Total Page - (1 to 40)

DEPARTMENT OF MICROBIOLOGY
SCHOOL OF LIFE SCIENCES
DR. BHIMRAO AMBEDKAR UNIVERSITY, AGRA

MINUTES

The minutes of the meeting of the Academic Committee of Department of Microbiology held in the Department of Microbiology of the Dr. Bhimrao Ambedkar University, Agra on 2nd June 2022 at 02:00 PM. The following members were present:

1. Dr. Bhawana Sharma, Scientist 'C' Department of Immunology, NJIL & OMD, Agra

2. Dr. Devesh Jadon, Department of Botany R.B.S.College, Agra

3. Dr. Seema Bhadauria, Principal, B.V.R.I. Bichpuri, Agra

4. Dr. Surabhi Mahajan, Department of Microbiology, Dr. Bhimrao Ambedkar University, Agra

5. Prof. Bhupendra Swarup Sharma, Dean Life sciences, Dr. Bhimrao Ambedkar University, Agra

1. The Academic Committee considered and approved of Revised Ordinances of the M.Sc. Microbiology. (In Faculty of Life Science) course based on Choice Based Credit System (CBCS) as per NEP 2020. (Appendix – 1)

2. The Academic Committee considered and approved the Revised Syllabus of M.Sc. Microbiology (In Faculty of Life Science) based on Choice Based Credit System (CBCS) as per NEP 2020. (To be implemented from the academic session 2022-2023). (Appendix – 2)

3. The Academic Committee considered and approved the Syllabus for Minor Subject for Post Graduate (M.Sc.) Courses for other Faculty, based on Choice Based Credit System (CBCS) as per NEP 2020. (To be implemented from the academic session 2022-2023. (Appendix – 3)

2/6/22 02.06.22 2/6/2022

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RAJEEV KUMAR
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4. The Academic Committee considered and approved of Ordinances of Post Graduate Diploma in Research (PGDR) in Microbiology (in Faculty of Life Science) course based on Choice Based Credit System (CBCS) as per NEP 2020. (Appendix – 4)

5. The Academic Committee considered and approved the Syllabus of Post Graduate Diploma in Research (PGDR) in Microbiology (in Faculty of Life Science) based on Choice Based Credit System (CBCS) as per NEP 2020. (To be implemented from the academic session 2022-2023). (Appendix – 5)

6. The Academic Committee considered and approved the fee structure of Post Graduate Diploma in Research (PGDR) in Microbiology (in Faculty of Life Science) based on Choice Based Credit System (CBCS) as per NEP 2020 (To be implemented from the academic session 2022-2023. Tuition fees 25000/- per semester and other fees (examination, enrollment, sports and cultural activities etc.) as per University norms.

Dr. Bhawana Sharma,
NJIL& OMD, Agra

Dr. Devesh Jadon,
R.B.S.College,Agra

Dr. Seema Bhadauria
B.V.R.I. Bichpuri, Agra

Dr. Surabhi Mahajan
Dr. Bhimrao Ambedkar University, Agra

Prof. Bhupendra Swarup Sharma,
Dr. Bhimrao Ambedkar University, Agra

DEPARTMENT OF MICROBIOLOGY,

SCHOOL OF LIFE SCIENCES

DR. BHIMRAO AMBEDKAR UNIVERSITY, AGRA

MINUTES

The minutes of the meeting of the Board of studies in Microbiology held in the Department of Microbiology, School of Life Sciences, Dr. Bhimrao. Ambedkar University, Agra on December 29, 2020 at 3.00 PM.

1. Dr. Bhawna Sharma, Scientist C, Department of Immunology, NJIL &OMD, Taj Ganj Agra
2. Dr. Devesh Jadon, Department of Botany, R.B.S.College, Agra
3. Prof. B. S. Sharma, Deptt. of Environmental Studies, SLS, Khandari, Agra
4. Dr. Surabhi Mahajan, Incharge, Department of Microbiology, SLS, Khandari, Agra
5. Prof. P. K. Singh, Dean and Head, Deptt. of Microbiology, SLS, Khandari, Agra

(I) The committee approved the syllabus of M. Sc. Microbiology I, II and III Semester (CBCS System) with 25% reduction as per advisory of State Government / UGC for the Session 2020-2021.

(II) The committee approved the syllabus of M. Sc. Microbiology I, II and III Semester (Old System) with 25% reduction as per advisory of State Government / UGC for the Session 2020-2021.

(III) The committee approved the syllabus of B.Sc. Microbiology I, II and III year with 25% reduction as per advisory of State Government / UGC for the Session 2020-2021.

(IV) The committee approved the syllabus of B.Sc. Industrial Microbiology I, II and III year with 25% reduction as per advisory of State Government / UGC for the Session 2020-2021.

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DEPARTMENT OF MICROBIOLOGY
SCHOOL OF LIFE SCIENCES
DR. BHIMRAO AMBEDKAR UNIVERSITY
AGRA

MINUTES

The minutes of the meeting of the Academic Committee of Department of Microbiology held in the Department of Microbiology of the Dr. Bhimrao Ambedkar University, Agra on 12th February 2022 at 11:00 AM. The following members were present:

1. Dr. Bhawana Sharma, Scientist 'C'
   Department of Immunology, NJIL & OND, Agra
2. Dr. Davesh Jadon,
   Department of Botany R.B.S.College, Agra
3. Dr. Seema Bhadauria, Principal, B.V.R.I. Bichpuri, Agra
4. Dr. Surabhi Mahajan, Department of Microbiology,
   Dr. Bhimrao Ambedkar university, Agra
5. Prof. Bhupendra Swarup Sharma, Dean Life sciences,
   Dr. Bhimrao Ambedkar University, Agra

1. The Academic Committee considered, approved and adopt the Syllabus of Microbiology as proposed by the UP Government under NEP 2020 as one of the subject at UG level in B.Sc.to be implemented from the session 2021-22 (Appendix – I).

