MAHATMA GANDHI UNIVERSITY

KOTTAYAM

KERALA, INDIA

SCHEME & SYLLABUS

For
B.Sc. MICROBIOLOGY PROGRAMME
&
COURSES OFFERED BY UG BOARD OF STUDIES IN MICROBIOLOGY

(UNDER CHOICE BASED CREDIT SYSTEM (CBCS); W.E.F.2017 ADMISSION)

MAHATMA GANDHI UNIVERSITY, KOTTAYAM

Undergraduate Programme in Microbiology

Scheme & Syllabus

CONTENTS

ACKNOWLEDGEMENT

The Expert Committee in Microbiology (UG) and Faculty of Sciences acknowledges honourable Vice Chancellor of Mahatma Gandhi University, for the help and guidance extended during the syllabus restructuring of B.Sc. Microbiology Programme.

We thank Pro Vice Chancellor of Mahatma Gandhi University, for the valuable suggestions.

We also thank the Registrar of Mahatma Gandhi University and members of Mahatma Gandhi University Syndicate for all the support given to us.

We thank the Academic and Finance section of Mahatma Gandhi University for extending their service for smooth completion of syllabus restructuring. We also acknowledge the contributions, support, and active participation in workshop and recommendations from Dr. Latha MS (Dean Faculty of Sciences and Syndicate Member, Mahatma Gandhi University), and faculty members in Microbiology from School of Biosciences and from various colleges in Mahatma Gandhi University in designing this Syllabus.

THANK YOU

Expert Committee in Microbiology (UG) and Faculty of Sciences

Kottayam

02-05-2017

ELIGIBILITY CRITERIA FOR ADMISSION TO B. SC. MICROBIOLOGY PROGRAMME

Pass in plus two or equivalent with biology as a subject or vocational higher secondary in any biological/paramedical/agricultural/related branch.

DURATION OF COURSE

- The duration of U.G. programme in Microbiology shall be 6 semesters.
- There shall be two Semesters in an academic year, the 'ODD' semester commences in June and on completion, the 'EVEN' Semester commences after a semester-break of three days with two month vacation during April and May. (The commencement of first semester may be delayed owing to the finalization of the admission processes.)

A student may be permitted to complete the Programme, on valid reasons, within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

EVALUATION OF PROJECT, OJT, ASSIGNMENT, SEMINAR, VIVA, INTERNAL ASSESSMENT, TEST PAPERS

• Assignments- Assignments are to be done from 1st to 4th Semesters. At least one assignment should be done in each semester for all papers.

• Seminar/Viva- A student shall present a seminar in the 5th semester for each paper and appear for Viva-voce in the 6th semester for each paper.

• Internal Assessment, Test Papers-At least one internal test-paper is to be attended in each semester for each paper. The evaluations of all components are to be published and are to be acknowledged by the candidates. All documents of internal assessments are to be kept in the college for two years and shall be made available for verification by the University. The responsibility of evaluating the internal assessment is vested on the teacher(s), who teach the paper.

• Project- All students are to do a project in the area of core course. This project can be done individually or in groups (not more than five students) for all subjects which may be carried out in or outside the campus. The projects are to be identified during the II semester of the programme with the help of the supervising teacher. The report of the project in duplicate is to be submitted to the department at the sixth semester and are to be produced before the examiners appointed by the University. External Project evaluation and Viva / Presentation is compulsory for all subjects and will be conducted at the end of the programme. Along with project report, a report of visit to a research institute/industry must be submitted during the viva.

CONDUCT OF PRACTICAL EXAMINATIONS

Practical examinations will be conducted at the end of Even Semesters by a team consisting of an external examiner and internal examiner. Total marks for the core courses practical examinations will be 100 comprising 20 internal and 80 external. Components for the internal evaluation of marks will be attendance, test, and record with 4 marks, 8 marks and 8 marks respectively. Examination for Practical II (core 12) and practical III (core 20) are for two and three consecutive days.

Mahatma Gandhi University, Kottayam
B.Sc Course in Microbiology under Choice Based Credit System
(Model III)
Consolidated scheme for all semesters

Semester	Course Code	Title	Course Category	Hours/ week		Credit	Marks %	
				T	P		Intl	Extl
First Semester		Common course- English I	Common	5		4	20	80
	MB1CRT01	Fundamentals of Microbiology	**Core 1**	4		4	20	80
	MB1CRT02	Microbial Physiology & Metabolism	**Core 2**	4		4	20	80
		Microbiology Practical-1	**(Core 5)**		4	0		
	BC1CMT01	First complementary course I Elementary Biochemistry-1	Complementary	2		2	15	60
		Practical complementary-1			2	0		
	BT1CMT01	Second complementary course I Cell Biology	Complementary	2		2	15	60
		Practical complementary -II			2	0		
TOTAL				**17h**	**8h**	**16**		
Second Semester		Common course - English II	Common	5		4	20	80
	MB2CRT03	Immunology	**Core 3**	4		4	20	80
	MB2CRT04	Microbial Genetics	**Core 4**	4		4	20	80
	MB2CRP05	Microbiology Practical-I	**Core 5**		4	4	20	80
	BC2CMT02	First complementary course II Biomolecules	complementary	2		2	15	60
	BC2CMP01	Complementary practical I			2	2	10	40
	BT2CMT02	Second complementary course II Genetics	complementary	2		2	15	60
	BT2CMP01	Complementary practical- II			2	2	10	40
TOTAL				**17h**	**8h**	**24**		
Third Semester	MB3CRT06	Bioinstrumentation and Techniques	**Core 6**	4		4	20	80
	MB 3CRT07	Industrial Microbiology	**Core 7**	4		4	20	80
	MB3CRT08	Food Microbiology	**Core 8**	4		3	20	80
		Microbiology Practical -II	**(Core 12)**		4	0		
	BC3CMT03	First complementary course III Enzymology and Metabolism	complementary	3		3	15	60
		Practical			2	0		
	BT3CMT03	Second complementary course III Molecular Biology and Recombinant DNA Technology	complementary	2		2	15	60
		Practical			2	0	10	40
TOTAL				**17h**	**8h**	**16**		

Fourth Semester	MB4CRT09	Fundamentals of Biostatistics, Bioinformatics & Research Methodology	**Core 9**	4		4	20	80
	MB4CRT10	Aquatic Microbiology	**Core 10**	4		3	20	80
	MB4CRT11	Agricultural Microbiology	**Core 11**	4		4	20	80
	MB4CRP12	Microbiology Practical - II	**Core 12**		4	4	20	80
	BC4CMT04	First complementary course IV Nutritional and Clinical Biochemistry	complementary	3		3	15	60
	BC4CMP02	Complementary practical-II			2	2	10	40
	BT4CMT04	Second complementary course IV	complementary	2		2	15	60
	BT4CMP02	Complementary practical-II			2	2	10	40
TOTAL				**17h**	**8h**	**24**		
Fifth Semester	MB5CRT13	Medical Bacteriology - I	**Core 13**	4		4	20	80
	MB5CRT14	Medical Mycology	**Core 14**	4		4	20	80
	MB5CRT15	Medical Parasitology	**Core 15**	4		3	20	80
	MB5CRT16	Environmental Microbiology and human rights	**Core 16**	4		4	20	80
		Microbiology practical -III	**(Core 20)**		5	0		
	MB5OPT01 MB5OPT02 MB5OPT03	*Open course: (Two options for the College to choose from) Human Physiology Nutrition and Health Ecology and Evolution	**Core**	4		3	20	80
TOTAL				**20h**	**5h**	**18**		
Sixth Semester	MB6CRT17	Medical Virology	**Core 17**	4		4	20	80
	MB6CRT18	Diagnostic Microbiology	**Core 18**	4		4	20	80
	MB5CRT19	Medical Bacteriology - II	**Core 19**	2		2	20	80
	MB4CRP20	Microbiology Practical - III	**Core 20**		5	4	20	80
	MB6CBT01 MB6CBT02 MB6CBT03	**Choice based paper I (One among the Three papers students can choose from) Microbioprocess Sanitation Microbiology Medical Entomology	**Core**	4		4	20	80
	MB6PRP01	Project work	**Core**		6(P)	4	20	80
TOTAL				**14h**	**11h**	**22**		

Project work is a single course spread over fifth and sixth semesters having both internal and external evaluation which will be conducted at the end of the programme.

Note: Along with project report, a report of visit to a research institute/industry must be submitted during the viva.

Total mark division for the core practical courses is 20/80 for internal/external exams. Components of internal evaluation are attendance (4 marks), test (8 marks) and record (8 marks).

