MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
(Affiliated to Krishna University, Machilipatnam)
SYLLABUS

Subject: Microbiology **Semester: I**
Course Title: Introduction to Microbiology & Microbial Diversity
Course code: 20MBCCIM13
No. of. Hours: 60 **LTP: 400** **Credits: 3**

Objectives

- To Impart basic knowledge on principles and applications of Microbiology
- To know about the diversity of microorganisms
- To learn the isolation of microbes

Course Outcomes

CO1: Illustrate the contributions made by prominent scientists.
CO2: Analyze different characteristics of microbes and difference of cell wall components in bacteria and archaebacteria.
CO3: Summarize the techniques used to stain, and observe the Microorganism under microscope
CO4: Demonstrate different isolation, preservation techniques.
CO5: Analyse various method used for sterilization and disinfection techniques.

UNIT- I: History of Microbiology **(10 Hrs.)**

History and mile stones in microbiology. Contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky. Importance and applications of microbiology. Classification of microorganisms. Whittaker' s five kingdom concept, Berge's Manual of Systematic Bacteriology. General characteristics and outline classification of Bacteria, Archaea, Mycoplasmas, Cyanobacteria, Fungi, Algae, Protozoa and viruses.

UNIT-II: Sterilization and preservations techniques **(10 Hrs.)**

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, Chemical methods and their applications. Microbial cultures: Concept of pure culture, Methods of pure culture isolation, Enrichment culturing techniqu es, single cell isolation, and pure culture development. Preservation of microbial cultures: sub culturing, overlaying cultures with mineral oils, Lyophilisation, and cultures, storage at low temperature.

UNIT-III: Microscopy and staining techniques **(10 Hrs.)**

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

UNIT-IV: Physiological characteristics of microbes **(10 Hrs.)**

Microbial growth: Principles of growth, Kinetics of growth, Methods of measuring growth: Direct methods: viable plate counts, membrane filtration. Indirect methods: Metabolic activity – most probable number; Batch and continuous growth, Synchronous culture, Diauxic growth, Types of cultures - stock, batch, continuous and synchronous cultures. Cultivation of aerobes and anaerobes. Reproduction in bacteria and spore formation.

UNIT-V: Characteristics of microbes **(10 Hrs.)**

Ultra structure of Prokaryotic cell- Variant components and invariant components. Cell wall of bacteria and fungi, Gram positive cell wall, Gram negative cell wall, Cell wall of fungi and yeasts._Morphology, Ultrastructure and chemical composition of bacteria, Actinomycetes, *Spirochetes, Rickettsia, Mycoplasma, Chlamydia.* Economic importance of *Algae* and *Fungi.* General characters of viruses, Morphology, replication of TMV and HIV, Cultivations of viruses. Economic importance of SCP.

Skill/Hands-on (10Hrs.)

1. PreservationofMicrobesbyusingvarioustechniques.
2. Preparationofdifferenttypesofproductionmediaformetabolites.
3. Cultivation of Microbes.

Co- Curricular Activities

- Assignments on SEM and TEM
- Group discussions
- Student presentations and seminars
- Online quizzes

Prescribed Text Books

1. Pelczar,M.J.,Chan,E.C.S.andKrieg,N.R.(1993).Microbiology.5thEdition,T ataMc,GrewHillPublishingCo.,Ltd.,NewDelhi.
2. Dube,R.C.andMaheswari,D.K.(2000)GeneralMicrobiology.S
3. Chand,NewDelhi.Edition),HimalayaPublishingHouse,Mumbai.
4. Power,C.B.andDaginawala,H.F.(1986).GeneralMicrobiologyVolI&II
5. Prescott,M.J.,Harley,J.P.andKlein,D.A.(2010).Microbiology.
6. 5thEdition,WCBMc,GrewHill,NewYork.
7. Reddy,S.M.andReddy,S.R.(1998).MicrobiologyPractical
8. Manual,3rdEdition,SriPadmavathiPublications,Hyderabad.
9. Singh,R.P.(2007).GeneralMicrobiology.KalyaniPublishers,NewDelhi.

ReferenceBooks

1. Stanier,R.Y.,Adelberg,E.A.andIngram,J.L.(1991).General
2. Microbiology,5thEd.,PrenticeHallofIndiaPt.Ltd.,NewDelhi.
3. MicrobiologyEditedbyPrescott
4. JayaBabu(2006).PracticalManualonMicrobialMetabolismsand
5. GeneralMicrobiology.KalyaniPublishers,NewDelhi.