2. The Academic Committee considered and approved revised Ordinances (Point number 14) of the Department of Microbiology (Appendix – II)

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12.02.22

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12.02.2022

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Choice Based Credit System (CBCS)
Department of Microbiology,
School of Life Sciences,
Dr. B. R. Ambedkar University, Agra

M.Sc. Microbiology I semester

Core Courses	Course Title	Marks		Total 100	Credit
		CIE	End Semester Examination		
MB -C101	Mycology	25	75	100	4
MB -C102	Virology	25	75	100	4
MB-C103	Bacteriology	25	75	100	4
MB-C104	Microbial Biochemistry and Basic Enzymology	25	75	100	4
MB-C105	Practical		100	100	4
	Industrial training/Survey/Research Project				
	Total			**500**	**20**

M.Sc. Microbiology II semester

Core Courses	Course Title	Marks		Total	Credit
		CIE	End Semester Examination		
MB-C201	Molecular Biology	25	75	100	4
MB -C202	Microbial Genetics	25	75	100	4
MB-C203	Bioinstrumentation	25	75	100	4
MB-C204	Immunology	25	75	100	4
MB-C205	Practical		100	100	4
MB-C206	**Industrial training/Survey/Research Project**		200	**200**	**8**
	Minor	25	75	**100**	**4**
	Total			**800**	**32**

M.Sc. Microbiology III semester

Core Courses	Course Title	Marks		Total	Credit
		CIE	End Semester Examination		
MB-C301	Microbial Metabolism	25	75	100	4
MB-C302	Biostatics, Computer Application and Bioinformatics	25	75	100	4
MB-C303	Genetic Engineering	25	75	100	4
MB-E304	Computational biology	25	75	100	4
MB-E305	Microbial Genomics and Proteomics				
MB-C306	Practical		100	100	4
	Industrial training/Survey/Research Project				
	Total			**500**	**20**

M.Sc. Microbiology IV semester

Core Courses	Course Title	Marks		Total	Credit
		CIE	End Semester Examination		
MB-C 401	Medical Microbiology	25	75	100	4
MB-C402	Industrial Microbiology	25	75	100	4
MB -E403	Food and dairy Microbiology	25	75	100	4
MB-E404	Environmental Microbiology				
MB-E405	Agricultural Microbiology	25	75	100	4
MB-E406	Plant Pathology				
MB- C407	**Practical**		100	**100**	**4**
MB-C408	**Industrial training/Survey/Research Project**		200	**200**	**8**
	Total			**700**	**28**

Note:

1. The I and II semesters of the First year of the M.Sc. Microbiology (in Faculty of Life Science) Programme will be known as VII and VIII semesters of the B.S.c research (in Faculty of Life Science).

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M.SC. MICROBIOLOGY I SEMESTER
CORE COURSE
MB-C101 MYCOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I Status of fungi in living world, general features of fungi and fungus like organisms, recent trends in the classification of fungi, physiology and growth of fungi, nutritional and environmental factors affecting growth, saprotrophs, parasites of Mutualistic symbionts, physiology of reproduction in fungi, Phylogeny of fungi. **Fungi and Biotechnology** Production of alcoholoic beverages, antibiotics, organic acids, ergot alkaloids, the cultivation of fungi for food- Mushrooms, mycofoods, Role of fungi in agriculture and forestry- Mycorrhizae and their application,	15
UNIT-II **Fungal Diversity- major taxonomic groups, structure, reproduction, life cycle and significance of the following representative:** 1. Gymnomycota- Cellular slime moulds (Dictyostelium), Plasmodial slime moulds (myxomycetes) 2. Mastigomycotina- *Coelomomyces*, *Lagenidium*, *Achlya*, *Phytophthora*, *Peronospora*, *Plasmodiophora* 3. Amastigomycotina- Zygomycotina, *Mucor*, *Syncephalastrum*, *Blakeslea*, *Cunninghamella*, *Entomorphthora*.	15
UNIT- III **Fungal diversity contd.** 1. Ascomycotina- *Taphrina*, *Chaetomium*, *Morchella*, *Neurospora* 2. Basidiomycotina- *Puccinia*, *Melampsora*, *Polyporus*, *Lycoperdon* 3. Deuteromycotina- *Fusarium, Cercospora, Curvularia, Beauveria, Microsporum*	15
UNIT- IV 1. Life cycle and sexual process in fungi, 2. Genetic variation in fungi- Nonsexual variations- haploidy, heterokaryosis, parasexuality, sexual variations, homothallisum and heterothallium, Mutation, physiological specialization. 3. Mycopesticides 4. Mycotoxins.	15

Suggested Books:

1. Introductory Mycology, CJ Alexopoulos, CW Mims, M Blackwel, JohnWiley& Sons.
2. The Fungi: An Advanced Treatise, GC Ainsworth, KF Sparrow, AS Sussman.
3. An Introduction to Fungi, HC Dube, VikasPubl, New Delhi.
4. The Fungi, PD Sharma, Rastogi Publications, Meerut
5. Fungi: Experimental Methods in Biology, R Maheshwari, CRC Press, Boka Raton, Florida
6. Introduction to Fungi, J Webster & WS Roland, Cambridge University Press.
7. A Text Book of Modern Plant Pathology, KS Bilgrami, HC Dube.
8. Plant Pathology, RS Mehrotra.
9. Fungi and Plant Disease, VK Gupta, TS Paul
10. Diseases of Crop Plants in India, Rangaswamy&Mahadevan.
11. Plant Pathology, GN Agrio Elsevier Academic Press.
12. Molecular Plant Pathology, Dickinson CM, Bios Scientific Publisher
13. Plant Pathology: Concepts and Laboratory Exercises, NT Robert, MT Windham, ASWindham, CRC Press.
14. Principles of Plant Pathology, RS Sing, Oxford and IBH Publishing Co. Pvt Ltd.

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M.SC. MICROBIOLOGY I SEMESTER
CORE COURSE
MB-C102VIROLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I: **Classification, Morphology and Chemistry of Viruses:** Virus evolution and classification, properties of viruses, virus structure, Techniques for visualization and enumeration of viral particles, measuring biological activity of viruses, assays for virus estimation and manipulation, characterization of viral products expressed in infected cells.	15
Unit II **Virus replication Strategies:** Principal events involved in replication: Adsorption, penetration, uncoating nucleic acid and protein synthesis, intracellular trafficking, assembly, maturation and release, viral-host interaction, Host response to viral infection. Identification of virus prototypes associated with different virus replication schemes; Details on important viruses namely Herpesvirus, Poliovirus, Influenza virus, Adeno Virus, Poxviruses, Hepatitis Viruses, coronaviruses, Retroviruses.	15
Unit III **Subviral pathogens:** HDV, Prions, Viroids **Pathogenesis of viral infection:** Stages of infection, Patterns of some viral diseases-epidemiology, transmission, infection, symptoms, risk, transformation and oncogenesis, emerging viruses. **Anti-viral strategies-prevention and control of viral diseases:** Host specific and nonspecific defense mechanisms involved in resistance to and recovery from virus infections. Role of interferon in viral infections. Contributions of various host defense mechanisms in viral infections; History of vaccines especially smallpox and polio. New methods: subunit vaccines,anti-idiotype and DNA vaccines.	15
Unit IV **History and development of plant virology, cryptograms, and classification of plant viruses and viroids:** Brief history of virology highlighting the significant contributions of scientists to the development of plant virology; significance of plant virology and modern classification of plant viruses and viroids according to ICTV; and cryptograms of various plant viruses and virus groups **Symptoms of plant virus diseases, transmission of plant viruses, viral and viroid diseases and their control:** General discussion on symptoms caused by viruses and viroids in diseased economically important trees and agricultural crops, and their control including development of virus disease resistant transgenetics	15

Suggested Books:

1. Medical Virology 10 Th Edition by Morag C and Tim bury M C .ChurchillLivingstone, London.
2. Introduction to Modern Virology 4th Edition by Dimmock N J, Primrose S. B.. Blackwell Scientific Publications. Oxford.
3. Virology by Conrat H.F., Kimball P.C. and Levy J.A.Prentice Hall, Englewood Cliff, New Jersey.
4. Text Book on Principles of Bacteriology, Virology and Immunology Topley and Wilsons.
5. Molecular Biology, Pathogenesis and Control by S.J: Flint and others. ASM Press, Washington, D.C.
6. Applied Virology. 1984. Edited by EdonardKurstak. Academic Press Inc.
7. Introduction to Modern Virology by Dimmock.

