BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani

Pilani Campus

First Semester 2018-2019
Instruction Division
Course Handout (Part II)

Date: 02.08.2018

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **BIO F212**
Course Title : **Microbiology**
Instructor In-charge : **PRABHAT NATH JHA**
Team of Instructors : **Jitendra Panwar, Sandeep, Shraddha Mishra, Shahid Khan, Poonam Singh**

1. Course Description: Introduction and classification of microbes; isolation, cultivation, physiological and biochemical characterization of microbes; structure, physiology and genetics of microbial cell; synthetic microbiology; host parasite relationship; physical chemical methods of controlling microbes; antimicrobial drugs; clinical microbiology; microbiology of soil, water and food; and related lab components.

2. Scope & Objective of the Course: This course deals with the structure, physiology, genetics and growth of various microorganisms as well as their control. Emphasis will be given on microbes and their role in human health, environment and industry.

3. Text Book (TB):

Tortora, G.J., Funke, B.R. and Case, C.L. 2016. Microbiology: An Introduction, 11th Ed., Pearson India Education Services Pvt. Ltd. India

4. Reference Book (RB):

Willey, J.M., Sherwood, L.M. and Woolverton, C.J. 2008. Prescott, Harley and Klein's Microbiology, 7th Edition, The McGraw-Hill Companies Inc., New York.

5. Lab Manual:

Experimental write-ups will be provided.

6. Course Plan:

Module No.	Lecture/ Tutorial Session	Reference	Learning Outcome
1. Course lay out and introduction to microbiology	L 1-3. The microbial world	TB-2, RB-1	Understanding the role of microbes in our life
2. Methods in Microbiology	L 4. Microscopy and Specimen preparation	TB-3, RB-2	Knowledge about microscopy & preparing microbial samples for observation
	L 5-6. Requirement for growth, obtaining pure cultures and maintenance	TB-6, RB-5	Knowledge about various culture media and methods to obtain pure microbial cultures
3. Study of Microbial Structures	L 7-10. The morphology & fine structure of bacteria	TB-4, RB-3	Understanding size, shape & arrangement of bacterial cells and their structures

	L 11-13. Eukaryotic microorganisms	TB-12, RB-4	Understanding fungi, algae and lichens
4. Identifying Microorganisms	L 14-16. Characterization, classification and identification of microorganism	TB-10, RB-19	Understanding methods of microbial classification & identification
5. Virology	L 17-19. Virus, Viroids, Prions	TB-13, RB-16,17,18	Understanding features, type, taxonomy and replication of virus
6. Microbial Growth	L 20-22. Growth of Microbes and its measurement; Synchronous and continuous culture	TB-6, RB-6	Understanding bacterial growth curve, methods of microbial growth measurement
7. Microbial Physiology	L 23-25. Microbial metabolism	TB-5, RB-8,9,10	Knowledge of energy generation and utilization in microbes
8. Control of Microorganism	L 26-28. Physical and chemical methods of microbial control, Antimicrobial drugs	TB-7, 20 RB-7	Knowing the methods to prevent microbial growth
9. Microbial Genetics	L 29-32. The genetics of microorganisms; Synthetic microbiology	TB-8, RB-11,12,13	Understanding genetic transformation & recombination in microbes
10. Clinical Microbiology	L 33-35. Principles of diseases and epidemiology, Microbial Mechanisms of Pathogenicity	TB-14, 15	Knowledge about bacterial pathogenesis in humans
11. Environmental Microbiology	L 36-38. Microbiology of soil, domestic and waste water	TB-27 RB-27,29,41	Understanding the role & application of microbes in environment
12. Applied Microbiology	L 39-41. Microbiology of food and Industrial microbiology	TB-28 RB-40,41	Understanding applications of microbes in food & beverage industry

7. Portions for self-study:

To be announced in class from time to time.

8. Lab Component:

PART 1: Basics

Exp 1.1: Introduction to microbiology laboratory and practices

PART 2: Bacterial isolation, identification and maintenance

Exp 2.1: Isolation of pure cultures of bacteria from various samples and cell count
Exp 2.2: Gram's staining of bacteria
Exp 2.3: Preparation of glycerol stock for long term preservation
Exp 2.4: IMViC test for biochemical characterization of bacteria
Exp 2.5: Test of hydrolytic enzymes (pectinase, cellulase, amylase, protease) in bacteria
Exp 2.6: Fluorogenic detection of *E. coli*

PART 3: Microbial population

Exp 3.1: Coliform counts in contaminated water sample
Exp 3.2: Dehydrogenase activity assay for qualitative determination of microbial population
Exp 3.3: Enumeration of microbial cells in air microflora

PART 4: Abiotic and biotic Factors
Exp 4.1: Bacterial growth curve
Exp 4.2: Effect of pH, temperature, salt and radiation on growth of microorganisms
Exp 4.3: Effect of various antibiotics on microbial growth
Exp 4.4: Effect of various metals on microbial growth

PART 5: Fungal microbiology
Exp 5.1: Isolation of pure cultures of fungus
Exp 5.2: Staining of fungus- Lactophenol cotton blue staining
Exp 5.3: Study of extracelluar hydrolytic enzymes (pectinase, cellulase, amylase, protease) in fungi
Exp 5.4: Determination of size of fungal spore using micrometry
Exp 5.5: Isolation of arbuscular mycorrhizal fungi from rhizospheric soil samples
Exp 5.6: Production of citric acid from fungus using laboratory fermenter

Note: *Out of the above mentioned list, a minimum of 12 experiments will be conducted in the Semester as per the availability of the consumables.*

9. Evaluation Scheme:

S. No.	Evaluation Component*	Weightage (%)	Date & Time	Remarks
1.	Mid-Semester Test	20	10/10 2:00 - 3:30 PM	CB
2.	Quiz/Assignments	10		CB/OB
3.	Laboratory evaluation	30		
4.	Comprehensive	40	5/12 FN	CB/OB

**Material in soft-copy will not be allowed in any evaluation component.*

10. Chamber consultation hour: To be announced in the class.
11. Notices: All notices will be displayed on the notice board of Department of Biological Sciences.
12. Make-up policy: Make-up decisions will be made on a case-by-case basis and only genuine cases as determined by the team and validated by Wardens and/or Medical Officer will be considered. No make-ups for Lab component and Quizzes.

Note: It shall be the responsibility of the individual student to be regular in attending lectures and the lab demonstration as per the schedule announced

(Prabhat Nath Jha)
Instructor-in-charge
BIO F212