S.K.R. & S.K.R. Govt. College for Women (Autonomous), Kadapa.
Reaccredited with 'B' Grade by NAAC
Y.S.R.Kadapa District – 516001, Andhra Pradesh

DEPARTMENT OF MICROBIOLOGY

Syllabus-Semester III & IV

SKR&SKR GOVT. COLLEGE FOR WOMEN (A) - KADAPA
II B.Sc -SEMESTER-III: MICROBIOLOGY SYLLABUS- 2021-2022
Paper-III: Microbiology
MEDICAL MICROBIOLOGY AND IMMUNOLOGY

TOTAL HOURS: 48 **CREDITS: 4**

UNIT- I: No. of hours: 8

Normal flora of human body. Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence and opportunistic infection. General account on nosocomial infection. General principles of diagnostic microbiology- collection, transport and processing of clinical samples. General methods of laboratory diagnosis - cultural, biochemical, serological and molecular methods.

UNIT- II: No. of hours: 10

General account on microbial diseases -causative agent, pathogenesis, epidemiology, diagnosis, prevention and control.
Bacterial diseases - Tuberculosis and Typhoid
Fungal diseases – Candidiasis, Aspergillosis, Yeast
Protozoal diseases – Malaria, Filaria & Diseases spread by House Fly.
Viral Diseases - Hepatitis- A & C and AIDS.

UNIT- III: No. of hours: 10

Description and pathology of diseases caused by Aspergillus, Penicillium. Description and pathology of diseases caused by hemoflagellates; *Leishmania donavani, L.tropica, Trypanosoma gambiense*. Principles of chemotherapy, Antibacterial drugs – Penicillin, Antifungal drugs – Nystatin, Antiviral agents – Robovirin, Drug resistance in bacteria.

UNIT- IV: No. of hours: 10

Types of immunity - innate and acquired; active and passive; humoral and cell-mediated immunity.
Primary and secondary organs of immune system - Thymus, Bursa fabricus, bone marrow, spleen and lymph nodes.
Cells of immune system – structure and functions of B and T lymphocytes, null cells, monocytes, macrophages,neutrophils, basophils and eosinophils.

UNIT – V: No. of hours: 10

Antigens - types, chemical nature, antigenic determinants, haptens. Factors affecting antigenicity.
Antibodies - basic structure, types, properties and functions of immunoglobulins.
Types of antigen-antibody reactions - Agglutinations, Precipitation, Neutralization, complement fixation, blood groups.
Labeled antibody based techniques - ELISA, RIA and Immuno fluroscence. Polyclonal and monoclonal antibodies - production and applications.
Concept of Hypersensitivity and Autoimmunity. Hybridoma technology.

MBP – III: MEDICAL MICROBIOLOGY AND IMMUNOLOGY
TOTAL HOURS: 48 **CREDITS: 2**

LIST OF EXPERIMENTS

1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Estimation of blood haemoglobin.
4. Total Leukocyte Count of the given blood sample.
5. Differential Leukocyte Count of the given blood sample.
6. Immunodiffusion by Ouchterlony method.
7. Identify bacteria - *E. coli, Pseudomonas, Staphylococcus, Bacillus*, using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests.
8. Isolation of bacterial flora of skin by swab method.
9. Antibacterial sensitivity by Kirby-Bauer method.
10. Study symptoms of the diseases with the help of photographs: Anthrax, Polio, Herpes, chicken pox, HPV warts, Dermatomycoses (ring worms)
11. Study of various stages of malarial parasite in RBCs using permanent mounts.

SUGGESTED READING:

- Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013). Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
- Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley-Blackwell Scientific Publication, Oxford.
- Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
- Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
- Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill, Microbiology. 4th edition. Elsevier Publication.
- Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

SKR&SKR GOVT. COLLEGE FOR WOMEN (A) - KADAPA
II B.Sc -SEMESTER-IV: MICROBIOLOGY SYLLABUS- 2021-2022
Paper-IV : Microbiology
INDUSTRIAL MICROBIOLOGY

Paper – IV INDUSTRIAL MICROBIOLOGY

UNIT – I No. of hours: 7

Microorganisms of industrial importance –History,introduction and general charecters of yeasts (*Saccharomyces cerevisiae*), moulds (*Aspergillus niger*) bacteria (*E.coli*), actinomycetes (*Streptomyces griseus*). Industrially important Primary and secondary microbial metabolites. Screening techniques. Techniques involved in strain improvement.