02.06.22

2/9/2022

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M.SC. MICROBIOLOGY I SEMESTER.
CORE COURSE
MB-C103 BACTERIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I History, scope and development of bacteriology, Sterilization, isolation, enrichment, pure culture and staining techniques, systematic study of bacteria; morphological, physiological, biochemical and serological studies, genetic characterization. Habitat, structure, reproduction & classification of bacteria.	15
UNIT- II 1. The photosynthetic bacteria; cyanobacteria, green bacteria, halobacteria and their economic importance 2. Methanogenic bacteria and their significance 3. Chemoautotrophs and Methylotrophs: Nitrifying bacteria, sulphur oxidizers, iron bacteria and their economic importance.	15
UNIT- III 1. Enterobacteriaceae and related organisms, their morphological & physiological characters, genetic interrelationship, taxonomic sub-division & their importance in human health. 2. Myxobacteria, cytophage group, filamentous & gliding chemoheterotrophs& filamentous sulphur oxidizing bacteria.	15
UNIT IV **Morphological & physiological characters, taxonomic sub-division & the importance of Pathogenic Bacteria-** Staphylococcus, Sterptococcus, Pnumococcus, Corynebacterium, Bacillus, Clostridium, Non-sporing anaerobes; organisms belonging to Enterobacteriaceae, Vibrios, NonfermentingBrucella, Mycobacteria, Spirochates, Actinomycetes, Rickettsiae, Chlamydie.	15

Suggested Books:

1. General Microbiology: R Y Stanier, Adelberg E A and J L Ingraham, Mac Millan Press Inc
2. Introduction to microbiology: Ingraham J L and Ingraham C A Thomson Brooks/ Cole
3. Principles of microbiology R M Atlas Wm C brown Publishers
4. Brock's biology of Microorganisms Madigan M T and Martinko J M Pearson Education Inc
5. Microbiology: An introduction: Tortora G J, Funke B R and Case C L Pearson Education Inc

7/6/12

M.SC. MICROBIOLOGY I SEMESTER
CORE COURSE
MB-C104 MICROBIAL BIOCHEMISTRY AND BASIC ENZYMOLOGY
(TOTAL CREDIT -04, END SEMESTER MARKS -75, CIE-25)

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I 1. Biomolecules – Chemical composition and bonding, three dimensional structure, configuration and confirmation. 2. Chemical reactivity – five general types of chemical transformation of : oxidation reduction reactions, nucleophilic substitution, electron transfer with in molecules producting internal rearrangement, group transfer reaction, condensation reaction 3. Water – weak interactions in aqueous system, ionization of water, weak acid and weak base, concept of pH &pKa, Buffers (bicarbonate buffering system). 4. Principles of Bioenergentics – Entropy, enthalpy and free energy. 5. Oxidative and Photophosphorylation, ATP production	15
Unit II 1. Carbohydrates: Classification, Structure, chemical feature and function. 2. Lipids – Classification, Structure, chemical feature and function 3. Amino acids, peptides and proteins - Classification, Reaction & physical properties. Three dimensional structures of protein and protein folding. 4. Nucleotides and nucleic acids	15
Unit III 1. Structural features of Biomembranes, 2. **Solute transport across membranes**: Introduction, Kinetics 3. Simple diffusion, facilitated transport: Symport, antiport and uniport. 4. Avtive Transport: Primary and Secondary active transport: ABC transporters, Phosphotransferase system, Drug export systems.	15
Unit IV 1. Enzymes – Classification and factors affecting enzyme activity 2. Allosteric Enzymes and their regulation 3. Enzyme kinetics – Equilibrium and steady state theory (MichalisMenten equation) and determination of kinetic parameters. 4. Enzyme inhibition – reversible and irreversible inhibition, competitive, non-competitive and un-competitive inhibition	15

Suggested Books:

1. Biochemistry, Voet Donald and Voet J.G ., John Wiley and sons INC
2. Biochemistry, Zubay .G. - Wm.C.brown Publishers
3. The Physiology and Biochemistry of prokaryotes White .D. -Oxford Univ.press
4. Principles of Biochemistry, LehningerA.L.Cox and Nelson , CBS Publishers and Distribution Pvt.Ltd
5. Biochemistry, Stryer .L., W.H.Freeman and Co
6. Principle and Techniques –Practical Biochemistry Wilson. K. and Walker.J. -Cambridge University press
7. Biochemistry, Murray, Harpers McGraw Hill
8. Biochemistry, Satyanarayana and Chakrapani, Books and Allied Publishers
9. Fundamentals of Biochemistry, VoetDonald,J.W.Voet and Ch.W.Pratt, Jhon Willey & Sons Inc.
10. Enzyme Kinetics by Paul Engel. John Wiley and Sons. Inc., New York.

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M.SC. MICROBIOLOGY II SEMESTER
CORE COURSE
MB-C201MOLECULAR BIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I 1. Introduction of molecular biology and genetics. 2. Genome organization – genome, c-value, c-value paradox, genome complexity, 3. DNA Replication Prokaryotic and eukaryotic DNA replication, mechanism of DNA replication, enzymes and accessory proteins involved in DNA replication.	15
Unit II 1. Transcription Prokaryotic transcription and eukaryotic transcription, RNA polymerase, General and specific transcription factors, regulatory element and mechanisms of transcription regulation. 2. Transcriptional and post transcriptional gene silencing. 3. Modification of RNA 5'-cap formation, transcription termination, 3' end processing and polyadenylation, splicing, Editing, Nuclear export of mRNA, mRNA stability.	15
Unit III 1. Translation Prokaryotic and eukaryotic translation, the translation machinery, mechanisms of initiation, elongation and termination, regulation of translation. **2.** Co- and Post- translational modifications of proteins.	15
Unit IV 1. Protein localization and transport Synthesis of secretary and membrane, import into nucleus. Mitochondria E. R., Golgi complex, chloroplast, and peroxisomes, Receptor mediated endocytosis. 2. Antisense and ribozyme technology Molecular mechanism of antisense molecules, inhibition of splicing, polyadenylation and translation. Disruption of RNA structureand capping biochemistry of ribozyme; hammerhead, hairpin and other ribozymes, strategies for designing ribozyme, application of antisense and ribozyme technologies.	15