*Choice based open course offered to students of other Departments (in Vth Semester)

MB5OPT01 Human Physiology - 3 Credits

MB5OPT02 Nutrition and Health - 3 Credits

MB5OPT03 Ecology and Evolution - 3 Credits

**Choice based core courses offered (in VIth Semester)

MB6CBT01- Microbioprocess - 4 credits

MB6CBT02- Sanitation Microbiology - 4 credits

MB6CBT03- Medical Entomology - 4 credits

Consolidated scheme for programmes (Model I, II & III)
Having Microbiology as a Complementary courses
Theory papers

Semester	Title with Course Code	Course Category	Hours/ week	Credit	Total Credit	Marks %	
						Intl	Extl
First	MB1CMT01 Fundamentals of Microbiology-1	Complementary	2	2	8	15	60
Second	MB2CMT02 Fundamentals of Microbiology-II	Complementary	2	2		15	60
Third	MB3CMT04 Applied Microbiology	Complementary	2	2		15	60
Fourth	MB4CMT05 Medical Microbiology	Complementary	2	2		15	60

Practical papers

Semester	Title with Course Code	Course Category	Hours/ week	Credit	Total Credit	Marks %	
						Intl	Extl
First and Second	MB2CMP03 Microbiology Practical-I	Complementary	2	2	4	10	40
Third and Fourth	MB4CMP06 Microbiology Practical-II	Complementary	2	2		10	40

Consolidated Scheme of Courses offered to B. Sc. Zoology Vocational - Medical Microbiology - (Model II Programme)

Semester	Course code	Course Title	Credit	Marks %	
				Internal	External
I sem.	ZM2VOT01	Fundamentals of Microbiology	3	20	80
	ZM2VOT02	Basics of Microbial Physiology & Genetics	3	15	60
II Sem.	ZM2VOT03	Parasitology	3	20	80
	ZM2VOT04	Medical Virology	3	15	60
	ZM2VOP01	Fundamentals of Microbiology, Basics of Microbial Physiology & Genetics, Parasitology & Medical virology	2	10	40
III Sem.	ZM3VOT05	Medical Mycology	3	15	60
	ZM3VOT06	Diagnostic Microbiology	3	15	60
IV Sem.	ZM4VOT07	Medical Bacteriology	3	15	60
	ZM4VOT08	Clinical Microbiology	3	15	60
	ZM4VOP02	Medical Mycology & Diagnostic Microbiology	2	10	40
	ZM4VOP03	Medical Bacteriology and Clinical Microbiology	2	10	40

Consolidated Scheme of Courses offered to B.Sc. Zoology and Industrial Microbiology (Double Main) Model-III Programme

Semester	Course code	Course Title	Credit	Marks %	
				Internal	External
I Sem.	ZIICRT01	Fundamentals of microbiology	2	15	60
	ZI1CRT02	Microbial Diversity	2	15	60
	ZI1CRT03	Microbial physiology	2	15	60
II Sem.	ZI2CRT04	Microbial waste management	2	15	60
	ZI2CRT05	Medical microbiology	2	15	60
	ZI2CRT06	Agricultural microbiology	2	15	60
	ZI2CRP01	Fundamentals of Microbiology & Microbial Waste Management	2	10	40
	ZI2CRP02	Microbial Diversity & Medical Microbiology	2	10	40
	ZI2CRP03	Microbial Physiology & Agricultural Microbiology	2	10	40
III Sem.	ZI3CRT07	Microbial Genetics and Recombinant DNA Technology	3	15	60
	ZI3CRT08	Industrial Microbiology	3	15	60
	ZI3CRT09	Fermentation Technology	3	15	60
IV Sem.	ZI4CRT10	Food Microbiology	3	15	60
	ZI4CRT11	Diary Microbiology	3	15	60
	ZI4CRP04	Microbial Genetics and Recombinant DNA Technology & Food Microbiology	2	10	40
	ZI4CRP05	Industrial Microbiology & Diary Microbiology	2	10	40
	ZI4CRP06	Fermentation Technology & Research methodology, Biophysics and Biostatistics	2	10	40
VI Sem.	ZI6PRP01	Project work & Field Visit/Study Tour, Visit to research Institutes, Group activity	2	20	80
VI sem.	ZI6OJP01	On Job training (64 Hrs + 36 Hrs)	3	100	-

Syllabus for B.Sc. Microbiology-Core

FIRST SEMESTER

Core Course I: MB1CRT01 Fundamentals of Microbiology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit 1

Introduction to Philosophy of Science - Relationship between History and Philosophy of Science. What is Science?Laws of science.

Definition, Scope and history of microbiology and future prospects. Diversity of microbial world. Beneficial and harmful microbes. Five kingdom classification. Principles of classification, Groups of bacteria as per Bergey's manual

References:

Biochemical methods by Pingoud A, Urbanke C, Hoggett J and Jeltsch A,Chapter 1

Unit 2

Differentiate between eukaryote and prokaryote. Principles of classification- classification of bacteria. Differences between archaebacteria and eubacteria. Ultrastructure of prokaryotic cell.

References:

1. Microbiology by Daniel Lim
2. Microbiology: Principles and Explorations by Jacquelyn G. Black
3. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton
4. Microbiology Pelczar, Chan and Krieg.
5. General microbiology Vol 1 Powar&Daginawala
6. Microbiology Pelczar, Chan and Krieg.
7. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K JayaramPanikar

Unit 3

Staining techniques, Culture media and culture methods (including anaerobic bacteria). Isolation of pure cultures.

References:

1. Microbiology Pelczar, Chan and Krieg. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

2. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton

3. General microbiology Vol 1 Powar&Daginawala

Unit 4

Sterilisation and disinfection – physical and chemical methods. Antibiotics – Classification & mode of action. Disinfectants and its testing

References:

1. Microbiology Pelczar, Chan and Krieg.
2. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
3. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
4. General microbiology Vol 1 Powar&Daginawala

Core Course 2: MB1CRT02 Microbial Physiology &Metabolism

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit 1: Nutrition, nutritional types, Preservation and transport of bacteria. Microbial Photosynthesis. Microbial life in extreme environments.

References:

1. General microbiology Vol 1 Powar&Daginawala
2. General microbiology Vol 2 Powar&Daginawala
3. Microbiology Pelczar, Chan and Krieg
4. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton

Unit 2: Growth requirements and conditions influencing growth, growth curve, growth kinetics, cell division, sporulation, germination. Enumeration & quantification of bacteria and microbes.

References:

1. General microbiology Vol 1 Powar&Daginawala
2. General microbiology Vol 2 Powar&Daginawala
3. Microbiology Pelczar, Chan and Krieg
4. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton

Unit 3: Enzymes, factors affecting enzyme activity, transition state in enzyme catalysed reactions, high energy compounds- ATP, GTP, role of reducing power of NAD, NADPH.

References:

1. General microbiology Vol 1 Powar&Daginawala
2. General microbiology Vol 2 Powar&Daginawala
3. Microbiology Pelczar, Chan and Krieg 11

Unit 4: Bacterial metabolism- Carbohydrate metabolism- glycolysis, alcoholic fermentation, TCA cycle, glyoxalate cycle, electron transport chain, substrate level and oxidative phosphorylation, pentose phosphate pathway. Transamination and Nitrogen fixation

References:

1. General microbiology Vol 1 Powar&Daginawala
2. General microbiology Vol 2 Powar&Daginawala
3. Microbiology Pelczar, Chan and Krieg
4. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton 12

SECOND SEMESTER

Core Course 3: MB2CRT03 Immunology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I:

History of Immunology, Introduction to Infection, Types of Immunity- innate immunity and acquired immunity, Detailed study of cells and organs involved in immune system

References:

1. Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby
2. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
3. I.Kannan (2007), "Immunology",MJP Publishers, Chennai 600005.
4. Roitt's Essential Immunology by Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt

Unit II:

Antigens- types, properties, Haptens, Adjuvants, Immunoglobulins- Structure, types and properties. Complement- function of complement, components and pathways, Major histocompatibility complex

Antigen antibody reaction- precipitation reactions, agglutination reactions, complement fixation, Neutralisation reactions, Inmunofluroscence, ELISA, RIA.

References:

1. Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby
2. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
3. I.Kannan (2007), "Immunology",MJP Publishers, Chennai 600005.
4. Roitt's Essential Immunology by Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt

Unit III:

Humoral Immune response, plasma cells and antibody secretion, Monoclonal antibodies, Cell mediated immune response- Cytokines, natural killer cells and antibody dependent cell mediated cytotoxicity

References:

1. Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby 13 Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

2. I.Kannan (2007), "Immunology",MJP Publishers, Chennai 600005.
3. Roitt's Essential Immunology by Peter Delves, Seamus Martin , Dennis Burton, Ivan Roitt

Unit IV:

Immunohaematology- Blood groups. Blood transfusion- Rh incompatibilities, Hypersensitivity Reactions- Type I, II, III, & IV. Brief of Transplantation Immunology- Types of grafts. Autoimmunity.