UNIT – II No.of hours: 10

Fermentation and fermenter: concept and discovery of fermentation. Fermenter: its parts and function.
Types of fermenter – batch, continuous and fed batch.
Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.
Basic concepts of Design of fermenter.
Ingredients of Fermentation media.
Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT – III No.of hours: 8

Microorganisms involved in Pharma and therapeutic enzymes. Enzymes used in detergents, textiles and leather industries. Production of amylases and Proteases. Production of therapeutic enzymes. Role of microorganisms in bioleaching and textile industry.

UNIT – IV No.of hours: 7 Industrial microorganisms: cell growth, microbial growth kinetics, factors affecting growth, basic nutrition, principles of production media, components of media, chemical composition of media.
Bioreactors: basic structure of bioreactor, types of bioreactors, kinetics and methodology of batch and continuous bioreactors. Sterilization of bioreactors: fibrous filter sterilization. Aeration and agitation: agitation in shake flask and tube rollers.

UNIT – V No.of hour: 7

Microbial production and applicatons of Industrail products: Citric acid, Ethanol, Penicillin, Glutamic acid, and vitamin B12, Single cell proteins,Production of bacterial and viral vaccines.

MBP – IV INDUSTRIAL MICROBIOLOGY

Total hours: 36 Credits: 2

1. Production of ethanol
2. Estimation of ethanol
3. Isolation of amylase producing microorganisms from soil
4. Production of amylase from bacteria and fungi
5. Assay of amylase
6. Demonstration of fermenter
7. Production of wine from grapes
8. Growth curve and kinetics of any two industrially important microorganisms.
9. Microbial fermentation for the production and estimation of ethanol from grapes
10. Microbial fermentation for the production and estimation of citric acid.

SKR&SKR GOVT. COLLEGE FOR WOMEN (A) - KADAPA

II B.Sc -SEMESTER-IV: MICROBIOLOGY SYLLABUS- 2021-2022

Paper-V : Microbiology

MOLECULAR BIOLOGY AND MICROBIAL GENETICS

TOTAL HOURS: 48 **CREDITS: 4**

UNIT- I No. of hours: 8

DNA and RNA as genetic material. Structure and organization of prokaryotic DNA. Watson and Crick model of DNA. Extra chromosomal genetic elements - Plasmids and transposons.
Replication of DNA - Semi conservative mechanism, Enzymes involved in replication.

UNIT- II No. of hours: 10

Mutations - spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions.
Mutagens - Physical and Chemical mutagens.
Outlines of DNA damage and repair mechanisms.

UNIT- III No. of hours: 10

Modern concept of gene Cistron, Recon and Muton. One gene one enzyme and one gene one polypeptide hypotheses.
Types of RNA and their functions,poly and mono cistronic m-RNA.
Genetic code –genetic code, the decoding system,codon- anticodon interaction.
Structure of ribosomes.
Bacterial recombination – Bacterial transformation, Bacterial conjugation, Transduction–Generalized and specialized transductions.

UNIT- IV No. of hours: 10

Transcription: Introduction- Basic features of RNA synthesis, *E.coli* RNA polymerase, Classes of RNA molecules, processing of tRNA and rRNA and m-RNA. Transcription in Eukaryotes, Eukaryotic rRNA genes, formation of eukaryotic tRNA molecules, RNA Polymerases of eukaryotes. **Translation:** Outline of Translation. Protein Synthesis, Complex Translation units, Inhibitors and Modifiers of protein synthesis, Protein Synthesis in Eukaryotes.

UNIT- V No. of hours: 8

Gene regulation- structural, constitutive, regulatory, clustered genes and the control of gene expression. Regulation of gene expression in bacteria - operon concepts - Negative and positive control of the Lac Operon, trp operon.

PAPER-V: MOLECULAR BIOLOGY AND MICROBIAL GENETICS
TOTAL HOURS: 48 CREDITS: 2

1. Study of different types of DNA and RNA using micrographs and model / schematic representations.
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS - PAGE).(Virtual Demo)
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology - Ultra centrifuge, Transilluminator, PCR

SUGGESTED READING:

- Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
- Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
- Lewin, B. (2000). Genes VIII. Oxford University Press, England.

- Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.

- Ram Reddy, S., Venkateshwarlu, K. and Krishna Reddy, V. (2007) A text Book of Molecular Biotechnology. Himalaya Publishers, Hyderabad.
- Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 th Edition. McGraw Hill, New York.

- Smith, J.E. (1996). Biotechnology, Cambridge University Press.

- Snyder, L. and Champness, W. (1997). Molecular Genetics of Bacteria. ASM press,

- Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.

- Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd., New Delhi.