Suggested Books:

1. Lodish et al., Molecular cell Biology, 4th Edition, W.H. Freeman & Company, 2000.
2. Smith & Wood, Cell Biology, 2nd Edition, Chapman & Hall, London, 1996.
3. Watson et al., Molecular Biology of the gene, 5th Edition, Pearson Prentice Hall. USA, 2003.
4. B. M. Turner, Chromatin & Gene regulation, 1st Edition, Wiley-Blackwell, 2002.
5. Benjamin Lewin, Gene X, Edition, Jones and Barlett Publishers, 2007.
6. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner; Molecular Biology of the Gene, 6th Edition, Benjamin Cummings Publishing Company Inc, 2007.
7. Alberts et al; Molecular Biology of the Cell, 4th edition, Garland, 2002.
8. Recombinant DNA technology by Watson et. al., (Scientific American Books).
9. Principles of Gene Manipulation by Old and Primrose.(Blackwell).
10. Molecular Biotechnology by Glick.

M.SC. MICROBIOLOGY II SEMESTER
CORE COURSE
MB -C202MICROBIAL GENETICS

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I 1. Gene as unit of mutation and recombination. 2. Molecular nature of mutations; mutagens. 3. Type of DNA damage (deamination, oxidative damage, alkylation, pyridine dimmers). 4. Ame's test for mutagenesis 5. DNA repair- photorepair, excision or dark repair, recombinational repair, SOS repair.	15
UNIT-II 1. Methods of genetic analysis and genetic mapping, Pedigree analysis, lod score for linkage testing. 2. Recombination - Homologus recombination - Holiday junction, site specific recombination - FLP/FRT and Cre lox recombination, Rec A and other recombinases 3. Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping. 4. Molecular markers in genome analysis, RFLP, RAPD, AFLP, STS, SCAR (Sequence characterized amplified regions), microsatellite, SSCP, QTL.	15
UNIT- III 1. Bacterial genetic system: transformation, conjugation and transduction. Bacterial genetics map with reference to *E.coli*. 2. Complementation analysis, cir-trans test, deletion mapping, Benzer's concept of cistron, concept of overlapping genes.	15
UNIT- IV 1. Southern, Northern and florescence *in situ* hybridization for genome analysis 2. Chromosome micro-dissection and micro-cloning. 3. Important application of advances in microbial genetics. Production of proteins. 4. Conventional as well as new generation recombinant DNA vaccines, design and advantages	15

Suggested Books:

1. Molecular Genetics of Bacteria by J. W. Dale. John Wiley and Sons.
2. Modern Microbial Genetics. Streips and Yasbin. Niley Ltd.
3. Moleculat Biology of the Gene , J.D. Watson, N.H. Hoppkins, J.W. Roberts, J.A. Steitz and A.M. Weiner. The Benjamin / Cummings Publications Co. Inc. California.
4. Gene XI by Lewin Oxford University Press..
5. Microbial Genetics by Frefielder. 4th Edition.
6. Molecular Genetics of Bacteria, Larry, Snyder and Wendy, Champness, ASM Publications.
7. Methods of General and Molecular Bacteriology, 1993. Edited by Philip. Gerhardt, ASMPublications.

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M.SC. MICROBIOLOGY II SEMESTER
CORE COURSE
MB -C203 BIOINSTRUMENTATION

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I – 1. Photometry – Basic principles, Instrumentation and applications of UV-Visible spectrophotometry 2. Infrared (IR).spectroscopy and its applications 3. Fluorescence spectroscopy – principle, instrumentation and applications. 4. Mass spectroscopy – Mass analyzers, principle, instrumentation and applications.	15
Unit II - 1. Raman spectroscopy and its applications 2. Electron spin resonance (ESR) spectroscopy and applications 3. Nuclear magnetic resonance (NMR) Spectroscopy – principle, instrumentation and applications 4. Circular Dichroism (CD) spectroscopy – principle, instrumentation and applications 5. X-ray Crystallography – principle, instrumentation and applications	15
UNIT III – 1. Centrifugation – basic principle, types and applications 2. Chromatography: Principle, types and applications of Paper, Thin layer, High performance liquid chromatography; Column Chromatography – Gel filtration, Ion exchange chromatography, affinity chromatography, adsorption chromatography. 3. Electrophoresis: Principle, types and applications; Agarose gel, PAGE, SDS-PAGE, Iso-electric focusing, Two Dimensional gel electrophoresis, Immuno-electrophoresis, Capillary electrophoresis, Pulse Field gel electrophoresis. 4. Autoradiography – Principle and applications, radioisotopes used in biology and their application.	15
Unit IV – 1. Microscopy – Basic principle and components of microscope, phase contrast and fluorescent and Confocal microscopes 2. Electron microscopy – principle and applications 3. Sequencing techniques for proteins and nucleic acids 4. Detection of molecules using flow cytometry and *in-situ* localization by hybridization techniques such as FISH and GISH	15

Suggested Books:

1. Instrumental Methods of Analysis. H.H. Willard, L.L. Merritt Jr. and others. CBS Publishers and Distributors.
2. Instrumental Methods of Chemical Analysis. Chatwal G and Anand, S. Himalaya Publishing House, Mumbai.
3. A Biologists Guide to Principles and Techniques of Practical Biochemistry. Williams, B.L. and Wilson, K.
4. Spectroscopy. Volume 1. Edited by B.B. Straughan and S. Walker. Chapman and Hall
5. Ltd.
6. Chromatography: Concepts and Contrasts- 1988 by James Miller. John Wiley and Sons.
7. Inc., New York.
8. Analytical Biochemistry by Holme.
9. Introduction to High Performance Liquid Chromatography by R. J. Hamilton and P. A.

