

Educational Objectives:

1. This is an introductory level course that describes various biological and molecular aspects of bacteria. Our coverage will focus almost entirely on bacteria that infect humans and cause serious disease.

Course Outcomes:

2. The aims of the course are to enable students to establish a broad coverage of modern aspects of molecular microbiology reflecting areas of high profile and research activity. Students will have understanding of in the principles underlying modern molecular mechanisms related to molecular microbiology.

3. **Course contents:**

- a. The Bacterial Cell: An introduction to the structure of the bacterial cell.
- b. Bacterial identification in the diagnostic laboratory versus taxonomy.
- c. Taxonomic characterization of bacteria. Approaches to rapid diagnosis
- d. Nutrition, Growth and Energy Metabolism: Anaerobic and aerobic metabolism. Metabolism of sugars and fatty acids
- e. Cell Envelope, spores and Macromolecular Biosynthesis: Structure and synthesis of the cell walls of gram-positive and gram negative bacteria
- f. Antibiotics - Cell Envelope: The mode of action of beta-lactate antibiotics.
- g. Antibiotics - Protein Synthesis, Nucleic Acid Synthesis and Metabolism: The mode of action of antibacterial chemotherapeutic agents. Antibiotic susceptibility testing.
- h. Genetic Exchange: The mechanisms of gene transfer in bacteria; Insertion sequences, transposable genetic elements and plasmids.
- i. Genetic Regulatory Mechanisms: The structure and transcription of bacterial genes. The molecular mechanisms that bacteria use to regulate gene activity. Inducible and repressible operons. The molecular mechanisms involved in catabolite repression and attenuation. The ways bacteria regulate enzyme activity.

- j. Enterobacteriaceae: Enterobacteriaceae, Vibrio, Campylobacter and Helicobacter
- k. Streptococci: Groups A, B and D streptococcus, pathogenesis, diagnosis. Streptococcus pneumonia and Staphylococci. Streptococcus and pneumonia, Staphylococcus infections, food poisoning, toxic shock Neisseria and Spirochetes: Syphilis, Lyme disease, leptospirosis, gonorrhoea, meningitis.
- l. Anaerobes and Pseudomonas - Opportunistic Infections. Clostridia, gas-gangrene, tetanus, botulism, pseudomonads.
- m. Zoonoses: Listeria, Francisella, Brucella, Bacillus and Yersinia Plague, Anthrax, Brucellosis, Listeriosis.
- n. General Aspects of Bacterial Pathogenesis: Exotoxins and endotoxins

Recommended Books:

1. **Medical Microbiology & Immunology** by Warren Levinson & Ernest Jawetz. 7th Ed. 2003. McGraw-Hill Publications. ISBN 0-07-122973-6.
2. **Principles of Virology, Molecular Biology, Pathogenesis, and Control** by S.J. Flint, L.W. Enquist, R.M. Krug, V.R. Racaniello, and A.M. Skalka. 2nd Ed. 2000. ASM Press.
3. **Fundamental Virology** edited by D.M. Knipe and P.M. Howley. 4th Ed. 2001, Lippincott Williams and Wilkins.