References:

1. Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby
2. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
3. I.Kannan (2007), "Immunology",MJP Publishers, Chennai 600005.

Core Course 4: MB2CRT04 Microbial Genetics

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I:–. Bacterial chromosome- structure, Experiments to prove DNA as genetic material, replication, Extrachromosomal genetic material-introduction- Plasmids – structure, replication, incompatibility, Transposons –Brief Introduction, transposition- Cut & Paste mechanism.

References:

1. Microbial Genetics Stanley R. Maloy, Freifelder and Cronan
2. Molecular Genetics of Bacteria Snyder and Charminess.
3. Fundamentals of molecular Biology by Veer BalaRastogiAne books India

Unit II: Genetic exchange – Experiments & Mechanism - Conjugation, Transformation, Transduction. Mechanism and Spread of Antibiotic Resistance in Bacteria.

References:

1. Microbial Genetics Stanley R. Maloy, Freifelder and Cronan
2. Molecular Genetics of Bacteria Snyder and Charminess.
3. Fundamentals of molecular Biology by Veer BalaRastogi, Ane books India

Unit III: Gene expression in prokaryotes - Central Dogma, Transcription, Translation, Enzymes involved. Control of Gene Expression in Prokaryotes – Induction, Repression, Positive Control, Negative Control – based on Lac operon.

References:

1. Microbial Genetics Stanley R. Maloy, Freifelder and Cronan
2. Molecular Genetics of Bacteria Snyder and Charminess.
3. Fundamentals of molecular Biology by Veer BalaRastogi, Ane books India

Unit IV: Mutation – Spontaneous, Induced – Mutagens, Physical & Chemical.

Types of Mutation - base pair changes, frame shift, deletion, addition. Useful phenotypes of mutants (Auxotrophs, conditional, lethal, resistant). Reversion vs suppression. Ames test. DNA repair in bacteria- Excision Repair & SOS repair.

References:

1. Microbial Genetics Stanley R. Maloy, Freifelder and Cronan
2. Molecular Genetics of Bacteria Snyder and Charminess.
3. Fundamentals of molecular Biology by Veer Bala Rastogi, Ane books India
4. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton

Core Course 5- MB2CRP05 Microbiology Practical – I

Total hours of instruction: 144 Hours/week: 4 (72 in Semester I and72 in Semester II) **Credit: 4**

Study the parts and usage of a Compound Microscope

Study the parts and working and uses of

Autoclaves

Hot air oven

Membrane Filter

LAF
Anaerobic Jar
Preparation of culture Media(NB, NA, MA) and dispensing media in test tubes, bottles, petridishes.

Cultivation of Bacteria on nutrient Agar for obtaining isolated colonies; Streak plate method.
Study of cultural colony characters- Size, shape, colour etc.
Viable Count of bacteria by pour plate/ spread plate method.
Preparation and examination of Hanging drop mount for studying the motility of bacteria.

Preparation of slide smears for staining.

Staining- Principle & techniques

- Simple staining

- Gram Staining

- Negative Staining.

- Special Staining – endospores

Slide agglutination test - Blood grouping, ASO

Precipitation reaction –RPR

ODD, RID, Dot ELISA-Demonstration

Titration of Antibody – Widal Test.

References:

1. Microbiology – Concepts and Application – Pelzer Jr. Chang Kreig Mac Graw Hill Inc
2. Microbiology – Prescott, Harley and Klein Wim.C.Brown Publishers.
3. Practical Microbiology – R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.
4. Microbiology Laboratory Manual – Cappuccino, Sherman, Pearson Education
5. Manual of Microbiology Kanika Sharma Ane Books Pvt. Ltd.
6. Bailey and Scott's Diagnostic Microbiology
7. Practical Medical Microbiology by Mackie &McCartney
8. Hand book of experimental immunology by D.M. Weir
9. Practical Microbiology by Dubey and Maheswari

THIRD SEMESTER

Core Course 6: MB3CRT06 Bioinstrumentation and Techniques

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

Microscopy- Principle and application– bright field, dark field, phase contrast, fluorescent & Electron Microscope –SEM ad TEM. Resolving power, Numerical Aperture, Chromatic Aberration.

Reference

1. Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.
2. Practical Biochemistry Principles and Techniques - Ed Keith Wilson and John Walker Cambridge University press, Cambridge, U K.
3. Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings
4. Publishing Company
5. Microbiology: Jacquelyn G. Black

Unit II

Basic Principles and application of Differential centrifugation, Density gradient centrifugation. Basic Principle and application of ElectrophoresisAGE, PAGE, SDS PAGE. Two dimensional electrophoresis

Reference

1. Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.
2. Practical Biochemistry Principles and Techniques - Ed Keith Wilson and John Walker
3. Cambridge University press, Cambridge, U K.
4. Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings Publishing Company
5. Biochemical Methods- S. Sadasivam and A. Manikam

Unit III

Basic principles of colorimetry and turbidometry

Spectrophotometry: Principles and application –UV, Visible Spectrophotometry, Beer Lambert's Law

Reference

1. Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.
2. Practical Biochemistry" Principles and Techniques - Ed Keith Wilson and John Walker Cambridge University press, Cambridge , U K.
3. Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings
4. Publishing Company

5. Practical Biochemistry by Pattambiraman

Unit IV

PCR- Mechanism and application, Principles of ribotyping, RFLP, RAPD, DNA finger printing, DNA foot printing

Reference

1. Practical Biochemistry by Pattambiraman
2. Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.
3. Practical Biochemistry- Principles and Techniques - Ed Keith Wilson and John Walker Cambridge University press, Cambridge, U K.
4. Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings
5. Publishing Company
6. Biotechnology –B D Singh
7. Cell ad molecular biology -Gerald Karp

Core Course 7: MB3CRT07 Industrial microbiology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

General concepts of industrial microbiology. Principles of exploitation of microorganisms for their products. Introduction to fermentation, types of fermentation -single, batch, continuous, dual or multiple, solid- state and submerged fermentation. Industrial strains– characteristics and isolation techniques- primary and secondary screening techniques, strain improvement- introduction.

References

1. Principles of Fermentation Technology by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker
2. Industrial Microbiology by L.E. Casida
3. Industrial and Environmental Biotechnology by Nuzhat Ahmed; Fouad M Qureshi and Obaid Y. Khan

Unit II

Fermentor- parts of stirred tank fermentor, Fermentation media formulation strategies, sterilization, control of foaming, product recovery and purification (outlines only).

References

1. Principles of Fermentation Technology by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker
2. Industrial Microbiology by L.E. Casida

Unit III

Industrial products derived from microbes- organic acid – Citric acid, industrial enzymes- amylase, proteinase. Amino acid production - glutamic acid and lysine. Production of antibiotics- penicillins, streptomycins

References

1. Manual of Industrial Microbiology and Biotechnologyby Ronald M. Atlas
2. Prescott and Dunn's Industrial Microbiology by Gerald Reed
3. Industrial Microbiologyby Samuel C. Prescott
4. Industrial Microbiologyby L.E. Casida

Unit IV

Immobilization methods, adsorption; covalent linkages, membrane entrapment- advantages and disadvantages.

Brief study of Intellectual Property Rights (IPR) –Definition & Function

References

1. Principles of Fermentation Technology by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker
2. Manual of Industrial Microbiology and Biotechnology by Ronald M. Atlas
3. Prescott and Dunn's Industrial Microbiology by Gerald Reed
4. Industrial Microbiology by Samuel C. Prescott
5. Industrial Microbiology by L.E. Casida

Core Course 8: MB3CRT08 Food Microbiology

Total hours of instruction: 54 Hours/week: 4 Credit: 3

Unit I

History of Food Microbiology. Beneficial role of microbes in food industry; Molds, yeasts and bacteria.

Principles of food preservation - High temperature - Low temperature - Drying - Food additives-organic acids & their salts, nitrites & nitrates, sulfur dioxide &sulfites, wood smoke

References

1. Frazier, W.C. 1978. Food Microbiology. McGraw Hill
2. Modern Food Microbiology by James M. Jay, Martin J. Loessner, and David A. Golden

Unit II

Contamination and spoilage - vegetables and fruits, meat and meat products, milk and milk products - fish and sea food - Poultry, Spoilage of canned foods. Food borne infections, poisoning and intoxications. Microbiological examination of food, Milk. HACCP- definition and principles (out line)

References

1. Frazier, W.C. 1978. Food Microbiology. McGraw Hill
2. Modern Food Microbiology by James M. Jay, Martin J. Loessner, and David A. Golden

Unit III

Importance of microbes in food industries. Fermented food products by microbes – Bread, Vinegar. Alcoholic beverages- wine, beer, cedar. Oriental fermented foods-Shoyu, Miso, Tempeh. Fermented vegetables. Milk and milk products- butter, cheese, Probiotics (brief study)

Reference

1. Frazier, W.C. 1978. Food Microbiology.McGraw Hill.
2. Industrial Microbiology by Samuel C. Prescott
3. Parihar and Parihar Dairy Microbiology, SaraswatiPurohit, Jodhpur India, 2007
4. Prajapati J. B. (1995), Fundamentals of Dairy Microbiology. 23

Unit IV

Microbial cells as food-single cell proteins- Baker's yeast

Edible mushroom- types and production- *Agaricusbisporus, Volvariellavolvacea, Pleurotus*

Food borne disease – Salmonellosis, Botulism and *E.coli* poisoning, aflatoxin and other toxins.