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M.SC. MICROBIOLOGY II SEMESTER
CORE COURSE
MB -C204IMMUNOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I 1. Immune response: innate and adaptive immune system, cells and molecules of immune system, Cells of the Immune system : Hematopoiesis and differentiation , Lymphocyte trafficking , B-lymphocyte , Macrophage Dendritic cells , Natural killer and Lymphokine activated killer cells, Eosinophils , Neutrophils and Mast cells . 2. Clonal selection theory. 3. Organization and structure of lymphoid organ. 4. Nature and biology of antigens and super antigens. 5. Antibodies structure and function.	15
Unit II- 1. Antigens antibody interactions. 2. Major histocompatibility complex. 3. BCR & TCR, generation of diversity. 4. Regulation of immune response: - antigen processing and presentation , generation of humoral and cell mediated immune response . - Activation of B & T –lymphocytes. - Cytokines and their role in immune regulation. - T-cell regulation, MHC restriction. - Immunological tolerance.	15
Unit III – 1. Complement system. 2. Cell mediated cytotoxicity: Mechanism of T cell and NK cell mediated lysis, Antibody dependent cell mediated cytotoxicity, macrophage mediated cytotoxicity. 3. Hypersensitivity. 4. Catalytic antibodies 5. Hybridoma Technology and monoclonal antibodies.	15
Unit IV – 1. Host parasite interaction 2. Cell signaling Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, 3. Cellular communication Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation. 4. Cancer immunology	15

Suggested Readings:

1. Kuby Immunology, Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne , Janis Kuby,
2. Immunology and Immunopathology by Stewart.
3. Cellular and Molecular Immunology by Abul K. Abbas et al.
4. Textbook of Immunology by Barret.
5. Essential Immunology by Roitt, Brostoff, Male, Harcourt Brace & Company (5th Edition), Mosby (6th Edition)
6. Immunology by J.Kuby, Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne, Freeman & Company Mosby publishers.

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M.SC. MICROBIOLOGY III SEMESTER
CORE COURSE
MB-C301 MICROBIAL METABOLISM

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I 1. Growth and cell division: mathematical nature and expression of growth. 2. Measurement of growth, growth yields, steady state growth and continuous growth. 3. Effect of nutrient concentration in growth rate. 4. Effect of environment on microbial growth	15
Unit II 1. Overview of Microbial nutrition. 2. Metabolic diversity among Microorganisms • Photosynthesis in microorganisms; Role of chlorophylls, Carotenoids and phycobilins. • Chemolithotrophy: Hydrogen-ion-nitrate-oxidizing bacteria; nitrate and sulfate reduction. • Methanogenesis and acetogenesis:fermentation's-diversity. • role of anoxic decompositions: nitrogen metabolism, nitrogen fixation; hydrocarbon transformation.	15
Unit III 1. Carbohydrate Catabolism: Glycolysis, Citiric acid cycle, Pentose phosphate pathway, EmbedenMayerhoff pathway. 2. Lipid Catabolism –Oxidation of fatty acids. 3. Amino acid oxidation and production of Urea.	15
Unit IV 1. Carbohydrate Anabolism – Gluconeogensis, glyoxalate pathway and regulation. 2. Lipid Biosynthesis 3. Biosynthesis of Amino acids – tryptophan, alanine, cysteine, histidine, glutamate 4. Biosynthesis of nucleotides and poly amines	15

Suggested Books:

1. Microbial Physiology and Metabolism, Caldwell D.R., Brown Publishers.
2. Microbial Physiology, Moat A.G. and Foster J. W. 1999.. Wiley.
3. Advances in Microbial Physiology. A.H. Rose. Academic Press, New York
4. Biochemistry by Geoffrey L. Zubay. 4th Edition. Brown Co, USA. 1999.
5. Microbial Physiology by A.G. Moat, J. W. Foster, M. P. Spector. 3rd Edition. John Wiley & Sons. 2002
6. Lehninger Principles of Biochemistry by D. L. Nelson, M. M. Cox. 6th Edition. W. H. Freeman. 2012
7. The Physiology and Biochemistry of Prokaryotes by D. White, J. Drummond, C. Fuqua. 4 th Edition. Oxford University Press. 2011.
8. Microbial Biochemistry by G. N. Cohen. 2nd Edition. Springer. 2014.
9. Lippincott's Illustrated Reviews: Biochemistry edited by D. R. Ferrier. 6th Edition. Lippincott Williams & Wilkins. 2013
10. Biochemical Calculations: by Irwin H. Segel. 2nd Edition. Wiley. 2004. 8. Understanding Enzymes by T. Palmer, E.Horwood. 3rd Edition. Wiley. 1991.

M.SC. MICROBIOLOGY III SEMESTER
CORE COURSE
MB -C302BIOSTATISTICS, COMPUTER APPLICATION AND BIOINFORMATICS

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I 1. Brief description, classification, tabulation of data and its graphical representation 2. Measures of central tendency and dispersion mean; median; mode range. Standard division, variance. 3. Simple linear regression and correlation. 4. Probability, Theorems of Probability and Probability distribution- Binomial, Poisson and normal Distribution	15
Unit II 1. Test of significance; null hypothesis, alternative hypothesis, two types of errors, Level of significance, 2. T test: Compares ion of two sample means (equal and Unequal) . 3. Compares ion of Three or more sample means (ANOVA) a. Analysis of variance in one way classification (one factor analysis). b. Analysis of variance in two way classification (two factor analysis). 4. Chi Square test: Goodness of Fit and Independence of the Attributes	15
Unit III 1. Introduction of digital computers organization low level and high level language binary number system. 2. Flow chart and programing techniques. 3. Introduction to data structure and data base concepts, 4. Introduction to MS-office software, covering Word processing. spreadsheets and presentation 5. Introduction to internet and its application.	15
Unit IV 1. Bioinformatics – an overview, introduction and scope of bioinformatics. 2. Biological database – Primary sequence database (Protein and DNA), Secondary database, composite database 3. Searching pairwise database BLAST, FASTA, Multiple sequence alignment (ClustalW, Psi BLAST). 4. Computer aided drug designing.	15

Suggested Books:

1. Statistics in biology, Bliss, C.I.K. McGraw Hill, NewYork.
2. Practical Statistics for experimental biologist Wardlaw, A.C.
3. How Computers work, Ron White. Tech. Media
5. How the Internet Work, Preston Gralla Tech. Media.
6. Statistical Methods in Biology, Bailey, N.T. J. English Univ. Press.
7. Biostatistics - 7th Edition by Daniel
8. Statistics for Biologist, Campbell R.C., Cambridge University Press, UK.
9. INTERNET – CDC publication, India.
10. Bioinformatics. 1998 by Baxevanis