MARISSTELLACOLLEGE(AUTONOMOUS),VIJAYAWADA-8
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SYLLABUS

Subject: Microbiology **Semester:I**
Course Title: Basic Techniques in Microbiology-Practical
Course Code: 20MBP1BT12
No. of Hours: 30 **LTP: 002** **Credits:2**

Objectives

- To impart Knowledge on isolation of microbes and microbial techniques.
- To know about the basic principles
- To learn the staining techniques and culturing

CourseOutcomes

CO 1: Isolate different types of microbes from soil samples.
CO 2: Handle microscope and identify various types of bacteria and fungi under microscope.
CO 3: Knowledge on gram positive and negative bacteria

List of Experiments

1. Microbiology Good Laboratory Practices and Biosafety.
2. Preparation of culture media for cultivation of bacteria
3. Preparation of culture media for cultivation of fungi
4. Sterilization of medium using Autoclave
5. Sterilization of glassware using Hot Air Oven
6. Light compound microscope and its handling
7. Microscopic observation of bacteria (Gram+ve bacilli and cocci, Gram-ve bacilli),Cyanobacteria, Algae And Fungi.
8. Simple staining
9. Gram's staining
10. Hanging-dropmethod.
11. Isolation of pure cultures of bacteria by streaking method.
12. Preservation of bacterial cultures by various techniques.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: II**
Course Title: Microbial Physiology & Biochemistry
Course Code: 20MBCCMP23
No. of Hours: 60 **LTP: 400** **Credits: 3**

Objectives

- To learn the structure of biomolecules
- To understand the properties and functions of enzymes
- To estimate the bacterial growth

Course Outcomes

CO1: Summarize different of biomolecules with their structure and functions.
CO2: Explain various analytical techniques used to separate bio molecules
CO3: Describe the properties, structure, function of enzymes
CO4: Discuss the role of nutrients in microbial growth. And reproduction, methods used to estimate bacterial growth.

CO5: Discuss the concept of central dogma of molecular biology, types, biosynthesis and functions of RNA and protein synthesis in prokaryotes and eukaryotes

UNIT-I: Biomolecules and analytical techniques **(10 Hrs.)**

Carbohydrates – Classification, chemistry, properties, an d function– mono, di, oligosaccharides. polysaccharides. Lipids – classification, chemistry, properties and function – free fatty acids, triglycerides, phospholipids, glycolipids & waxes Principle and applications of- Colorimetric. Chromatography (Paper, Thin -layer and Column), Spectrophotometry (UV and Visible), Centrifugation and Gel Electrophoresis.

UNIT- II: Characteristics features of amino acids and proteins **(10 Hrs.)**

Amino acids – classification, structure and function. Essential amino Acids & amphoteric nature of amino acids and reactions and functions of carboxyl and amino groups and side chains. Proteins - isolation and characterization of proteins. Structural levels of proteins – primary,

secondary, tertiary and quaternary, denaturation of proteins. Hydrolysis of proteins. Outlines of Protein sequencing using various methods.

UNIT – III: Composition of DNA **(10 Hrs.)**

Nucleic acids–structure, function and their properties. Structural polymorphism of DNA, RNA. Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B - DNA), deviations from Watson- Crick model, other forms of DNA (A- and Z- DNA), forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking). Structural characteristics of RNA . Types of RNA.

UNIT – IV: Metabolic pathways **(10 Hrs.)**

Aerobic respiration - Glycolysis, HMP path way, ED path way, TCA cycle, Electron transport, oxidative and substrate level phosphorylation. Kreb'scycle, glyoxylate cycle, hexose monophosphate (HMP) shunt, gluconeogenesis. Anaerobic respiration Fermentation, Biochemical mechanisms of lactic acid, ethanol, butanol and citric acid fermentations. Nitrate and sulphate respiration. Outlines of oxygenic and an oxy genic photosynthesis in bacteria

UNIT – V: Enzymology **(10 Hrs.)**

Properties and classification of Enzymes. Bio catalysis - induced fit and lock and key models. Coenzymes and Cofactors. Factors affecting catalytic activity. Inhibition of enzyme activity - competitive, non-competitive, uncompetitive and allosteric. Enzyme kinetics: Michaelis - Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of pH and temperature, temperature.

Skill based /Hands on (10 Hrs.)

1. Separation of amino acids by paper chromatography techniques.
2. Production of ethanol by Microbes-Bacteria
3. Production of amylase by Fungi

Co- Curricular Activities

- Assignments on Aminoacids–classification,structureandfunction
- Group discussions
- Student presentations and seminars
- Online quizzes

PrescribedTextBooks

1. Jun, S., Si, F., Pugatch, R. and Scott, M., 2018. Fundamental principles in bacterial physiology—history, recent progress, and the future with focus on cell size control: a review. *Reports on Progress in Physics*, *81*(5), p.056601.

2. Satyanarayana, U., 2021. *Biochemistry, 6e-E-book*. Elsevier Health Sciences.

3. Mehta, D. and Satyanarayana, T., 2013. Diversity of hot environments and thermophilic microbes. In *Thermophilic microbes in environmental and industrial biotechnology* (pp. 3-60). Springer, Dordrecht.

ReferenceBooks

1. Poole, R.K., 2019. *Advances in microbial physiology*. Academic Press.

2. Sokatch, J.R., 2014. *Bacterial physiology and metabolism*. Academic Press.

3. Smyth, J.D. and McManus, D.P., 1989. *The physiology and biochemistry of cestodes*. Cambridge university press.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8

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SYLLABUS

Subject: Microbiology **Semester: II**

Course Title: Qualitative & Quantitative Analysis - Practical

Course code: 20MBP2QA22

No. of Hours: 30 **LTP: 002** **Credits: 2**

Objectives

- To impart knowledge on various analytical techniques.
- To know about the carbohydrates and amino acids
- To estimate the DNA & RNA by calorimetric and ordinal method.