References

1. Frazier, W.C. 1978. Food Microbiology. McGraw Hill.
2. Industrial Microbiology by L.E. Casida

FOURTH SEMESTER

Core Course 9: MB4CRT09 Fundamentals of Biostatistics, Bioinformatics & Research Methodology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

Nature and scope of statistical methods and their limitation.

Compilation, classification, tabulation, and application in life science.

Graphical representation, Measure of average and dispersion mean, median, mode.

References

1. Fundamentals of Biostatistics. Bernard Rosner
2. Biostatistics for medical, nursing and pharmacy students. A. Indrayan and L. Satyanarayana.
3. Statistics for Biologists. Campbell. R.C

Unit II

Sampling methods – simple random, stratified, systematic and cluster sampling procedures. Sampling distribution, Probability, Tests of significance based on T, Chi-square and F Test Designing and methodology of experiment

References

1. Fundamentals of Biostatistics. Bernard Rosner
2. Biostatistics for medical, nursing and pharmacy students. A. Indrayan and L. Satyanarayana.
3. Statistics for Biologists. Campbell R.C

Unit III

Introduction to Bioinformatics, Importance and scope of Bioinformatics, Data base types, Data mining and data analysis methods - Computer tools for sequence analysis, Finding and retrieving sequences, Similarity searching

References

1. Bioinformatics: A Beginner's Guide. By Jean- Michel Claverie and Cedric Noterdame; Wiley Publishing, Inc.2003.
2. Bioinformatics: A practical approach. K. Mani and Vijayaraj, Aparna Publication, 2004

Unit IV

Introduction to research methodology. Experimentation in science and data handling, design of an experiment; Experimentation; observation; data collection; interpretation and deduction. Documentation of experiments, record keeping. Academic search techniques –, plagiarism - Introduction to use of IT in teaching and learning. Power point features and slide preparation.

References

1. Debbie Holmes, Peter Moody, Diana Dine. Research methods for the Biosciences, International Student Ed., Oxford University Press Inc. New York
2. S K Aggarwal. Foundation Course in Biology, Ane's Student Ed., Second Ed.
3. R C Sobti, V L Sharma. Essentials of Modern Biology, Ane's Student Ed.

Core Course 10: MB4CRT10 Aquatic microbiology

Total hours of instruction: 54 Hours/week: 4 Credit: 3

Unit I

The aquatic environment and distribution of microorganisms in the aquatic environment.Aquaticecosystem-fresh water (ponds,lakes,stream) marine(estuaries, mangroves,deep sea).Water zonations-upwelling.Benthicmicroorganisms.Marinemicroflora and biofouling.

References

1. Aquatic microbiology-Rheinheiner
2. Marine pollution-Clark

Unit II

Techniques for the study of aquatic microorganisms. The role and importance of aquatic microbial ecosystem. Microbial consortia. Surface attachment and biofilm development. Antibacterial and bioactive compounds from aquatic microorganisms.

References

1. Elements of microbiology- Pelczar, Reid and chan
2. Aquatic microbiology-Rheinheiner

Unit III

Water pollution, microbial changes induced by inorganic and organic pollutants. Metals as pollutants. Algal blooms. Biological and chemical control of algal blooms

References

1. Elements of microbiology- Pelczar, Reid and chan
2. Aquatic microbiology-Rheinheiner
3. Fundamentals of bacteriology-A.J.Salle
4. Ecological aspect of waste water treatment vol 2 biological activities and treatment process-Cruds C.R and hawkes
5. Microbiology-Prescott, M.J, Harley, J. P. and Klein, D. A.

Unit IV

Potability of water. Purification and disinfection. Indicator organisms. Microbiological examination of drinking water. Water born diseases and control measures.

References

1. Elements of microbiology- Pelczar,Reid and chan
2. Aquatic microbiology-Rheinheiner
3. Fundamentals of bacteriology-A.J.Salle

Core Course 11: MB4CRT11 Agricultural microbiology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

Brief account of microbial interactions –symbiosis-mutualism-commensalism-Amensalism-synergism-parasitism-predation.Plant –microbe interactions- Mycorrhiza–VAM, Ecto, Endo and Ectendomyccorhiza. Actinomycets

References

1. Microbiology Fundamentals and applications-Ronald M.Atlas
2. Soil microorganisms and plant growth-N.S.Subba Rao
3. Agricultural microbiology- G.Rangaswamy and D.J. Bagyaraj
4. Microbial ecology-Atlas and Bartha
5. General microbiology-Pelczar, Reid andChan
6. Microbiology- Prescott, M.J., Harley J P., and Klein,D.A

Unit II

Microbial diseases of plants-common **bacterial-**crown gall disease (Agrobacterium), potato scab (Streptomyces), soft rot disease (Erwinia), Bacterial wilt of potato (Pseudomonas), citrus canker (Xanthomonas), **fungal-** Club root disease (Plasmodiophora), Wart disease of potato (Synchytrium), Brown spot of maize (Physoderma), ergot of cereals (Claviceps), Tikka leaf spot of peanut (Cercospora) and **viral** -Tobacco Mosaic disease (TMV), Bunchy Top of Banana, Bhendi Vein- clearing or Yellow vein Mosaic (Bhendi Mosaic virus), Tomato spotted wilt, Sugar cane mosaic(SMV)-pathogens-Transmission and control measures. Natural defense mechanisms of plants.

References

1. Soil microorganisms and plant growth-N.S. Subba Rao
2. Plant microbiology-. – Campell, R
3. Agricultural microbiology- G. Rangaswamy and D.J. Bagyaraj
4. Advances in Agricultural microbiology- Subba Rao
5. Diseases of crop plants in India- G.Rangaswamy.
6. Crop diseases and their management-Chaube H.S. and Pundhir V.S

Unit III

Rhizosphere and Phyllospheremicroflora and its importance. Endophyticmicroflora. Microbiology of silage, Tobacco curing. Role of microbes in retting. Rumen microbiology

References

1. Soil microorganisms and plant growth- N.S. Subba Rao
2. Plant microbiology-. –Campell,R
3. Agricultural microbiology- G. Rangaswamy and D.J. Bagyaraj

4. Advances in Agricultural microbiology- Subba Rao
5. Microbiology Fundamentals and applications-Ronald M.Atlas

Unit IV

Biopesticides-Bacterial-viral-fungal pesticides.Biological control of plant diseases. Integrated pest management, Production of Biofertilizers

References

1. Soil microorganisms and plant growth-N.S.Subba Rao
2. Plant microbiology-. Campell,R
3. Agricultural microbiology- G.Rangaswamy and D.J. Bagyaraj
4. Advances in Agricultural microbiology-subba Rao
5. Microbiology Fundamentals and applications-Ronald M.Atlas
6. Microbial ecology-Atlas and Bartha
7. General microbiology-Pelczar, Reid andChan
8. Microbiology- Prescott, M.J., Harley J P., and Klein,D.A

Core Course 12- MB4CRP12 Microbiology Practical – II

Total hours of instruction: 180 Hours/week: 5 (90 in Semester III and 90 in Semester IV) Credit: 4

Enumeration of soil microbes by Plate culture method and isolation of

Microorganisms from soil sample – Bacteria, Fungi, Actinomycetes andAzotobacteria.

Wine Production from grapes

Immobilization of yeast cells

Study of Microbial contamination in food products Analysis of food samples- Vegetables, Fruits, Fish and Meat Milk analysis by MBRT

Isolation of Lactobacillus from curd

Mushroom cultivation

Enumeration and isolation of microorganism from water.

Microbial investigation of drinking water samples, total bacteria count, coliformtest – MPN.

Estimation of BOD.

