UNIT 1: SOIL MICROBIOLOGY

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

1.1 Physical & Chemical Characteristics of Soil (formation and horizon of soil)
1.2 Rhizosphere & Microbial flora of Soil and their Interactions among soil microorganisms: (Neutral, Beneficial & Harmful interactions)
1.3 Biogeochemical cycle - Nitrogen cycle and biochemistry of nitrogen fixation
1.4 Biogeochemical cycle – Sulphur cycle and winogradsky's column
1.5 Biogeochemical cycle – Carbon cycle & humus

REFERENCE BOOKS (SEMESTER 4 UNIT 1)

1. Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5th Edition. New York: WCB Mc GrawHill publication.
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Salle, S.J. (1974).Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
4. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.
5. Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.

UNIT 2: FOOD MICROBIOLOGY

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

2.1 Microbial flora of fresh food & Microbial spoilage of Fresh foods & Canned Foods
2.2 Food Borne infection & intoxication: Role of *S.aureus*, *C.botulinum* & *Salmonella* Spp.in food poisoning
2.3 Preservation of foods: General principles & methods of food preservation
2.4 Microbiological examination of food; Introduction to AGMark
2.5 Brief introduction about fermented foods: Pickles, Sauerkraut, Silage, Sausages & Bread and Microorganisms as food: Single Cell Protein, Mushrooms and Functional foods

REFERENCE BOOKS (SEMESTER 4 UNIT 2)

1. Frazier, W.C., Westhoff, D.C. (1978). Food Microbiology. Tata McGraw-Hill Publishing Company.
2. Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5th Edition. New York: WCB Mc GrawHill publication.
3. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
4. Salle, S.J. (1974).Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
5. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.
6. Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.

UNIT 3: MILK MICROBIOLOGY

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

3.1 Types of microbes in milk
3.2 Fermented milk Beverages & Manufactured Dairy Products: Starter Culture, Cheese, Yogurt, Buttermilk, Acidophilus milk, Kefir
3.3 Spoilage of milk & milk products
3.4 Microbial analysis of milk: SPC, Direct count, MBRT, Resazurin test and Grading of milk
3.5 Preservation of milk: Principles & methods of preservation

REFERENCE BOOKS (SEMESTER 2 UNIT 3)

1. Prajapati, J.B. (1995). Fundamentals of Dairy Microbiology: Ekta Publication, India
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5th Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
3. Powar and Daginawala, General Microbiology Vol-I. Himalaya Publishing House, Mumbai.
4. Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5th Edition. New York: WCB Mc GrawHill publication.

UNIT 4: MICROBIOLOGY OF DRINKING WATER AND WASTE WATER

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

4.1 Microbiology of drinking water: Sanitary survey, Bacteriological evidence of pollution, Bacteriological analysis & Sampling techniques of water & Microorganisms other than Coliforms as nuisance organisms
4.2 4.2 Water purification: Sedimentation, Filtration use of Sand filters, Disinfection C Waste water
4.3 Chemical and Microbial Characteristics of waste water, B.O.D., C.O.D. as indicator of quality of waste water
4.4 Waste water treatment & Disposal - Single Dwelling Process & Treatment - Primary Treatment, Secondary Treatment, Advanced & final treatment
4.5 Solid waste processing: Anaerobic Sludge digestion & Composting

REFERENCE BOOKS (SEMESTER 4 UNIT 4)

1. Frazier, W.C., Westhoff, D.C. (1978). Food Microbiology. Tata McGraw-Hill Publishing Company.
2. Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5th Edition. New York: WCB Mc GrawHill publication.
3. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi.
4. Salle, S.J. (1974).Fundamental Principals of Bacteriology, Tata McGraw Hill Publication Co. Ltd. New Delhi.
5. Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.
6. Stainer, R.Y., Iingraham, J.L., Wheelis, M.L., Painter, R.K. General Microbiology, 5th Edition. MacMillan Press Ltd., London.

UNIT 5: ENVIRONMENTAL MICROBIOLOGY

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

5.1 Pollution – types, pollutants, sources, effects on ecology

5.2 Biomagnification of pesticides

5.3 Biodeterioration of paper, metal and paint.

5.4 Bioleaching and bioenhanced oil recovery

5.5 Microbial technology for sustainable environment: Biofuel, Bioplastic, Biofertilizer

REFERENCE BOOKS (SEMESTER 4 UNIT 5)

1. Atlas. R.M., Microbiology, 2nd Edition. Wm. C. Brown Publishers
2. Pelczar, M.J., Chan E.C.S., Krieg, N.R., Microbiology, 5th 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-401 APPLIED AND ENVIRONMENTAL MICROBILOGY (PRACTICAL)

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

1) Isolation of nitrogen fixing bacteria
2) Cultivation of nitrifying and denitrifying bacteria (Demo)
3) Cultivation of cellulose decomposing microorganisms from soil (Demo)
4) Demonstration of oozing , and isolation of pathogen from diseased specimen of lemon leaf showing citrus canker and isolation of Xanthomonas spp.
5) Standard qualitative analysis of milk
6) Methylene Blue Reduction Time test for milk
7) Isolation and identification of coli forms from Water by Presumptive, Confirmed & Completed test
8) Chemical analysis of water: Chloride, Hardness, Nitrite Nitrogen, Alkalinity, Acidity, TDS, TSS, TS
9) Chemical analysis of water: BOD (demo), DO (to perform)
10) Determination of air flora and air density from indoor & outdoor sources

REFERENCE BOOKS (SEMESTER 4 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.