M.SC MICROBIOLOGY III SEMESTER
CORE COURSE
MB-C303GENETIC ENGINEERING

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I 1. Scope of Genetic Engineering. 2. Isolation of enzymes, *in-vitro* synthesis of DNA and patenting of life forms. 3. Restriction enzymes and modification enzymes. 4. Nucleic acid Purification and Yield Analysis. 5. Nucleic Acid Amplification, PCR and Its application	15
Unit II 1. Gene cloning Vectors Plasmids, bacteriophage, phagemides, cosmids, Artificial Chromosomes. 2. Restriction mapping of DNA fragments and Map construction. 3. cDNA Synthesis - mRNA enrichment, reverse transcription, DNA primers, linkers, Adapters and their chemical synthesis, Library construction and screening. 4. Alternative strategies of Gene Cloning. Cloning interacting genes- Two and three hybrid systems. 5. Nucleic acid microarrays.	15
Unit III 1. Site directed Mutagenesis and Protein Engineering. 2. How to study the Gene Regulation? DNA transfection, Northern blot, Primer extension, SI mapping, Rnase protection assay. 3. Expression Strategies for heterologous genes Expression in bacteria, expression in Yeast, expression in insects and insect cells, expression in mammalian cells. 4. Processing of Recombinant proteins. Purification and stabilization of proteins.	15
Unit IV 1. Phase Display. 2. T-DNA and Transposon Tagging 3. Transgenic and gene Knock out Technologies Targeted gene replacement, chromosome engineering. 4. Gene Therapy. Vector engineering, Strategies of delivery, gene replacement/ augmentation, gene correction, gene editing, regulation and silencing.	15

Suggested Books:

1. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press, 2001.
2. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL, 2001.
3. Brown TA, Genomes, 3rd ed. Garland Science 2006
4. Selected papers from scientific journals.
6. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.
7. Genetic Engineering by SandhyaMitra
8. Gene Technology by SN Jogdand.

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M.SC. MICROBIOLOGY III SEMESTER
ELECTIVE COURSE
MB-E304COMPUTATIONAL BIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
Unit I: Biological Databases: Introduction. Types of databases in terms of biological information content. Protein and gene information resources. Different formats of molecular biology data. Specialized resources for genomics, proteomics and metabolomics.	15
Unit II: Sequence Alignment: Methods and algorithms of pairwise and multiple sequence alignment. Global and local alignment. Alignment scoring matrices. Database similarity searching. Different approaches of motif detection. Concept and use of protein families. Concept of orthology, paralogy and homology in gene and protein sequences	15
Unit III: Molecular Phylogenetics: Methods and tools for phylogenetic analysis. Creation evaluation and interpretation of evolutionary trees. Advantages and disadvantages of phenetic and cladistics approaches.	15
Unit IV: Genomics and Gene Annotation: Organization and structure of prokaryotic and eukaryotic genomes. Genome annotation and databases. Automated in-silico methods of finding gene and relevant features. Genome Sequencing using first and seconding generation sequencing methods. Advantages of genome sequencing projects in modern biological research.	15

Suggested Books:

1. Introduction to Computational Biology: An Evolutionary Approach by Haubold, Wiele. 1st edition. Springer International. 2006.
2. Introduction to Bioinformatics by A. Lesk. 3rd edition. OUP India. 2009.
3. Statistical methods in Bioinformatics: An introduction by W. Ewens, G.R. Grant. 2nd Edition. Springer-Verlag. 2006.
4. Bioinformatics: Sequence and genome analysis by D. Mount. 2nd edition. Cold Spring Harbor Lab Press. 2004.
5. Bioinformatics: A practical guide to the analysis of genes & proteins. Edited by Baxevanis, Outlette. 2nd edition. John Wiley and Sons. 2001.
6. An Introduction to Protein Informatics by K-H Zimmermann. 1st edition, Springer International. 2007.
7. Fundamental Concepts of Bioinformatics by Krane. 1st edition. Pearson Education. 2003. 8. Discovering Genomics, Proteomics and Bioinformatics by Campbell. 2nd edition. Campbell Pearson Education. 2007.
8. Structural bioinformatics: an algorithmic approach by F. J. Burkowski. 1st edition, Chapman & Hall/CRC. 2009.
9. Structural Bioinformatics edited by J. Gu, P.E. Bourne. 2nd Edition. Wiley-Blackwell. 2009.

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M.SC. MICROBIOLOGY III SEMESTER
ELECTIVE COURSE
MB-E305MICROBIAL GENOMICS AND PROTEOMICS
(TOTAL CREDIT -04, END SEMESTER MARKS -75, CIE-25)

TOPIC	TEACHING HOURS
Unit I The genomic era-functional and structural genomics, current status of microbial genomics projects. Impact in agriculture, environment and medicine.	15
Unit II The strategies: whole genome sequencing, shotgun and clone by clone approach. Sequencing methods, large insert cloning vector, gene libraries.	15
Unit III Sequence analysis, Swissprot and other protein analysis tools, BLAST and DNA analysis tools, microarray and design of chips.	15
Unit IV The databases like EMBL gene bank, NCBI etc., use of internet and networking, submission of data to gene banks patents and copyrights.	15

Suggested Books:

1. MicrobialGenomesRead, T D. Nelson, K E, FRASERraser, C M. . USA: Humana Press, Inc.,
2. Discovering Genomics, Proteomics and BioinformaticsHEYEReyer, L. Camlbell, A. USA Cold Spring Harbor Lab. Press, 2006. 352 p. ISBN 0-8053-4722-4
3. Concepts and Techniques in Genomics and Proteomics, N. Saraswathy and P. RamalingamWooodhead publishing
4. Genomics and Proteomics: Principles, Technologies, and Applications. D. Thangadurai, J. Sangeetha CRC Press

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M.SC. MICROBIOLOGY IV SEMESTER
CORE COURSE
MB-C401MEDICAL MICROBIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I Early discovery of pathogenic microorganism; development of bacteriology of scientific disciplines; Normal microbial flora of the human host; role of resident flora; Classification of medically important microorganisms, dermatophytes dimorphic fungi, opportunistic fungal pathogen.	15
UNIT-II 1. Transplantation immunology 2. Immunity of infectious agents (intercellular, parasites helminthes & viruses) 3. Tumor Immunology. 4. AIDS and other Immunodeficiency. 5. Autoimmunity	15
UNIT-III Common viral infection of human Herpes, Arbovirus, HIV (Symptoms, transmission, control, culture and reproduction); important protozons (Malaria, Amoebiasis, Taxoplasmosis, trypanosomiases, Leshmaniasis, Anaplasmosis); Metazoans: trematodes, Nematodes (Schistomiasis, Filariasis, Hookworms, Round worms).	15
UNIT IV Strategies/approaches (conventional and modern) in the diagnosis of important disease/syndrome: meningitis, urinary tract infection, sexually, wound infection etc. General concepts in epidemiology and disease control-conventional and new generation vaccines	15

Suggested Books

1. Medical Microbiology by MIMS, Play Fair, Roitt& Mosby Publishers,
2. Medical Microbiology by Melnick.
3. Textbook of Microbiology by Ananthanarayan, C.K.J.Panikar, Oreint Longman Ltd.
4. Medical Microbiology by David Greenwood, Richard C.B.Slack, John.F.Peutherer.
5. Medical Microbiology – A Clinical perspective by J.B.Sharma, paras publishing.
6. Medical Microbiology by Patrick R.Murray, Ken.S.Rosenthal, George.S.Kobayashi, Michael A.Ptaller.
7. Pharmaceutical Microbiology edited by W.B. Hugo & A.D. Russell, 6th Edition, Black well science.
8. Microbiology in clinical practice by Shanson D.C., 2nd edition, London; Wright

