Deccan Education Society's

FERGUSSON COLLEGE, PUNE
(AUTONOMOUS)

FIRST YEAR B. Sc. Microbiology
SYLLABUS

SEMESTER – I

Academic Year 2016-2017

F.Y. B.Sc. (Microbiology)

Particulars	Paper Code	Title of Paper	No. of Credits
Semester I	MIC1101	Introduction to Microbial World	2
	MIC1102	Basic Techniques In Microbiology	2
	MIC1103	Practicals based on 'Introduction to microbial world'	2

PAPER CODE:MIC1101
PAPER –I: TITLE: INTRODUCTION TO MICROBIAL WORLD
[Credit -2: No. of Lectures = 36]

	Title and Contents	No. of Lectures
Unit -I	**Origin of Microbial life:** Biogenesis Vs Abiogenesis (Hypothesis and experiments) Miller's experiments, Ubiquitous nature of microbial life. Development from simple to complex life forms.	**6**
Unit -II	**Significance of Scientific contributions in development in Microbiology as a discipline:** A. **Early contributions** Robert Hook, Anton Van Leeuwenhoek, Louis Pasteur, Robert Koch, John Tyndall. **B. Scientific contribution leading to diversification of Microbiology** i. Medical Microbiology and Immunology- Edward Jenner, Paul Ehrlich, Ellie Metchnikoff, Lister. ii. Food Microbiology and Fermentation- Alexander Fleming, Louis Pasteur, Selman Waksman iii. Soil Microbiology- Winogradsky, Martinus Beijerinck iv. Microbial Genetics – Watson and Crick, Hargobind Khurana, Griffith, Avery, McCarty, and Macloed. **C. Frontiers in Microbiology** Nanobiotechnology, rDNA Technology, Bioinformatics, Proteomics, Genomics, Neutraceuticals.	**15**
Unit –III	**Diversity of Microbial World:** A. Systems of Classification- Binomial nomenclature, three kingdom, five kingdom classification and utility. B. Differences in Cellular and Acellular microorganisms Differences in prokaryotic and eukaryotic (Occurrence, morphology, mode of reproduction and economic importance) C. Different groups microorganisms- Bacteria, Yeast, Fungi, Actinomycetes, Algae, Viruses,	**15**

	Protozoa, Viroids and Prions (Morphological and differential characteristics, Nutrition and cultivation methods, habitats, economic importance, harmful and beneficial activities)	

References:

1. Daniel Lim, Microbiology, 2nd Edition; McGraw-Hill Publication
2. Ingraham J. L. and Ingraham C.A. (2004). Introduction to Microbiology. 3nd Edition.
Thomson Brooks / Cole.
3. Madigan M.T., Martinko J.M. (2006). Brock's Biology of Microorganisms. 11th Edition.
Pearson Education Inc.
4. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata
MacGraw Hill Press.
5. Prescott L.M., Harley J.P., and Klein D.A. (2005). Microbiology, 6th Edition. MacGraw Hill Companies Inc.
6. Prescott, Lancing. M., John, P. Harley and Donald, A. Klein (2006) Microbiology, 6th
Edition, McGraw Hill Higher Education
7. Willey J. M., Sherwood L. M. and Woolverton C. J. (2013) Prescott's Microbiology, 8th
Edition, McGraw-Hill Higher Education
8. Salle A.J. (1971) Fundamental Principles of Bacteriology. 7th Edition. Tata MacGraw Hill
Publishing Co.
9. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology, 5th Edition.
Macmillan Press Ltd.
10. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: An Introduction. 8th Edition.
Pearson Education Inc
11. Wilson K. and Walker J.M. (2005) Principles and Techniques of Biochemistry and Molecular Biology. 6th Edition. Cambridge University Press.
12. Hans G. Schlegel (1993) General Microbiology, 8th Edition, Cambridge University Press
13. David T. Plummer (1993) An Introduction To Practical Biochemistry, 3rd Edition, Tata
McGraw-Hill Publishing Company Limited, New Delhi.

