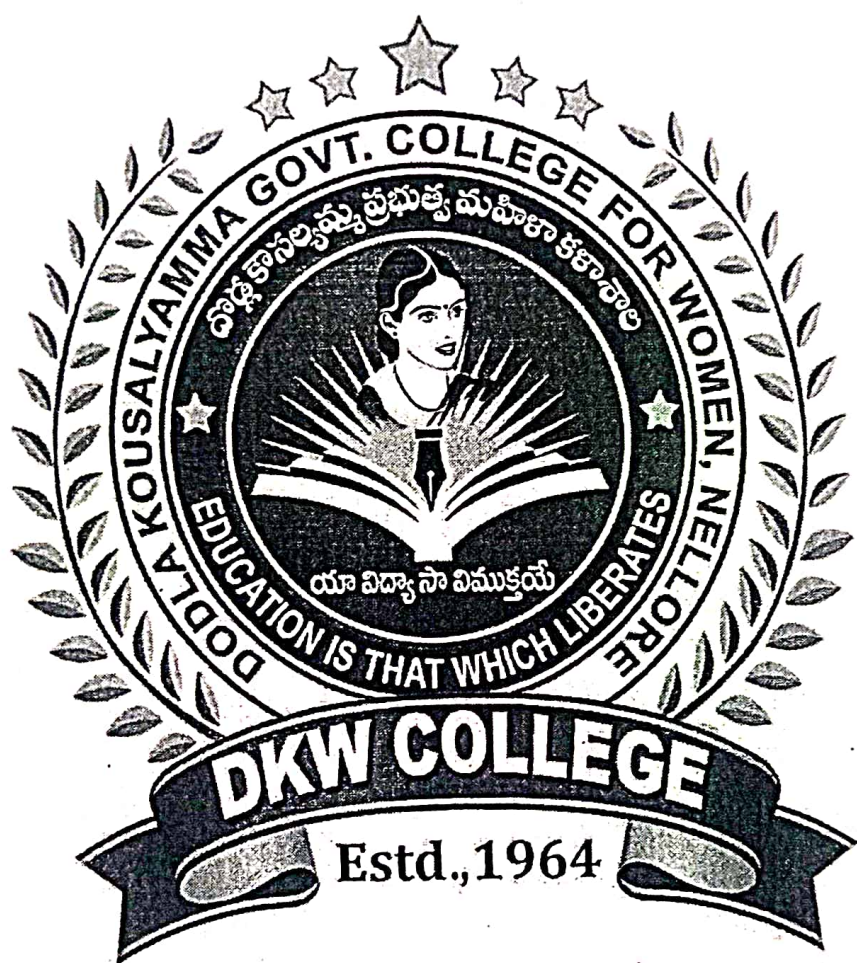


**D.K.GOV.T.COLLEGE FOR WOMEN (A),
SPSR NELLORE-524003**

**Re-accredited by NACC with A Grade Recognized by UGC
as “College with Potential for Excellence”**



**BOARD OF STUDIES
DEPARTMENT OF MICROBIOLOGY
2021-2022**

Credits-03

D.K. GOVT. COLLEGE FOR WOMEN (A), SPSR NELLORE.
CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)
I B.Sc; I Semester / MICROBIOLOGY Core Course -1, 2020-21
INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY
Theory syllabus
(Total hours of teaching –60@ 04Hrs /Week)

Learning Outcomes:

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

- Explain origin of microbes on the earth.
- Analyze the differences between prokaryotes and eukaryotes of nature
- Acquire awareness about Importance and applications of microbiology.
- Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.
- Classify fungi, Actinomycetes, Algae and Mycoplasma based on their structure, reproduction and life cycles.
- Evaluate the Microbial cultures

UNIT-I No. of hours: 12

1. History and mile stones in microbiology.
2. Contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky.
3. Importance and applications of microbiology.
4. Classification of microorganisms- Whittaker's five kingdom concept, Bergey's Manual of systematic Bacteriology.

UNIT-II No. of hours: 12

1. Ultra structure of Prokaryotic cell- Variant components and invariant components.
2. General characteristics and outline classification of Bacteria, Cyanobacteria, Protozoa and viruses.
3. General characteristics and outline classification Actinomycetes, Mycoplasma. Fungi, Algae
4. Economic importance of algae and fungi. SCP.

UNIT-III No. of hours: 12

1. Methods of sterilization:- Physical methods – Dry heat, moist heat, radiation methods,
2. Chemical methods- Alcohol and phenol methods and their application.
3. Microbial cultures:- Concept of pure culture, Methods of pure culture isolation, single cell isolation, Preservation of microbial cultures: overlaying cultures with mineral oils, lyophilization, and cultures storage at low temperature.

