SEMESTER-II

COURSE 4: MICROBIOLOGY, CELL BIOLOGY

Theory Credits: 3 3 hrs/week

I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

1. Learn about Scope and Techniques of Microbiology.

2. Learn about concept of Microbial species and strains,

3. Learn about cell structure and function.

4. Learn about cell signaling and control mechanisms.

5. Learn about genome organization of prokaryotic and eukaryotic organisms

II. Syllabus

Unit-I- Scope and Techniques of Microbiology

1. History and contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming.
2. Ultrastructure of bacteria and growth curve. Pure culture techniques.
3. Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Simple, gram and acid-fast staining.

Unit-II-Microbial Taxonomy and Metabolism

1. Concepts of microbial species and strains. Classification of bacteria based on morphology, nutrition and environment. General characteristics, transmission and cultivation of viruses.
2. Structure and properties of plant (tobacco mosaic virus, TMV), animal (Newcastle disease virus, NDV), human (Human immunodeficiency virus, HIV) and bacterial viruses (T4 phage). Emerging and reemerging viruses (dengue) and zoonotic viruses (rabies, SARS-CoV-2).
3. Microbial production of penicillin. Bacterial toxins, tuberculosis, typhoid. Introduction to fungi, algae and mycoplasm.

Unit-III- Cell Structure and Functions

1. Structure, properties and functions of cellular organelles (E.R, Golgibodies, Mitochondria, Ribosomes lysosomes , nucleus) of eukaryotic cells.
2. Cell cycle and its regulation
3. cell division (mitosis and meiosis).

Unit-IV- CELL SIGNALLING

1. Chemical composition and dynamic nature of the membrane,
2. Cell Surface Receptors
3. cell signaling and communication(GPCR .- cAMP,cGMP,IP3-DAG)

Unit – V - Central Dogma of Molecular Biology

1. Genome organization of prokaryotic and eukaryotic organisms
2. Enzymes involved in Replication, Transcription, and Translation
3. DNA repair Mechanism

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about preparation of media for culturing of various microorganisms
2. Learn about isolation of microrganisms from different sources
3. Learn about staining techniques and biochemical identification of bacteria
4. Learn about different stages of cell division

SEMESTER-II

COURSE 4: MICROBIOLOGY, CELL BIOLOGY

Practical Credits: 1 2 hrs/week

1. Cleaning and preparation of glassware
2. Preparation of nutrient agar medium for bacteria
3. Preparation of PDA medium for fungi
4. Sterilization techniques (autoclave, hot air oven, filter)
5. Isolation of bacteria from soil
6. Simple staining technique
7. Differential staining technique
8. Microbial counting by Haemocytometer
9. Identification of different bacteria
10. Motility test by hanging drop
11. Biochemical identification of bacteria
12. Preparation of pure culture by slab, slant, streak culture
13. Study of stages of cell division

14 Extraction and isolation of DNA from bacteria

V. REFERENCES

1. Microbiology–6th Edition, (2006), Pelczar M.J., Chan E.C.S., Krieg N.R.; The McGrawHill Companies Inc. NY
2. Prescott's Microbiology, 8th edition, (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, Chris Woolverton; McGrawHill Science Engineering, USA
3. Textbook of Microbiology, Anantnarayan and Paniker (2017)
4. Brock biology of microorganisms, 2003, Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J.; Upper Saddle River (NJ): Prentice-Hall, 2003.
5. Genes XI, 11th edition, (2012), Benjamin Lewin; Publisher - Jones and Barlett Inc. USA
6. Molecular Biology of the Gene, 6th Edition, (2008), James D. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.; Cold Spring Harbour Lab. Press, Pearson Pub.
7. Molecular Biology, 5th Edition, (2011), Weaver R.; McGraw Hill Science. USA
8. Fundamentals of Molecular Biology, (2009), Pal J.K. and Saroj Ghaskadbi; Oxford University Press.
9. Molecular Biology: Genes to Proteins, 4th edition (2011), Burton E Tropp Jones& Bartlett Learning, USA.
10. Cell and Molecular Biology: Concepts and Experiments, 6th Edition, Karp, G. 2010.; John Wiley & Sons. Inc.

VI. CO-Curricular Activities

a) **Suggested Co-Curricular Activities**

1. Assignments
2. Seminars, Group Discussions on related topics
3. Charts on Replication, cell cycle , cell signalling