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M.SC. MICROBIOLOGY IV SEMESTER
CORE COURSE
MB-C402INDUSTRIAL MICROBIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I **Biofermantation:** Designing and application; Principles of biofermentation, monitoring and control of parameters (pH, oxygen, agitation, temperature, foam etc.), batch & continuous. computer control of fermentation process.	15
UNIT-II Isolation, Maintenance, Preservation & improvement of industrial strains, The isolation, preservation and improvement of industrially important and useful microorganisms. Industrial fermentation- typical media, media formulation, water, energy and carbon sources, nitrogen sources, minerals, vitamin sources, nutrient recycle, buffers, precursors and metabolic regulators, oxygen requirement.	15
Unit III **Downstream Processing:** Filtration of fermentation broths, ultracentrifugation, recovery of biological products by distillation, superficial fluid extraction.	15
Unit IV **Production aspects:** Microbial strains, substrates, strain improvement, flow diagrams, product optimization, and applications of industrial alcohol (ethanol and butanol), amino acids (lysine, phenylalanine, tryptophan), antibiotics (cephalosporins, tetracyclines, polyenes), enzymes and immobilized enzymes, SCP, microbial polyesters, biosurfactants.	15

Suggested Books:

1. Solid State fermentation in Biotechnology by Pandey.
2. Industrial Microbiology by Waiter.
3. Fermentation Microbiology and Biotechnology by Mansi.
4. Industrial Microbiology by Patel.
5. Biotechnology: A text book of Industrial Microbiology by Greger
6. Principles of Fermentation technology by Whitaker.
7. Industrial Microbiology by Prescot& Dunn.
8. Microbial Technology by J.H. Peppler& D. Perlman.
9. Industrial Microbiology by L.E.Casida.
10. Industrial Microbiology by B.M. Miller &W.Litsky.
11. Economic Microbiology by Rose,
12. Advances in Applied Microbiology by Ed.Perlman, Series of volumes.

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M.SC MICROBIOLOGY IV SEMESTER
ELECTIVE COURSE
MB-E403FOOD AND DAIRY MICROBIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS
Unit I: Microorganisms important in food microbiology: Taxonomical classification of microbes associated with food products, their phenotypic and biochemical identification. Food associated molds, yeasts, yeast-like fungi and bacteria. Microbiome of food material	15
Unit II: **Microbiology of foods:** Microbial habitat of specific food materials, adaptations and changes in microbiome of vegetables, fruits, milk, fermented and non-fermented milk products, fresh meats, poultry and non-dairy fermented foods. **Microbial spoilage of foods:** Types and causes of spoilage of cereals and cereals products, spoilage of vegetables and fruits, spoilage of meat and meat products, spoilage of fish and other sea foods, spoilage of eggs and other poultry products, spoilage of milk and milk products. Study of microorganisms responsible for spoilage and microbial succession during spoilage. Brief insights into chemical and physical spoilage of foods. **Food preservation:** General principles of food preservation, various classical, physical, chemical, and biological methods of preservation. New developments in food preservation techniques. Analysis of practical implementation of such techniques.	15
Unit III: **Fermentation processes:** Production of fermented milk and milk products, plant-based products, fish products, meat products and nutraceuticals. Manufacture of starter cultures from lab to pilot scale. Batch submerged and solid-state fermentation of foods. **Food beverages and enzymes**: Concept of human microbiome, probiotics and prebiotics. Insight into health benefits of fermented milk products. Understanding benefits of tradition and non-traditional fermented foods. Introduction to the concept of bioactive compounds and brief study of such compounds from fermented foods including malt beverages, wines, distilled liquors and vinegar.	15
Unit IV: **Food-borne diseases:** Food borne infections including bacterial, viral and fungal infections. Study of infections due to food borne parasites. In depth study of various types and causes of food intoxication. Summary of prevention of microbial food infections. Identification and first aid for specific types of food infections.	15

Suggested Books:

1. Food Microbiology by W.C. Frazier, D.C. Westhoff , K.N. Vanitha. 5 th edition. McGraw Hill Education. 2013.
2. Modern Food Microbiology by J.M. Jay, M.J. Loessner, D.A. Golden. 7 th edition. Springer. 2006.
3. Fundamental Food Microbiology by B. Rayand A. Bhunia. 5th edition. CRC press. 2013.
4. Food Microbiology by M. R. Adams, M. O. Moss, P. McClure. 4 th edition. Royal Society of Chemistry. 2015.
5. Food Microbiology: Fundamentals and Frontiers by M. P. Doyle, L. R. Beuchat. 3 rd edition. ASM press. 2007.
6. Food Microbiology: An Introduction by T. Montville, K. Matthews, K.Kniel. 4 th edition. ASM press. 2017.

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M.SC. MICROBIOLOGY VI SEMESTER
ELECTIVE COURSE
MB-E404ENVIRONMENTAL MICROBIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I Microbial Ecology: Basic concept, types of microbial habitats, factors affecting microbial population; microbial interactions; competition, Amenesalism, parasitism, mutualism, commensalisms, synergism; Biogeochemical cycles: Carbon, Nitrogen, Phosphorous and Sulphur Cycle; Conservation and management of microbial diversity.	15
Unit II **Microbial diversity in normal environments:** Diversity of microbes in terrestrial (agricultural and desert soils), aquatic (fresh water and marine), atmospheric (stratosphere) and animal (cattle, termites, pests such as cockroach and nematodes, and human being) and their potential applications	15
UNIT-III **Microbial diversity in extreme environments:** Occurrence, diversity, adaptations and potential applications of oligotrophs, thermophiles, psychrophiles, barophiles, organic solvent and radiation tolerants, metallophiles, acidophiles, alkaliphiles and halophiles	15
UNIT IV Waste treatment: Wastes: types, solid and liquid wastes, treatments: physical, chemical and biological, aerobic and anaerobic, liquid waste treatment: trickling activated sludge, attached films, oxidation ponds and ditches; solid waste treatment. Sccharification, composting.	15

Suggested Books:

1. Extremophiles by B.N.Johri, Springer Verlog, New York.
2. Microbial Diversity by D.Cdwd, Academic press.
3. Manual at Environmental Microbiology, 2nd edition, by C.J. Hurst, ASM Press.
4. Microbial Ecology: Fundamentals and Applications, Atlas, RM &Barta, R.
5. Aerobiology, 1997, by Tilak.
6. Environmental Microbiology by Ralph Mitechell.
7. Bioremediation principles by Eweis.
8. Techniques in Microbial Ecology by Buruage.
9. Environmental Microbiology, 1981, by W.P. Grant and P.E. Long