UNIT-IV No. of hours:12

1. Staining Techniques - Simple and Differential staining techniques.
2. Principles of microscopy - Bright field and Electron microscopy (SEM and TEM).
3. Nutritional types of bacteria (Microbiological media)-Natural and synthetic basal, complex, enrichment, selective, differential,
4. Maintenance and transport media.

UNIT-V No. of hours: 12

1. Microbial growth: Principles of growth, Batch and continuous growth, Synchronous culture, Diauxic growth,
2. Methods of measuring growth: Direct methods: viable plate counts, membrane filtration.
3. Indirect methods: Microscopic counts, electronic counters, most probable number
4. Metabolic activity – measurements of DNA, Protein.

D.K. GOVT. COLLEGE FOR WOMEN (A), SPSR NELLORE.
CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)
I B.Sc; II Semester / MICROBIOLOGY Core Course -2, 2020-21
MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY

Theory syllabus
(Total hours of teaching –60@ 04Hrs /Week)

Learning Outcomes:

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

- Explain Classification of Carbohydrates, Lipids and Amino acids
- Analyze Protein sequencing
- Acquire awareness about Properties and classification of Enzymes.
- Illustrate diversity in structure, function and their properties of DNA, RNA
- Evaluate the oxidative and substrate level phosphorylation

UNIT-I **No. of hours: 12**

1. Carbohydrates – Classification and function– mono, di, oligo and polysaccharides.
2. Lipids – classification and function – free fatty acids, triglycerides, phospholipids,
3. Aminoacids –classification, structure and function.

UNIT-II **No. of hours: 12**

1. Proteins–Structural levels of proteins– primary, secondary, tertiary and quaternary,
2. denaturation of proteins and Hydrolysis of proteins.
3. Outlines of Protein sequencing using various methods.

UNIT – III **No. of hours: 12**

1. Properties and classification of Enzymes. Coenzymes and Cofactors.
2. Factors affecting catalytic activity.
3. Inhibition of enzyme activity- competitive, non competitive, uncompetitive and allosteric.

UNIT – IV **No. of hours: 12**

1. Nucleic acids–structure, function and their properties of DNA, RNA:-Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA),
2. deviations from Watson-Crick model, other forms of DNA (A- and Z-DNA),
3. Structural characteristics of RNA. Types of RNA.

UNIT – V **No. of hours: 12**

1. Aerobic respiration - Glycolysis, HMP path way, ED path way, TCA cycle, Electron transport, oxidative and substrate level phosphorylation.
2. Anaerobic respiration Fermentation, Biochemical mechanisms of lactic acid, ethanol, butanol and citricacid fermentations. Nitrate and sulphate respiration.
3. Outlines of oxygenic and anoxy genic photosynthesis in bacteria.

D.K. GOVT. COLLEGE FOR WOMEN (A), SPSR NELLORE.
CBCS/ SEMESTER SYSTEM (w.e.f 2021-22 admitted batch)
II B.Sc; III semester/MICROBIOLOGY Core Course – 3, 2021 – 2022
IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Theory syllabus

(Total hours of teaching - 60@04 hrs/week)

Learning outcomes:

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

- Acquire and know about the immunity.
- Acquire the importance of antigen antibody reactions
- Understand about the clinical pathogens.
- Acquire knowledge about chemotherapy.

UNIT-I: No. of hours: 12

- Types of immunity - innate and acquired; active and passive; humoral and cell-mediated immunity.
- Primary organs of immune system: Bursa fabricius, Bone marrow and Thymus.
- Secondary organs of immune system: Spleen and Lymph nodes.
- Cells of immune system: B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils.

UNIT – II: No. of hours: 12

- 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, Blood groups.
- Labeled antibody based techniques - ELISA, RIA.
- Concept of monoclonal and polyclonal antibodies Production (Hybridoma technology).

UNIT- III: No. of hours: 12

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

UNIT- IV: No. of hours: 12

- General account on microbial diseases - causal organism, pathogenesis, epidemiology, diagnosis, prevention and control
- Bacterial diseases - Tuberculosis and Typhoid
- Fungal diseases – Candidiasis and Aspergillosis
- Protozoal diseases – Malaria
- Viral Diseases - Hepatitis- B & D and AIDS

UNIT- V: No. of hours: 12

- Description and pathology of diseases caused by hemoflagellate; *Leishmania donavani*.
- Principles of chemotherapy
- Antibacterial drugs – Penicillin, Antifungal drugs – Nystatin, Antiviral agents – Ribavirin
- Tests for antibiotic susceptibility – Disc diffusion method and MIC.
- Interferon – Nomenclature, types & classification, Induction of interferon, types of Inducers.