Study of common Plant pathogen – Citrus canker

Estimation of rhizosphere microbial population and calculation of R: S ratio. Isolation of nitrogen fixing bacteria – Rhizobium

References

1. Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja

2. Practical Microbiology – R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.

3. Microbiology Laboratory Manual – Cappuccino, Sherman, Pearson Education

4. Manual of Microbiology Kanika Sharma Ane Books Pvt. Ltd.

5. Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja

FIFTH SEMESTER

Core Course 13: MB5CRT13 Medical Bacteriology- I

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Detailed study of Morphology, Cultural characteristics, Biochemical, Epidemiology, Pathogenesis, Laboratory diagnosis, Prophylaxis and Treatment of the following bacteria:

Unit I

Staphylococcus aureus, Streptococcus pyogenes, Pneumococcus, Neisseria

References

1. Mackie and McCarteny Practical Medical Microbiology – 13th Edition, Churchill Livingstone.
2. Ronald M. Atias (1989) Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
3. David Greenwood, Richard C.B. Stack and John Forrest Peutherer (1992). Medical Microbiology.14th edition. ELBS with Churchill Livingstone.
4. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

Unit II

Corynebacterium, Bacillus, Clostridium perfringens, Clostridium tetani, Clostridium botulinum

References

1. Mackie and McCarteny Practical Medical Microbiology – 13th Edition, Churchill Livingstone.
2. Ronald M. Atias (1989) Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
3. David Greenwood, Richard C.B. Stack and John Forrest Peutherer (1992). Medical Microbiology.14th edition. ELBS with Churchill Livingstone.
4. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

Unit III

Enterobacteriaceae I- Coliforms, *Proteus mirabilis*, Enterobacteriaceae II:-*Shigelladysentriae*, *Salmonella typhi& Salmonella paratyphi, Vibrio cholerae, Pseudomonas.*

References

1. Mackie and McCarteny Practical Medical Microbiology – 13th Edition, Churchill Livingstone.

2. Ronald M. Atias (1989) Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
3. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

Unit IV

Mycobacterium tuberculosis, *Mycobacterium leprae*

References

1. Mackie and McCarteny Practical Medical Microbiology – 13thEdition, Churchill Livingstone.
2. Ronald M. Atias (1989) Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
3. David Greenwood, Richard C.B. Stack and John Forrest Peutherer (1992). Medical Microbiology.14thedition. ELBS with Churchill Livingstone.
4. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

Core Course 14: MB5CRT14 Medical Mycology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

General Characters of Fungi- Yeast and mold. Cultivation of Fungi – Culture methods, Culture media and cultural characters. Staining methods used in mycology – wet mount and LPCB.Ultra structure of yeast.

References

1. Text book of medical mycology – JagadishChander,Interprint, New Delhi.
2. Introduction to Mycology- Alexopolus.
3. Botany for Degree students Fungi – B R Vashishta , A K Sinha

Unit II

Reproduction in Fungi- Asexual and Sexual method. Classification of Fungi – Principles and Approaches. Antifungal agents- Mechanism of action

References

1. Text book of medical mycology – Jagadish Chander,Interprint, New Delhi.
2. Botany for Degree students Fungi – B R Vashishta , A K Sinha

Unit III

Fungal Diseases: Causative Fungi, Clinical Manifestations, Laboratory Diagnosis and treatment of following diseases-Superficial mycoses. Pityriasisversicolor, Dermatophytoses, Piedra.

Subcutaneous mycoses – Mycetoma, Rhinosporidiosis, Phycomycosis, Sporotrichosis.

References

1. Text book of Medical Mycology – JagadishChander, Interprint, New Delhi.
2. Mycology and Virology – Topley and Wilson. Volume 4
3. Medical Mycology by Rippon .W B Saunders. Co
4. Manual of Clinical Mycology by Conant, Smith, Baker, Callaway &Mertics

Core Course 15: MB5CRT15 Medical Parasitology

Total hours of instruction: 54 Hours/week: 4 Credit: 3

Unit I

Parasitology – General Concepts – Introduction to Parasitology, Classification – Host parasite relationship. Laboratory techniques in parasitology-Blood –Thick and thin smear, Faeces –Examination for ova and cyst.

References

1. Text book of Parasitology by JayaramPanickar
2. Bailey and Scott's Diagnostic Microbiology
3. Practical Medical Microbiology – Mackie, McCartney
4. Text book of Medical Parasitology by Parija S.C.

Unit II

Protozoology: Pathogenic mechanisms, Disease transmissions, their life cycles and Lab Diagnosis of the following- *Entamoebahistolytica*, *Plasmodium vivax, Plasmodium falciparum*, *Leishmaniadonovani*, *Giardia lamblia*, *Trichomonasvaginalis*, *Balantidium coli*, *Toxoplasmagondii*and *Cryptosporidium parvum.*

References

1. Parasitology by K.D. Chatterjee
2. Text book of Parasitology by JayaramPanickar
3. Text book of Medical Parasitology by P. Chakraborty

Unit III

Helminthology: Classification, Cestodes – *Taeniasolium,T. saginata, T.echinococcus*, trematodes –*Schistosomahaematobium*,*Fasciola hepatica*, Nematodes – Ascaris, Anchylostoma, Trichuris, Enterobius and Wuchereria- their life cycle , Transmission, pathogenicity and Lab Diagnosis.

References

1. Text Book of Medical Parasitology by P. Chakraborty
2. Text Book of Parasitology By JayaramPanicker
3. Text Book of Medical Parasitology by Parija S.C.
4. Parasitology by K.D. Chatterjee

Core Course 16: MB5CRT16 -Environmental Microbiology and Human Rights

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I (18 hours)

Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness.

Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems.

a. **Forest resources**: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. **Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. **Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. **Energy resources**: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.
f. **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification
   - Role of individual in conservation of natural resources.
   - Equitable use of resources for sustainable life styles.

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

Unit II (26 hours)

Biodiversity and its conservation

Introduction, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation, Hot-sports of biodiversity

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India

Environmental Pollution

Definition, Causes, effects and control measures of: -

Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution, Pollution case studies
Disaster management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

References

1. BharuchaErach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
3. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
4. Dc A.K.Enviornmental Chemistry, Wiley Eastern Ltd.(Ref)
5. Down to Earth, Centre for Science and Environment (Ref)
6. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
7. Jadhav.H&Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
8. Mekinney, M.L &Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
9. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
11. Rao.M.N&Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
12. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
13. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
14. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)
15. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (Ref)
16. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (Ref)
17. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p (Ref)

Unit III (10 hours)

Waste water management and sewage treatment. Bioremediation and strategies for bioremediation. Phytoremediation Microbial degradation of petroleum and petroleum products, Pesticide degradation. Biostimulation and bioaugmentation.

Unit IV (10 hours)

Bioremediation of contaminated soils and wastelands - solid waste - sources and management (composting, vermiculture and methane production), environmental mutagenesis and toxicity testing.

Unit V (8 hours)

Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Human Rights and United Nations – contributions, main human rights related organs- UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Environment andHuman Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western Ghats- mention Gadgil committee report, Kasthurirengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

References

1. AmartyaSen, The Idea Justice, New Delhi: Penguin Books, 2009.
2. Chatrath, K. J.S., (ed.), Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies, 1998)
3. Law Relating to Human Rights, Asia Law House, 2001.
4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt. Ltd, New Delhi,
5. S.K.Khanna, Children And The Human Rights, Common Wealth Publishers, 1998. 2011.
6. Sudhir Kapoor, Human Rights in 21st Century, Mangal Deep Publications, Jaipur,2001.
7. United Nations Development Programme, Human Development Report 2004: Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

SIXTH SEMESTER

Core Course 17: MB6CRT17 Medical Virology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

General characters of viruses **–** structure, classification- Baltimore, cultivation. Structure and replication of bacteriophages. Replication of animal viruses.

References

1. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
2. Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.
3. Dimock& Primrose Introduction to modern virology Oxford: Blackwell
4. White &Fenner Medical Virology New York : Academic Press
5. Collier & Oxford Human Virology London Oxford University Press
6. Fields et al Virology Philadephia: Lippincott – Raven
7. Zuckerman Clinical Virology Chichester:JohnWiley.
8. Topley&Wilson.Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III Bacterial Diseases, Edward Arnold, London.

Unit II

Characters and pathogenic significance of pox viruses, herpes viruses, picorna viruses &myxoviruses –Influenza, Mumps, Measles.

References

1. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
2. Dimock& Primrose Introduction to modern virology Oxford: Blackwell
3. White &Fenner Medical Virology New York : Academic Press
4. Collier & Oxford Human Virology London Oxford University Press
5. Fields et al Virology Philadephia: Lippincott – Raven
6. Zuckerman Clinical Virology Chichester :JohnWiley.
7. Topley /Wilson's (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III
8. Bacterial Diseases, Edward Arnold, London.

Unit III

Characters and pathogenic significance of arboviruses –Bunya virus, Togavirus, Flavivirus. Rhabdoviruses, hepatitis viruses, oncogenic viruses & HIV.