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M.SC. MICROBIOLOGY IV SEMESTER
ELECTIVE COURSE
MB-E405AGRICULTURAL MICROBIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT –I Microbiota of soil, inter-relationship between soil microorganisms & higher plants. Microbial products influencing plant growth. Organic matter decomposition: Degradation of plant residues, humus, mineralization & immobilization process, soil sickness, composting, vermin-composting, green manure, rhizosphere&phylosphere, biogas, biodegradation of pests & pollutants, biofertilizers	15
UNIT-II Biological nitrogen-fixation: The range of nitrogen fixing organisms; mechanism of nitrogen fixation (biochemistry of nitrogenase); genetics of nitrogen-fixation. Rhizobium-Legume Association; Symplasmids, N2 fixation by non-leguminous plants. Chemical transformation by microbes: Organic matter decomposition, nutrient mineralization and immobilization; transformation of carbon and carbon compounds.	15
UNIT-III Plant diseases & their control: Causative agents, symptoms & control of important, fungal, bacterial & viral diseases of cereal crops, fruits & vegetables, Bacterial- Citrus canker. Fungal- ergot of bajra and rot of sugarcane. Viral- viral diseases of potato.	15
UNIT IV New strategies & Biotechnology in Agriculture: The new green revolution, frostcontrol biotechnology, tolerance of herbicides, gene protection technology, biopesticides, bioconversion. patents, tissue culture	15

Suggested Books:

1. Agricultural Microbiology by G.Rangaswamy and Bagyaraj, Prentice Hall India.
2. Bio-fertilizers in Agriculture and Forestry, by N.S. SubbaRao.
3. Soil Microbiology and Plant Growth, by N.S. SubbaRao.
4. Sharma, P.D. (2016). Plant Pathology, Rastogi publications
5. Rao, N.S.S. (2015). Soil Microbiology. Oxford & IBH Publishing Co., New Delhi.
6. Jeffery C. Pommerville (2014). Alcamo's Fundamental Microbiology, Jones pub.
7. Ghulam Hassan Dar (2010).Soil Microbiology and Biochemistry
8. Agrios G. N. 2005. Plant Pathology. 5th Edition, Academic Press, San Diego.
9. Christon J. H. 2001. A Manual of Environmental Microbiology. ASM Publications.
10. Forster C. F. & John DA 2000. Environmental Biotechnology. Ellis Horwood Ltd. Publication.

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M.SC. MICROBIOLOGY IV SEMESTER
ELECTIVE COURSE
MB-E406PLANT PATHOLOGY

CREDITS 4

TOPIC	TEACHING HOURS 60
UNIT I: Concepts and physiology of plant diseases: Causes of disease, pathogenesis, pathogenesis in relation to environment, effect of microbial infections on plant physiology, photosynthesis, respiration, transpiration, translocation.	15
UNIT II: Biochemical basis of plant diseases: Enzymes and toxins in plant diseases, phytoalexins. Some important plant diseases and their etiological studies: Crown gall, symptoms of viral diseases and their control, diseases of some important cereals, vegetables and crops. Genetic basis of plant diseases: Genetics of host-pathogen interactions, resistance genes, resistance mechanisms in plants.	15
UNIT III: Disease control: Principles of plant disease control, physical and chemical methods of disease control, biocontrol, biocontrol agents - concepts and practices, fungal agents, Trichoderma as biocontrol agent, biocontrol agents – uses and practical constraints.	15
UNIT VII Molecular approach: Molecular diagnosis, transgenic approach for plant protection, futuristic vision of molecular diagnosis, applications and constraints. Disease forecasting: History and important milestones in disease control, disease forecasting and its relevance in Indian farming.	15

Suggested Books:

1. Plant Pathology by G. N. Agrios. 5 th edition. Academic Press. 2005
2. Plant Pathology by R.S. Mehrotra, and A. Aggarwal, 3rd edition. Tata McGraw Hill. 2017
3. Bacterial plant pathology: cell and molecular aspects by D. C. Sigee. Cambridge University Press.1993.
4. Molecular plant pathology by M. Dickinson. BIOS Scientific Publishers, London. 2003.
5. The essentials of Viruses, Vectors and Plant diseases by A.N. Basu& B.K. Giri. Wiley Eastern Limited.1993.
6. Biocontrol of Plant Diseases (Vol. I) by K.G. Mukerji and K.L.Garg. CRC Press Inc.,USA.1988.
7. Molecular Biology of Filamentous Fungi by U. Stahl and P. Tudzyski. VCH VerlagsgesellschaftmbH. 1992. Facilitating the achi

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Appendix 3

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MINOR FOR OTHER FACULTY
M.SC. MICROBIOLOGY
DEPARTMENT OF MICROBIOLOGY
FACULTY OF LIFE SCIENCE
DR. BHIMRAO AMBEDKAR UNIVERSITY
MB-C103 BACTERIOLOGY

CREDITS 4

TOPIC	TEACHING HOURS
UNIT –I History, scope and development of bacteriology, Sterilization, isolation, enrichment, pure culture and staining techniques, systematic study of bacteria; morphological, physiological, biochemical and serological studies, genetic characterization. Habitat, structure, reproduction & classification of bacteria.	**15**
UNIT- II 1. The photosynthetic bacteria; cyanobacteria, green bacteria, halobacteria and their economic importance 2. Methanogenic bacteria and their significance 3. Chemoautotrophs and Methylotrophs: Nitrifying bacteria, sulphur oxidizers, iron bacteria and their economic importance.	**15**
UNIT- III 1. Enterobacteriaceae and related organisms, their morphological & physiological characters, genetic interrelationship, taxonomic sub-division & their importance in human health. 2. Myxobacteria, cytophage group, filamentous & gliding chemoheterotrophs& filamentous sulphur oxidizing bacteria.	**15**
UNIT IV **Morphological & physiological characters, taxonomic sub-division & their importance of Pathogenic Bacteria-** Staphylococcus, Sterptococcus, Pnumococcus, Corynebacterium, Bacillus, Clostridium, Non-sporing anaerobes; organisms belonging to Enterobacteriaceae, Vibrios, NonfermentingBrucella, Mycobacteria, Spirochates, Actinomycetes, Rickettsiae, Chlamydie.	**15**

Suggested Books:

1. General Microbiology: R Y Stanier, Adelberg E A and J L Ingraham, Mac Millan Press Inc
2. Introduction to microbiology: Ingraham J L and Ingraham C A Thomson Brooks/ Cole
3. Principles of microbiology R M Atlas Wm C brown Publishers
4. Brock's biology of Microorganisms Madigan M T and Martinko J M Pearson Education Inc
5. Microbiology: An introduction: Tortora G J, Funke B R and Case C L Pearson Education Inc

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