ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

IV SEMESTER **BIOCHEMISTRY** TIME:5Hrs/Week

BCH 4804(3) **Microbiology, Immunology and Molecular biology** Max.Marks:100

w.e.f. 2021-2022 (20AH)

OBJECTIVES: To enable the students to-

- Understand the importance of microbes and learn the life cycle of viruses
- Learn the methods of nitrogen fixation in various living forms
- Narrate the various methods of fermentation and explain the concepts at industrial scale
- Get acquainted with the components of immune system and vaccines
- Explain the elements of central dogma of Molecular biology and learn the concepts of genetic engineering and its applications

Course Outcomes- Students will be able to

CO1: Identify microbial growth kinetics and their applications and learn life cycle of viruses

CO2: Explain nitrogen fixing concepts and concepts of synthesis of glutamine

CO3: Identify and perform fermentations using free cells and immobilization methods

CO4:.Narrate principles of immunology and vaccination and perceive assay methods for various antigens

CO5: Develop methods to improve application of genetic engineering in the fields of medicine, agriculture and industry.

Unit-I: Microbiology 12 hours

Introduction to microbiology and microbial diversity. Classification of microorganisms-prokaryotic and eukaryotic microorganisms. Bacterial structure, growth curve and kinetics of growth. Introduction to viruses-plant and animal viruses, structure, life cycle, Food and dairy microbiology.

Unit-II: Nitrogen Fixation 12hours

Nitrogen cycle, Non-biological and biological nitrogen fixation, photosynthetic and non-photosynthetic systems, Nitrogenase system. Utilization of nitrate ion, Ammonia incorporation into organic compounds. Synthesis of glutamine and regulatory mechanism of glutamine synthase.

Unit-III: Applied Biochemistry 12 hours

Fermentation Technology: Batch, continuous culture techniques, Principle types of fermentors. Pasteur effect. Industrial production of chemicals- alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin), Enzyme Technology: Immobilization of enzymes and cells, industrial applications, enzymes in Bioremediation.

Unit- IV: Immunology 12hours

Organs and cells of immune system. Innate and acquired immunity, Cell mediated and humoral immunity (T-cells and B-cells). Classification of immunoglobulins, structure of IgG. Epitopes / antigenic determinants. Concept of haptens. Adjuvants. Monoclonal antibodies. .Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion. Blood group antigens. Immunodiagnostics- ELISA. Vaccines and their classification. Traditional vaccines-live and attenuated. Modern vaccines- recombinant and peptide vaccines. Outlines of hypersensitivity reactions.

Unit- V: Molecular biology 12 hours

Types of RNA and DNA, DNA replication-leading and lagging strands, okazaki fragments, inhibitors of DNA replication. Genetic code, Protein synthesis-transcription, translation, inhibitors of protein synthesis. Outlines of cloning technology, vectors, restriction enzymes, PCR,applications of cloning in agriculture, industry and medical fields.

Recommended books:

1. Willey MJ, Sherwood, LM &Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9th Ed., McGrawHill.
2. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
3. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
4. Fermentation Technology (2nd ed.) Standury (Pergman press)
5. Biotechnology: Textbook of Industrial microbiology 2nd Edit. By Crueger and Crueger (2000).
6. Principles of Biochemistry, White. A, Handler, P and Smith.
7. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
8. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.
9. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication.
10. Molecular biology by David Freifelder