D.K. GOVT. COLLEGE FOR WOMEN (A), SPSR NELLORE.
CBCS/ SEMESTER SYSTEM (w.e.f 2021-22 admitted batch)
II B.Sc; IV semester/MICROBIOLOGY Core Course – 3, 2021 – 2022
INDUSTRIAL MICROBIOLOGY
Theory syllabus
(Total hours of teaching - 60@04 hrs/week)

Learning outcomes:

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

- Acquire and know about the bioreactors and fermentation methods.
- Acquire the importance of microbial production of industrial products.
- Learn about the bioleaching.
- Understand the industrially – important microorganisms.

UNIT – I No. of hours: 12

- Strain improvement techniques for industrially important metabolites from microbes.
- Microorganisms of industrial importance – yeast (*Saccharomyces cerevisiae*), mould (*Aspergillus niger*)
- Microorganisms of industrial importance - bacteria (*E.coli*), actinomycete (*Streptomyces griseus*).
- Industrially important Primary and secondary microbial metabolites.

UNIT – II No. of hours: 12

- Fermentation: concept and discovery of fermentation.
- Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.
- Ingredients of Fermentation media.
- Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT – III No. of hours:12

- Bioreactors/Fermentors: basic structure of bioreactor
- Types of bioreactors
- Sterilization of bioreactors: fibrous filter sterilization.
- Aeration and agitation: agitation in shake flask and tube rollers.

UNIT – IV No. of hours: 12

- Industrial microorganisms: microbial growth curve, factors affecting growth.
- Principles of production media, components of media.
- Microbial production of Industrial products: Citric acid and Ethanol
- Microbial production of Industrial products: Penicillin and vitamin B12.

UNIT – V No. of hours: 12

- Microbial Enzymes used in detergents, textiles and leather industries
- Production of industrially important enzymes: Amylases, proteases.
- Production of therapeutic enzymes
- Role of microorganisms in bioleaching

D.K. GOVT. COLLEGE FOR WOMEN (A), SPSR NELLORE.
CBCS/ SEMESTER SYSTEM (w.e.f 2021-22 admitted batch)
II B.Sc; IV Semester; Paper V /MICROBIOLOGY Core Course – 3, 2021 – 2022
MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Theory syllabus
(Total hours of teaching - 60@04 hrs/week)

Learning outcomes:

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

- Acquire and know about the DNA, RNA.
- Acquire the knowledge on mutations and mutagens.
- Acquire and the importance of regulation of gene expression in bacteria.
- Understand the genetic code.

UNIT-I No. of hours: 12

- DNA and RNA as genetic material (Griffith's experiment and Fraenkel Conrat & Stanley's experiment).
- Extra chromosomal genetic elements - Plasmids and transposons.
- Replication of DNA - Semi conservative mechanism, Enzymes involved in replication.

UNIT-II No. of hours: 12

- Types of genes - structural, constitutive, regulatory genes
- Regulation of gene expression in bacteria - Operon concepts
- Negative and positive control of the Lac Operon
- Poly and Mono cistronic m-RNA.

UNIT-III No. of hours: 12

- Mutations - spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications and insertions.
- Mutagens - Physical and Chemical mutagens.
- Outlines of DNA damage and repair mechanisms.
- Genetic recombination in bacteria - Conjugation, Transformation and Transduction (Generalized and specialized transductions).

UNIT-IV No. of hours: 12

- Concept of gene: Muton, Recon and Cistron
- Outlines of Transcription: RNA polymerases in *E.coli*, Initiation, Elongation and Termination
- Outlines of Translation: Initiation, Elongation and Termination

UNIT-V No. of hours: 12

Basic principles of Genetic engineering:

- Restriction endonucleases
- DNA polymerases, Ligases and Vectors
- Outlines of gene cloning methods
- PCR
- Genomic c-DNA libraries
- General account on applications of genetic engineering in industry, agriculture and medicine.