References

1. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

2. Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.
3. Dimock& Primrose Introduction to modern virology Oxford: Blackwell
4. White &Fenner Medical Virology New York : Academic Press
5. Collier & Oxford Human Virology London Oxford University Press
6. Fields et al Virology Philadephia: Lippincott – Raven
7. Zuckerman Clinical Virology Chichester: JohnWiley.
8. Topley / Wilson's (1990).Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III Bacterial Diseases, Edward Arnold, London.

Unit IV

Diagnosis of viral infections. Immunoprophylaxis and chemoprophylaxis of viral infections.

References

1. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
2. Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.
3. Dimock& Primrose Introduction to modern virology Oxford: Blackwell
4. White &Fenner Medical Virology New York: Academic Press
5. Collier & Oxford Human Virology London Oxford University Press
6. Fields et al Virology Philadephia: Lippincott – Raven
7. Zuckerman Clinical Virology Chichester: JohnWiley.
8. Topley / Wilson's (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III
9. Bacterial Diseases, Edward Arnold, London

Core Course 18: MB6 CRT18 Diagnostic Microbiology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

Laboratory associated infections. Microbiological safety cabinets- Types. Disinfection and decontamination of laboratory wastes. WHO safe code of practice for a clinical microbiology laboratory. Guidelines for the collection and transport of specimens. Nosocomial infection.

References

1. Medical Laboratory Manual For Tropical Countries Vol. II Microbiology. Monica Cheesbrough ELBS
2. Bailely&Scott Diagnostic Micribiology. E.J. Baron, L.R. Peterson and S.M. Finegold. Mosby

Unit II

Scheme for the microbiological examination of sputum, throat and mouth specimens, wound aspirates, CSF, blood and bone marrow.

Scheme for the Microbiological examination of stool specimens, urine, urogenital specimens, skin specimens.

References

1. Medical Laboratory Manual For Tropical Countries Vol. II Microbiology. Monica Cheesbrough ELBS
2. Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman

Unit III

Serological diagnosis: Applications of serological techniques such as agglutination reactions- Widal (typhoid fever), precipitation reactions RPR (syphilis), complement fixation tests, and enzyme immunoassay for the diagnosis of Bacterial viral and immunological diseases. Molecular techniques in Microbiology- principles and applications Hybridisation, PCR, RFLP.

References

1. Mackie& McCartney Practical Medical Microbiology J.G.Collee, A.G.Fraser,B.P.Marmion and A.Simmons (Eds.) Churchill Livingstone
2. Manual of Clinical Microbiology P.R. Murray,E.J.Baron, J.H.JoorgensonM.A.Pfaller and Yolken R.H. ASM Press Washington DC

Unit IV

Antibiotic sensitivity tests. Disc diffusion and dilution methods, Determination of MIC and MBC. Animal inoculation in clinical studies. Egg inoculation.

References

1. Medical Laboratory Manual For Tropical Countries Vol. II Microbiology. Monica Cheesbrough ELBS
2. Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman

Core Course 19: MB6CRT19 Medical Bacteriology II

Total hours of instruction: 36 Hours/week: 2 Credit: 2

Detailed study of Morphology, Cultural characteristics, Biochemical, Pathogencity, Epidemiology, pathogenesis, laboratory diagnosis, prophylaxis and treatment of the following bacteria

Unit I

Haemophilus, Bordetella, Brucella, Yersinia

References

1. Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. IIedition. Maxwell Macmillan International editions.
2. David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology.14thedition. ELBS with Churchill Livingstone.
3. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. Jayaram Panikar

Unit II

Spirochetes-Treponema and Leptospira, Mycoplasma pneumoniae

References

1. Mackie and McCarteny Practical Medical Microbiology – 13thEdition, Churchill Livingstone.
2. RonaldM.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
3. David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology.14thedition.ELBS with Churchill Livingstone. .
4. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar

Unit III

Rickettsiaceae- Genus Rickettsia, *Chlamydiae pneumonia, C. trachomatis*

References

1. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
2. Mackie and McCarteny Practical Medical Microbiology – 13thEdition, Churchill Livingstone.
3. Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. IIedition. Maxwell Macmillan International editions.

4. David Greenwood, Richard C.B.Stack and John Forrest Peutherer (1992). Medical Microbiology.14thedition. ELBS with Churchill Livingstone.
5. Topley / Wilson's (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol..III Bacterial Diseases, Edward Arnold, London.

Core Course 20: MB6CRP20 Microbiology Practical - III

Total hours of instruction: 216 Hours/week: 6 (108 in Semester V and 108 in Semester VI) **Credit: 4**

General procedure for the systematic study of Bacteria – Morphology, Staining, Colony Characteristics on BA, MA, other selective Media.

Biochemical reactions of Bacteria: Sugar Fermentation, IMVIC, H_2S production, urease, Catalase, Oxidase, TSI

Identification of Bacteria- *Staphylococcus*, *E. coli*, *Klebsiella*, *Pseudomonas*, *Proteus*

Antimicrobial activity – Disc diffusion

Cultivation of Fungi- Study of colony characters of yeasts and Molds.

Microscopic morphology of molds- *Pencillium*, *Aspergillus*. *Mucor*, *Rhizopus*, *Fusaruim* by Lactophenol cotton blue mount examination.

Gram staining of yeast.

Examination of Germ tube – *Candida albicans*

Egg inoculation demonstration

Reference

1. Medical Microbiology by Robert Cruickshank
2. Bailey & Scott's Diagnostic Microbiology
3. Practical Medical Microbiology-Mackie &McCartney
4. Microbiology Laboratory Manual – Cappuccino Sherman
5. Text book of Microbiology – Ananthanarayanan and Jayaram – Orient Longman
6. Text book of Medical Mycology – JagadishChander .Interprint
7. Manual for identification of Medical Bacteria by. S.T. Cowan 51

Field study: (Internal only)

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

Choice Based Open Course Offered to Students of Other Departments (5th Semester)

Open course I: MB5OPT01 Human Physiology

Total hours of instruction: 72 Hours/week: 4 Credit: 3

Unit I

Elementary tissues- Epithelial, connective, muscular and nervous tissue. Homeostasis. Structure of different muscles. Mechanism of muscular contraction, Rigor mortis. Introduction to nervous system.Classification of nervous system. Synapse, Myoneural junction, Neurotransmitters.

References

1. Textbook of Medical Physiology. Arthur C.Guyton and John E.Hall
2. Essentials of Medical Physiology. K.Sembulingam and PremaSembulingam

Unit II

Composition and functions of blood, Haemoglobin, Blood clotting. Blood groups, Blood transfusion. Structure of heart. Action potential in cardiac muscle. Cardiac cycle. Heart sounds. Conducting mechanism. Cardiac output Blood pressure, Pulmonary and systemic circulation. Organisation of respiratory system. Pulmonary ventilation. Gas transport. Control of respiration.

References

1. Textbook of Medical Physiology. Arthur C.Guyton and John E.Hall
2. Essentials of Medical Physiology. K.Sembulingam and PremaSembulingam

Unit III

Salivary and gastric glands and their secretions. HCL secretion and regulation. Pancreas structure and pancreatic juice. Structure and functions of liver- Bile. Kidney-structure and functions. Nephron. Renal regulation of water and electrolyte balance.

References

1. Textbook of Medical Physiology. Arthur C.Guyton and John E.Hall
2. Essentials of Medical Physiology. K.Sembulingam and PremaSembulingam

Unit IV

Chemical classes of hormones. Action of hormones. Endocrine glands- Hypothalamus, pituitary, thyroid, pancreas, adrenal and pineal gland. Role of reproductive hormones, gastrointestinal hormones and neurohormones. Endocrine disorders.

References

1. Endocrinology. Mac E. Hadley.
2. Molecular Endocrinology. FraklynF.Bolander

Open course II: MB5OPT02- Nutrition and Health

Total hours of instruction: 72 Hours/week: 4. Credit: 3

UnitI

Personal hygiene, Safety and First Aid, Rights and responsibilities

References

1. Nutrition and Dietetics for healthcare-Barrier M Helen

UNIT II

Human Blood Group System. Medical Application of Blood Groups. Testing donor blood.Blood Bank.