PAPER CODE: MIC1102
PAPER –II: Basic Techniques In Microbiology
[Credit -2: No. of Lectures = 36]

	Title and Contents	No. of Lectures
Unit -I	**Scope and fundamental principles in Microbiology** • Interdisciplinary approach • SI units of measurements – (Length , Volume, Weight) • Properties of light, Spectrum, Wavelength, Frequency, Amplitude • Molar and Normal solutions, Avogadro's Number	**6**
Unit -II	**Microscopy and Staining Techniques** A) Microscopy • History of microscopy • Terms in microscopy – Magnification, Refractive index, Numerical aperture ,Resolving power • Aberrations in lenses • Principle, working, ray diagram and applications of 1. Bright field microscopy 2. Dark field microscopy 3. Phase contrast microscopy 4. Fluorescence microscopy • Introduction to 1. Confocal microscopy 2. Electron microscopy – SEM, TEM B) Stain and staining techniques • Stain – Definition, Concept of chromophore and auxochrome group, Acidic and basic stains • Role of fixatives, accentuators, mordants and decolorisers • Principle and applications of 1. Negative staining 2. Monochrome staining 3. Differential staining – Gram's staining and Acid fast staining Special staining – Capsule staining	**15**
Unit –III	**Sterilization and disinfection** • Physical agents – Mode of action and application of 1.Heat	**15**

	2. Radiation 3.Filtration • Chemical agents - a)Characteristics of an ideal disinfectant b)Mode of action and application of - Aldehydes , Halogens, Quaternary ammonium compounds , Phenol and Phenolic compounds, Heavy metals, Alcohols, Dyes , Detergents and Ethylene oxide • Checking of efficiency of sterilization – Biological and Chemical indicators Checking efficiency of disinfectant – Phenol coefficient- Rideal Walker coefficient	

Note : Numericals and problem solving related to topics will be conducted

References:

1. Daniel Lim, Microbiology, 2nd Edition; McGraw-Hill Publication
2. Ingraham J. L. and Ingraham C.A. (2004). Introduction to Microbiology. 3nd Edition.
Thomson Brooks / Cole.
3. Madigan M.T., Martinko J.M. (2006). Brock's Biology of Microorganisms. 11th Edition.
Pearson Education Inc.
4. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata
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Companies Inc.
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9. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology, 5th Edition.
Macmillan Press Ltd.
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Pearson Education Inc
11. Wilson K. and Walker J.M. (2005) Principles and Techniques of Biochemistry and Molecular Biology. 6th Edition. Cambridge University Press.
12. Hans G. Schlegel (1993) General Microbiology, 8th Edition, Cambridge

University Press
13. David T. Plummer (1993) An Introduction To Practical Biochemistry, 3rd Edition, Tata
McGraw-Hill Publishing Company Limited, New Delhi

	PAPER CODE: MIC1103 **PAPER –III: Practicals based on 'Introduction to microbial world'** **[Credit -2: No. of Practicals = 10]** **1 Practical=4 hrs**
	Title of Experiment/ Practical
1	Introduction to Microbiology laboratory – a. GLP and Biosafety b. To study Principle and applications of instruments: Microscope, Autoclave, Hot-air oven, Centrifuge, pH meter, Incubator, Refrigerator, Distillation apparatus, Laminar Air-flow system, Water-bath, Colorimeter, Spectrophotometer and SOP writing
2	Preparation and sterilization of culture media
3	Aseptic Transfer Techniques
4	Assessment of sterility of glassware and nutritional media (Hot air oven and Autoclave
5	Sterilization by membrane filtration and sterility assessment
6	Observation of pond water organisms
7	Cultivation of photosynthetic organisms using Winogradsky's column
8	Observation of organisms - a. *Rhizopus, Penicillium, Aspergillus* using different natural samples b. Observation of permanent slides of Protozoans: *Amoeba, Paramoecium, Plasmodium, Entamoeba*
9	Observation of actinomycetes by slide culture technique and coverslip technique.
10	Demonstration of microflora from air and preservation of bacterial and fungal cultures.