D. K. GOVT COLLEGE FOR WOMEN (A), NELLORE.
II B. Sc - SEMESTER -V: MICROBIOLOGY THEORY SYLLABUS, 2020-21.

Paper-V : ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

Total hours of teaching 60hrs @ 4 hrs per week

Learning Outcomes:

On successful completion of this course the students will be able to:

1. Acquire and know about the Microflora
2. Understand the Microbial interaction
3. Acquire and the importance of Liquid waste management
4. Understand the plant disease control

UNIT-I

No. of hours:12

1. Terrestrial Environment: Soil profile and soil Microflora
2. Aquatic Environment : Microflora of fresh water and marine habitats
3. Atmosphere: Aeromicroflora and dispersal of microbes
4. Extreme Habitats, Extremophiles: temperature,pH,Pressures Salinity.

UNIT- II

No. of hours:12

1. Role of Microorganism in nutrient cycling(Carbon,nitrogen,phosphorus).
2. Treatment and safety of drinking (potable) water, methods to detect portability of water samples:(a)Standard qualitative procedure: presumptive test /MPN test, confirmed test and Completed tests for feacal coliforms (b) Membrane filter techniques,
3. Microbial interaction: Mutualism, commensalism, antagonism, competition, parasitism, predation.

UNIT- III

No.of hours:12

1. Outline of Solid waste management: Sources and types of Solid waste,Methods of solid waste disposal(composting and sanitary landfills)
2. Liquid waste management: composition and strength of Sewage(BOD and COD), primary ,secondary,(oxidation ponds, trickling filters, activated sludge process and septic tank)and tertiary sewage treatment

UNIT- IV

No.of hours:12

1. Plant Growth Promoting Microorganism-Mycorrhizae,Rhizobia,Azospirillum Azotobacter,Frankia.
2. Phasphate-solubilizers and cyanobacteria.
3. Outlines of biological nitrogen fixation (symbiotic, non-symbiotic)
4. Biofertilisers- Rhizobium

UNIT-V

No. of hours:12

1. Concept of disease in plants, symptoms of plant diseases caused by fungi, bacteria and viruses,
2. Plant disease- groundnut rust, Citrus canker and tomato leaf curl
3. Principles of plant disease control

D. K. GOVT COLLEGE FOR WOMEN (A), NELLORE.

III B. Sc - SEMESTER –V: MICROBIOLOGY THEORY SYLLABUS, 2020-21.

Paper-VI : FOOD AND INDUSTRIAL MICROBIOLOGY

Total hours of teaching 60hrs @ 4 hrs per week

Learning Outcomes:

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

1. Acquire and know about the Food infection
2. Understand the Microbes as food
3. Acquire and the importance of Microbial production of industrial products
4. Understand the industrially-important microorganisms.

UNIT-I

No. of hours: 12

Intrinsic and extrinsic parameters that effects microbial growth in food

Microbial spoilage of food-fruits, vegetables, milk, meat and canned foods

Food infection(salmonellosis) and Food intoxication (Botulism)

UNIT-II

No.of hours:12

Principles of food preservation-physical and chemical methods.

Fermented and dairy foods-cheese and yogurt.

Microbes as food-SCP, edible mushrooms (white button, oyster and paddy starw). probiotics and their benefits.

UNIT-III

No.of hours :12

Microorganisms of industrial importance-yeasts, (*Saccharomyces cerevisiae*)

Moulds, (*Aspergillus niger*) Bacteria(*E.coli*), actinomycets(*streptomyces griseus*).

Isolation and screening and Outline of strain improvement of industrially-important microorganisms.

UNIT-IV

No.of hours : 12

Types of fermentation processes-solid state, liquid state,batch,fed-batch, and continuous.

Basic concepts of Design of fermentor.

Ingredients of fermentation media

Downstream processing-filtration, centrifugation, cell disruption, solvent extraction.

UNIT-V

No.of hours:12

Microbial production of industrial products: citric acid, Ethanol, Amylase, penicillin,

Glutamic acid, and vitamin B12

D.K.GOV.T.COLLEGE FOR WOMEN (A) .NELLORE.
III B. Sc - MICROBIOLOGY SYLLABUS, SEMESTER- VI, 2020-21.

CLUSTER ELECTIVE, Paper VIII-1 A
DIAGNOSTIC MICROBIOLOGY

Total hours of teaching 60hrs @ 3hrs per week

UNIT-I

No. of Hours: 12

Causative agent and symptoms of bacterial, viral, fungal and protozoan diseases of various human body systems: nervous (meningitis, encephalitis, cryptococcosis, trypanosomiasis) respiratory (tuberculosis, influenza, histoplasmosis, toxoplasmosis), gastrointestinal (typhoid. Hepatitis, candidiasis, amoebiasis), urogenital systems (Nongonococcal urethritis, genital herpes, candidiasis Trichomoniasis).
Disease associated
clinical samples for diagnosis.