References

1. Physiology –Tortora
2. Physiology – Mahaputra

UNIT III

Life style diseases- Diabetes, Obesity, HIV, Fatty Liver, Liver Cirrhosis, Hypertension, Stroke

References

1. Life span nutrition-Consumption through Life –SR Rolfes, LK De Bruyne and E N Whitney. Nutrition and Dietetics for healthcare-Barrier M Helen

UNIT IV

An overview of nutrition- Nutrition in infancy, Nutrition in adulthood and later years. Planning a healthy diet. protein energy malnutrition

References

2. Nutritional Biochemistry –Tom Brody
3. Nutritional Biochemistry- Swaminathan
4. Food and nutrition – Facts and figures, New Delhi,Jaypee- Guptha L C *et al.*,

Open course III: MB5OPT03- Ecology and Evolution

Total hours of instruction: 72 Hours/week: 4 Credit: 3

Unit I

Ecology –Definition and Principle, Ecosystem, Biomes-Major Terrestrial Biomes

References

1. Geographical realms Fundamentals of ecology-Odum
2. Modern concepts in ecology-Kumar.H.D
3. Ecology and environment-Sharma P.D
4. Ecology principles and application-Chapman and Reiss
5. Environmental biology-Jobes A.M
6. Essential Environmental Studies S.P. Misra, S.N. PandeAne Books Pvt. Ltd.
7. Environmental Science V.K. Ahluwalia, Sunita Malhotra Ane Books Pvt. Ltd.

Unit II

Common rhythms in nature-diurnal rhythm, Circadian rhythm, Lunar rhythm. Photoperiodism, Hibernation, Aestivation, Pheromones

References

1. Geographical realms Fundamentals of ecology-Odum
2. Modern concepts in ecology-Kumar.H.D
3. Ecology and environment-Sharma P.D
4. Ecology principles and application-Chapman and Reiss
5. Environmental biology-Jobes A.M
6. Essential Environmental Studies S.P. Misra, S.N. PandeAne Books Pvt. Ltd.
7. Environmental Science V.K. Ahluwalia, Sunita Malhotra Ane Books Pvt. Ltd.

Unit III

Food chain—Food web, Ecological pyramids, Biogoechemical Cycles-Carbon, Nitrogen, Phosphorous

References

1. Geographical realms Fundamentals of ecology-Odum
2. Modern concepts in ecology-Kumar.H.D
3. Ecology and environment-Sharma P.D
4. Ecology principles and application-Chapman and Reiss
5. Environmental biology-Jobes A.M
6. Essential Environmental Studies S.P. Misra, S.N. PandeAne Books Pvt. Ltd.
7. Environmental Science V.K. Ahluwalia, Sunita Malhotra Ane Books Pvt. Ltd.

Unit IV

Origin of Life –Lamarckism, Darwinism, Evidences of Evolution

References

1. Geographical realms Fundamentals of ecology-Odum
2. Modern concepts in ecology-Kumar.H.D
3. Ecology and environment-Sharma P.D
4. Ecology principles and application-Chapman and Reiss
5. Environmental biology-Jobes A.M
6. Essential Environmental Studies S.P. Misra, S.N. PandeAne Books Pvt. Ltd.
7. Environmental Science V.K. Ahluwalia, Sunita Malhotra Ane Books Pvt. Ltd.

Choice Based Course Offered to Students of Department of Biochemistry (6th Semester)

Choice based course: MB6CBT01 Microbioprocess

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

Typical bioprocess. Different stages in bioprocess. Advantages of bioprocess over chemical process. Industrially important microbial metabolites. Isolation, screening and selection of industrially important microorganism. Mode of culturing- Batch, Continuous and Fed-batch culture. Specific growth rate and yield.

References

1. Microbial biotechnology-Principles and Applications L.Y.Kun (Ed.) World Scientific
2. Modern concepts of Biotechnology H.D.KumarVikas Publishing Co. Pvt. Ltd. New Delhi
3. Industrial Microbiology CasidaJr.Wiley Eastern Ltd.

Unit II

Designing of media for fermentation. Defined and undefined media, Factors affecting fermentation. Optimisation of bioprocess. Precurssors, inducers, inhibitors, antifoam agents Submerged and solid state fermentation.

References

1. Industrial Microbiology CasidaJr.Wiley Eastern Ltd.
2. Industrial Microbiology – An Introduction M.J.Waites ,N.L.Morgan, J.S.Rockey& G. Higton Blackwell Science

Unit III

Bioreactor. Parts of bioreactor. Instrumentation of bioreactor. Aerobic microbioprocess. Importance of dissolved oxygen. Volumetric oxygen transfer coefficient. Agitation. Aeration.

References

1. Mcrobial biotechnology-Principles and Applications L.Y. Kun (Ed.) World Scientific
2. Industrial Microbiology – An Introduction M.J. Waites, N.L. Morgan, J.S. Rockey& G. Higton Blackwell Science

Unit IV

Downstream processing- methods. Separation of biomass. Purification of the products- various techniques. Economics and market potentials of fermentation products.

Choice based course II: MB6CBT02 Sanitation Microbiology

Total hours of instruction: 72 Hours/week: 4 Credit: 4

Unit I

General concept of sanitation and disinfection .Sanitation of industrial and food processing units Safe location of animal houses, hospitals, industrial fermentation units etc. Biosafety Biosafety in hospitals and laboratories. Regulations and measures

References

1. Fundamentals of bacteriology-A.J.Salle
2. Microbiology- Prescott, M.J., Harley J P., and Klein,D.A
3. Biology of microorganisms-T.D.Brock
4. Environmental aspects of microbiology-Joseph C. Danie
5. Microbiology essentials and applications-Larry Mckane and Judy Kandel

Unit II

Airborne diseases and preventive measures. Methods of sampling air. Quantification of air microflora Air sanitation – techniques and applications

Biological weapons, their regulation and precaution.

References

1. Environmental Microbiology Vijay Ramesh
2. Medical Laboratory Manuel for Ttropical Countries Monica cheesbrough ELBS
3. Environmental aspects of microbiology-Joseph C. Danie

Unit III

Microbiology of municipal sewage and sewage treatment. BOD and COD Concept. Treatment of Industrial effluent- Waste water treatment-Mechanical and biological.

Aerobic and anaerobic treatments. Domestic septic tank. Treatment of municipal water supplies. Water borne diseases.

References

1. Fundamentals of bacteriology-A.J.Salle
2. Ecological aspect of waste water treatment vol 2 biological activities and treatment process-Cruds C.R and hawkes
3. Microbiology- Prescott, M.J., Harley,J.P. and Klein, D.A
4. Biology of microorganisms-T.D.Brock

Unit IV

Solid waste disposal-sanitary land fills, composting, vermicompost. Disposal of animal and agricultural waste. Methanogenesis and biogas production

References

1. Fundamentals of bacteriology-A.J.Salle
2. Ecological aspect of waste water treatment vol 2 biological activities and treatment process-Cruds C.R and hawkes
3. Microbiology- Prescott, M.J., Harley J P., and Klein,D.A
4. Foundations in microbiology-TalaroK and TalaroA
5. Microbiology:an introduction- Tortora G.j Funke B.R. and Case C.L
6. Industrial microbiology-CasidaL.E

Choice based course III: MB6CBT03 Medical Entomology

Total hours of instruction: 72. Hours/week: 4. Credit: 4

Unit I

Scope of Medical Entomology. Entomology and disease transmission. Modern concepts of Entomology, Knowledge of the biology and life cycles of Arthropod vectors- metamorphosis. Mechanism of disease transmission and types. Control measures with particular reference to vectors and disease in India.

References

1. Applied Entomology by P.G.Fenemore and Alka Prakash
2. Modern Entomology by D.B.Tembhare
3. General and applied Entomology by Nayar, Ananthakrishanan and David

Unit II

Arthropods of Medical Importance-A brief account of the Biology, Life cycle, Mechanism of disease transmission and Control measures.

Class Insecta-Mosquitoes flies-Sand fly, Tsetse fly, house fly, bed bugs, louse, fleas

References

1. A hand book of Medical Entomology and Elementary Parasitology by G.K. Rathnaswamy
2. Hand book of Medical Entomology-EaswariNayar

Unit III

Class Arachnida- Ticks (hard and soft), mites

Class Crustacea-Water fleas, Crabs, Shrimps

Artropods producing toxic or allergic reactions in man-biting insects, spiders, scorpions.

References

1. A hand book of Medical Entomology and Elementary Parasitology by G.K. Rathnaswamy
2. Hand book of Medical Entomology-EaswariNayar
3. Modern Entomology by D.B. Tembhare

Unit IV

Entomological Techniques-Collection and maintenance for short periods for identification or isolation of pathogens. Preservation, labelling etc. for future use.

Reference

1. Applied Entomology by P.G. Fenemore and Alka Prakash
2. Hand book of Medical Entomology-EaswariNayar
3. Modern Entomology by D.B.Tembhare

Syllabus for Microbiology as a Complementary Subject in UG programmes

FIRST SEMESTER

Complementary course I: MB1CMT01 Fundamentals of Microbiology-1

Total hours of instruction: 36 Hours/week: 2 Credit: 2

Unit I

Microbial world.Diversity of Microbial World.History of microbiology.Beneficial and harmful microbes. Differentiate between prokaryote & Eukaryote. Scope and different fields of Microbiology- Medical, Industrial, Agricultural, Food, Immunology etc., Principles and methods of bacterial classification. Ultrastructure of bacteria-cell wall, cytoplasmic membrane,inclusions, flagella, endospore. Differentiate between archaebacteria and Eubacteria

References

1. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
2. Microbiology Pelczar, Chan and Krieg.
3. General microbiology Vol 2 Powar&Daginawala

Unit II

Microscopy – optical, phase contrast, fluorescent, darkfield, electron (TEM & SEM) - Principle Pathway of Light.

