BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER 2021-22

Dated: 17.01.22

Course Handout Part II

Course No. : BIO G523
Course Title : Advanced & Applied Microbiology
Instructor In-charge : JAYATI RAY DUTTA
Instructors : Ruchi Jain Dey, Pranay, Naresh & Kalyani

1. Course Description: Molecular taxonomy, Systematic Microbiology; Study of molecular diversity of microorganisms, Molecular tools employed in study of microbial ecology, clinical microbiology, human-microbe interaction, molecular plant-microbe interaction, applied microbiology, nanotechnology and synthetic microbiology.

2. Scope & Objective of the Course:
This course deals with in-depth study of microbial taxonomy and evolution as well as the molecular aspects of microbe-host interactions. In addition, it includes applied aspects of microbiology for in industry and human-health. It also emphasizes on recent developments in microbial genomics, nanotechnology and biotechnology.

3. Text Book (TB):
Madigan M.T., Martinko, J.M., Dunlap, P.V., Clark, D.P., Brock, Biology of Microorganism, 12th Ed., 2009, Pearson International Education.

4. Reference Book (RB):
1. Wiley, J.M., Sherwood, L.M., Woolverton, C.J. Prescott, Harley, and Klein's Microbiology, 7th Ed. McGraw-Hill International Edition.
2. Glazer, A.N. and Nikaido, H, Microbial Biotechnology, Fundamentals of applied Microbiology, 2nd Ed., Cambridge.

5. Course Plan:

Lec. No.	Learning Objectives	Topic to be covered	Ref. to Chapters
1-4	Bacterial Evolution and Systematics	Microbial Evolution, Microbiology Systematics, Microbial taxonomy	TB-14, RB1-19
5-7	Molecular biology of Archaea	Molecular biology of Archaea, DNA replication, Transcription and RNA processing, protein synthesis, shared features of Bacteria and Archaea	TB-8
8-11	Socio-microbiology	Quorum-sensing; prospective application of quorum-sensing mechanisms in medicine, biofilm	TB-9, 23
12-15	Microorganisms for Sustainable Agriculture	Plant growth promoting microorganisms; Associative bacteria, Endophytic bacteria: mechanisms of colonization, various plant growth promoting properties; Biocontrol: Mycorrhiza	RB1-29 TB-24

16-18	Molecular Plant-Microbe interaction-1	Molecular basis of legume-rhizobia interaction, plant-pathogenic bacteria interaction	RB1-29 TB-24
19-20	Molecular Plant-Microbe interaction-2	Plant immune response: Molecular aspects	Reviews
21-24	Medical Microbiology	Microbial interactions: Microbe-human interaction, normal microbiota in human; Host-parasite/pathogen interaction; Pathogenicity of Microorganisms, Antimicrobial Chemotherapy,	TB-28, RB1-33 RB1-34 and relevant reviews
25-26	Microbial Biosensors	Biosensors and their applications	RB1-35
27-31	Synthetic Microbiology	Synthetic/engineered microorganisms and their applications	Reviews
32-34	Industrial Microbiology	Microbial polysaccharides and Bioplastics	RB2-8
35-38	Food Microbiology	Primary and secondary metabolites, fermented foods, beverages, Enzymes, Single-cell protein	TB-25
39-40	Microbes & fuel generation	Biomass production, Bioethanol/biodiesel production from different microbial sources.	Reviews

List of experiments:

a) Production & estimation of citric acid by calorimetry.
b) Production of wine from grapes and estimation of ethanol generation by GC.
c) Production, expression & confirmation of recombinant protein.
d) Production and estimation of Glutathione peroxidase in *L. plantarum*.
e) Antibiotic sensitivity test – Disc diffusion method
f) Antibiotic susceptibility test – Minimum inhibitory concentration
g) Study of the morphology of the given microbial strain using Microscopic techniques (Gram staining with Light Microscope; and Scanning Electron Microscope)
h) Molecular detection of the given microbial strain (PCR-RFLP method)

7. Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue	Remarks
1.	Mid-semester	90 min	25	As per Timetable	CB
2.	Lab practical (Evaluation components include: 1. Laboratory quiz based on experiments conducted during class + Attendance 2. Comprehensive written-test		20		OB
3.	Presentations/ assignments		20		OB
4.	Comprehensive	2 hours	35	As per Timetable	CB

8. Chamber consultation hour: To be announced in the class.

9. Notices: All notices will be displayed on Course management system.

10. Make-up policy: Make-up decisions will be considered for only genuine cases and validated by proper evidence of illness. No make-up for Lab components and assignments.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
BIO G523