UNIT-II

No .of Hours: 12

Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) and precautions required.

Method of transport of clinical samples to laboratory and storage.

UNIT-III

No of Hours: 12

Examination of sample by staining-Gram stain. Ziehl-Neelson Staining for tuberculosis, Giemsa-stained thin blood film for malaria.

Preparation and use of culture media- Blood agar, Chocolate agar, Lowenstein-Jensen medium, Mac Conkey agar. Distinct colony properties of various bacterial Pathogens.

UNIT-IV

No. of Hours:126

Diagnosis of Typhoid, Dengue, HIV and Swine flu using Serological Methods- Agglutination, ELISA,

Immunofluorescence, Nucleic acid based methods- PCR, Nucleic acid probes.

UNIT- V

No. of Hours:12

Importance of determination of sensitivity/resistance of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method.

Credits-03

D.K.GOV.T.COLLEGE FOR WOMEN (A) .NELLORE.

III B. Sc - MICROBIOLOGY SYLLABUS

SEMESTER- VI, 2020-21.

Paper VIII, CLUSTER ELECTIVE,

**Paper VIII-1 B MICROBIAL QUALITY CONTROL IN FOOD AND
PHARMACEUTICAL INDUSTRIES**

Total hours of teaching 60hrs @ 3hrs per week

UNIT-I

No. of Hours:12

Good laboratory practices- Good morphological practices. Biosafety cabinets- Working of Biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3. Discarding biohazardous waste- Methodology of Disinfection, Autoclaving & Incineration.

UNIT-II

No .of Hours:12

Culture and microscopic methods – Standard plate count, most probable numbers, direct microscopic counts, Biochemical and immunological methods: Litmus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products

UNIT-III

No .of Hours:12

Molecular methods- Nucleic acid probes, PCR based detection, biosensors.

UNIT-IV

No. of Hours:12

Enrichment culture techniques for detection of specific microorganisms – on XLD agar, Salmonella Shigella agar, Mannitol salt agar, EMB agar, Mac Conkey agar, Sabouraud agar. Ascertaining microbial quality of milk by MBRT. Rapid detection methods of microbiological quality of milk at milk collection centers (COB, 10min reassuring assay).

UNIT-V

No. of hours:12

Hazard analysis of critical point (HACCP)- principles, flow diagrams, limitations. Microbial standards for different foods and water-BIS standards for common foods and drinking water. QC&QA, warehousing, sample testing in pharma industry.

Credits-03

D.K.GOV.T.COLLEGE FOR WOMEN (A) .NELLORE.
III B. Sc - MICROBIOLOGY SYLLABUS SEMESTER- VI, 2020-21.

Paper VIII, CLUSTER ELECTIVE,
Paper VIII-1 C : BIOINFORMATICS

Total hours of teaching 60hrs @ 3hrs per week

UNIT-I

No. of Hours: 12

RDBMS-Definition of relational database

Mode of data transfer (FTP, SFTP, SCP), advantage of encrypted data transfer

UNIT-II

No .of Hours: 12

Bioinformatics- Its Definitions, Introduction, History. Bioinformatics- Objectives, Applications, Its need, Scope, Careers. Bioinformatics scenario in India & the rest of the world. Sequences used in Bioinformatics-DNA, protein, RNA. Dawn of sequencing. Brief understanding of DNA, Protein, and RNA molecules.

UNIT-III

No .of Hours:12

Local and Global Sequence alignment, pair wise and multiple sequence alignment. Scoring alignment, scoring matrices. Types of phylogenetic trees, Different approaches of phylogenetic tree construction- UPGMA, Neighbor joining, Maximum Parsimony, Maximum likelihood.

UNIT-IV

No .of Hours:12

Local and Global Sequence alignment, pair wise and multiple sequence alignment. Scoring alignment, scoring matrices. Types of phylogenetic trees, Different approaches of phylogenetic tree construction- UPGMA, Neighbor joining, Maximum Parsimony, Maximum likelihood.

UNIT-V

No .of Hours:12

Diversity of Genomes: Viral, Prokaryotic & eukaryotic genomes Genome, transcriptome, proteome, 2-D Gel electrophoresis, Maldi Toff spectroscopy Major features of completed genomes: F.Coli, S.Cerevisiae , Human Hierarchy of protein structure – primary, secondary and tertiary structures , modeling Structural Classes, Motifs, Folds and Domains.

Protein structure prediction in presence and absence of structure template.