References

1. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
2. Microbiology Pelczar, Chan and Krieg.
3. General microbiology Vol 2 Powar&Daginawala
4. Biophysics R.N.Roy

Unit III

Staining – preparation of specimens for staining, simple staining, differential staining & negative staining. Microscopic examination of microorganisms- hanging drop, simple, differential and negative staining

References

1. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
2. Microbiology Pelczar, Chan and Krieg.
3. General microbiology Vol 2 Powar&Daginawala

SECOND SEMESTER

Complementary course 2: MB2CMT02 Fundamentals of Microbiology-II

Total hours of instruction: 36 Hours/week: 2 Credit: 2

Unit I

Bacterial Nutritional requirements& Sources, Culture Media, Culture Methods, Anaerobic culture methods, Isolation of Pure Culture.Sterilisation and disinfection-Physical and chemical methods.Principles and Application. Antibiotics mode of action of â - Lactum antibiotics, antibiotics act on protein synthesis & DNA replication – Antibiotic Sensitivity Test – Disc Diffusion.

References

1. Microbiology Pelczar, Chan and Krieg
2. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
3. General microbiology Vol. 2 Powar&Daginawala
4. Ananthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan,
5. C.K. JayaramPanikar

Unit II

Factors affecting growth of bacteria. Growth curve. Nutritional Types of Bacteria – Classification.- Autotrophs, Heterotrophs, chemotrophs, lithotrpohs and organotrophs

Microbial metabolism- Glycolysis, AlchoholicFermantation, TCA Cycle, Glyoxalate cycle, Pentose phosphate pathway.

References

1. Microbiology Pelczar, Chan and Krieg
2. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
3. General microbiology Vol 1 & 2 Powar&Daginawala

Unit III

Bacterial genetics - Genetic exchange- transformation, transduction and conjugation. Extra chromosomal genetic material-Plasmid. Genetic mechanisms of drug resistance in bacteria based on plasmid.

References

1. Microbiology Pelczar, Chan and Krieg
2. Prescott/Harley/Klein's Microbiologyby Joanne Willey, Linda Sherwood, and Chris Woolverton
3. General microbiology Vol. 2 Powar&Daginawala
4. Microbial Genetics Stanley R. Maloy, Freifelder and Cronan
5. Molecular Genetics of Bacteria Snyder and CharminessologyM.J.Pelczar,Jr. ECSChan and N.R.Krieg Tata McGraw-Hill

Complementary course 3- MB2CMP03 Microbiology Practical-I

Total hours of instruction: 72 Hours/week: 2 (36 in semester I and36 in Semester II) **Credit:2**

Study the parts and usage of a compound microscope

Study the parts and working and uses of

Autoclaves

Hot air oven

Membrane Filter

Safety Cabinet

Anaerobic Jar

Incubator

Preparation of culture Media (NB, NA, MA) and dispensing media in test tubes, bottles, petridishes.

Preparation and examination of Hanging drop mount for studying the motility of bacteria.

Preparation of slide smears for staining.

Staining techniques

- Simple staining

- Gram Staining

- Negative Staining.

Cultivation of Bacteria on nutrient Agar for obtaining isolated colonies. Study of cultural colony characters- Size, shape, colour etc.

Viable Count of bacteria by pour plate/ spread plate method.

Demonstration of antibacterial activity by disc diffusion method

References:

1. Microbiology – Concepts and Application – Pelzer Jr. Chang Kreig Mac Graw Hill Inc
2. Microbiology – Prescott, Harley and Klein Wim.C.Brown Publishers.
3. Practical Microbiology – R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.
4. Microbiology Laboratory Manual – Cappuccino, Sherman, Pearson Education.

THIRD SEMESTER

Complementary course 4: MB3CMT04 Applied Microbiology

Total hours of instruction: 36 Hours/week: 2 Credit:2

Unit I

Food as substrate for microorganisms. Principles of food preservation-High temperature,Low temperature, drying, chemical preservation- Production of edible mushrooms-Pleurotus,Agaricus,Volvariella, milk products-Butter, Cheese. Oriental fermented Food products-Miso,tempeh. Single cell protein,Probiotics. Microbiological examination of milk. Spoilage –milk,meat

References

1. Principles of Fermentation Technologyby Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker
2. Manual of Industrial Microbiology and Biotechnologyby Ronald M. Atlas
3. Prescott and Dunn's Industrial Microbiologyby Gerald Reed
4. Industrial Microbiologyby Samuel C. Prescot
5. Food Microbiology Frazier

Unit II

Soil microbiology- Microorganisms & interactions. Biogeochemical cycles- Nitrogen and Phosphorous**.** Biofertilizers-Rhizobium, Biodegradation of pesticides, Biopesticides, biogas production.

References

1. Agricultural Microbiology Bagraja&Rangaswami
2. Soil Microorganisms & Plant Growth - N.S. Subba Rao
3. MicrbialEchology – Atlas &Bartha
4. Environmental aspects of Microbiology – Joseph C. Daniel
5. Bioremediation Baker &Herson

Unit III

Microbial assessment of water quality, water purification. Aeromicrobiology – definition, Microbilogical assessment of air quality. A brief account of microbial production of useful products-antibiotics, alcohol, organic acids and enzymes

References

1. Micrbialechology – Atlas &Bartha
2. Environmental aspects of Microbiology – Joseph C. Daniel
3. Microbiology Pelczar, Chan and Krieg.

FOURTH SEMESTER

Complementary course5: MB4CMT05 Medical Microbiology

Total hours of instruction: 36 Hours/week: 2 Credit: 2

Unit I

Sources of infection. Methods of transfer of infections. Factors determining pathogenic potentials of microbes. A brief study on bacterial pathogens-*Staphylococcus*, *Streptococcus*, *Corynebacteriumdiphtheria*, *E.coli*, *Salmonellatyphi*, *Shigella*, *Vibrio cholera* and *Mycobacteriumtuberculosis*

References

1. Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman

Unit II

Introduction to virology – unique properties and structure of viruses. A brief study on viral diseases –Small pox, chicken pox, polio, influenza, hepatitis, rabies, influenza and AIDS

References

1. Aanthanarayan and Paniker's Textbook of Microbiology R. Ananthanarayan, C.K. JayaramPanikar
2. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood, and Chris Woolverton
3. Microbiology Pelczar, Chan and Krieg

Unit III

Introduction to mycology, General characters of fungi, classification, cultivation, cultural characters, microscopic morphology. Mycotoxins. Abreif study on diseases caused by fungi. Pytiriasis, Dermatophytoses& Candidiasis

References

1. Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman
2. Microbiology M.J.Pelczar,Jr. ECSChan and N.R.Krieg Tata McGraw-Hil

Complementary course 6- MB4CMP06 Microbiology Practical-II

Total hours of instruction: 72 Hours/week: 2 (36 in semester III and36 in Semester IV) **Credit:2**

Isolation & Enumeration of microorganisms from soil sample

Study of microbial contamination in food products.

Analysis of milk quality by Methylene blue reductase test

Study of microorganisms in air exposed plate method.

Identification of common fungus like *Mucor*, *Rhizopus*, *Penicillium*, *Aspergillus* by Lactophenol cotton blue mount examination.

Preparation of fungal media

Cultivation of fungi study of colony characters of yeast and mold.

Microscopic morphology of yeast and molds.

References:

1. Practical Microbiology – R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.
2. Experiments in Microbiology, Plant Pathology and Biotechnology- K R Aneja, New Age International Publishers
3. Microbiology Laboratory Manual – Cappuccino, Sherman, Pearson Education.
4. Bailey and Scott's Diagnostic Microbiology.

Detailed syllabi of Courses offered to

B. Sc. Zoology Vocational - Medical Microbiology - (Model II Programme) is given in pages 115-189 of the curriculum of undergraduate courses in Zoology

Mahatma Gandhi University home page/ syllabus of undergraduate programme wef 2017/ Bachelor of Sciences/ Zoology / pages 115-189

Detailed syllabi of Courses offered to

B.Sc. Zoology and Industrial Microbiology (Double Main) Model-III Programme is given in the curriculum of undergraduate courses in Zoology

Mahatma Gandhi University home page/ syllabus of undergraduate programme wef 2017/ Bachelor of Sciences/ Zoology / pages 279-334