Course Outcomes

CO1: Knowledge on different biomolecules by analytical techniques.
CO2: learn the isolation of genetic material from microbes.
CO3: Understand the enzymatic activities

List of Experiments

1. Qualitative Analysis of Carbohydrates.
2. Qualitative Analysis of Amino acids.
3. Colorimetric estimation DNA by diphenylamine method.4. Estimation of RNA by Ordinal method.
5. Colorimetric estimation of proteins by Biuret / Lowry method.
6. Estimation of reducing sugar-Anthrone method.
7. Estimation of sugar by titration method–Benedict's method.
8. Determination of pKa and pI values of amino acids
9. Assay of amylase activity, bacterial growth curve.
10. Effect of temperature / pH on enzyme production by microbes
11. Demonstration of immobilization of enzyme activity.
12. Preparation of different media – synthetic and complex media.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: III**
Course Title: Medical Microbiology & Immunology
Course code: 20MBCCMI33
No. of Hours: 60 **LTP: 400** **Credits: 3**

Objectives

- To impart the sound knowledge on the role of immune system
- To know about the diagnosis methods
- To learn about the antigen and antibody reactions, types of immunity

Course Outcomes

CO1:. Illustrate the basic concepts of different types of Immunity. And role of cells and organs related to Immune System

CO2: Discuss the chemical nature,,types, properties and functions of immunoglobulins and process ,role of antigen antibody reactions in clinical diagnosis

CO3: Summarize the concepts of hypersensitivity, principals of diagnostic microbiology.
And role of normal flora, antibacterial substances, in Human body.

CO4: Discuss the role of Vectors in genetic engineering, and Molecular Biology.

UNIT- I **(10 Hrs.)**

Normal f lora of the 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 **(10 Hrs.)**

General account on microbial diseases - causal organism, pathogenesis, epidemiology, diagnosis, prevention and control._Bacterial diseases -

Tuberculosis and Typhoid Fungal diseases – Candidiasis, Aspergillosis, Yeast Protozoal diseases – Malaria, Filarial & Diseases spread by House Fly. Viral Diseases - Rabies, Hepatitis- A & C and AIDS.

UNIT- III **(10 Hrs.)**

Description and pathology of diseases caused by Aspergillus, Penicillium. Description and pathology of diseases caused by hem flagellates; *Leishmania donovani, L.tropica, Trypanosoma gambiense.* Principles of chemotherapy, Antibacterial drugs – Penicillin, Antifungal drugs – Nystatin, Antiviral agents – Ribavirin, Drug resistance in bacteria. Interferon – Nomenclature, types & classification, Induction of interferon, types of Inducers.

UNIT- IV **(10 Hrs.)**

Types of immunity - innate and acquired; active and passive; humoral and cell-mediated immunity.

Primary and secondary organs of immune system - Thymus, Bursa fabrics, bone marrow, spleen and lymph nodes. Cells of immune system. Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils. .

UNIT- V **(10 Hrs.)**

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 Immunofluorescence. Polyclonal and monoclonal antibodies - production and applications. Concept of Hypersensitivity and Autoimmunity. Hybridoma technology.

Skill based/ Hands on (10 Hrs.)

1. Blood group chart.
2. Making a video on types of immunity.
3. Collection of clinical samples for diagnosis of disease.

Co- Curricular Activities

- Assignments on General account on microbial diseases
- Group discussions
- Student presentations and seminars
- Online quizzes

PrescribedTextBooks

1. AnanthanarayanR.andPanikerC.K.J.(2009)TextbookofMicrobiology.8thedition,UniversityPressPublication.
2. BrooksG.F.,CarrollK.C.,ButelJ.S.,MorseS.A.andMeitner,T.A.(2013)
3. Jawetz, MelnickandAdalbert'sMedical Microbiology. 26 thedition.McGrawHillPublication.

ReferenceBooks

1. DelvesP,MartinS,BurtonD,RoittIM.(2006).Roitt'sEssentialImmunology.11 theditionWiley-Blackwell Scientific Publication,Oxford.
2. GoldsbyRA, KindtTJ, Osborne BA.(2007). Kuby's Immunology.6theditionW.H.

MARIS STELLA (AUTONOMOUS) COLLEGE VIJAYAWADA-8
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SYLLABUS

Subject: Microbiology **Semester: III**
Course Title: Medical Microbiology & Immunology - Practical
Course Code: 20MBP3MI32
No. of Hours: 30 **LTP: 002** **Credits: 2**

Objectives

- To acquire knowledge on various methods used to collect samples for diagnostic purpose.
- To know about the types of immunity
- To understand the blood grouping

Course Outcomes

CO1: Perform blood grouping test.
CO2: Perform different types of blood tests like hemoglobin percentage and leucocyte count.
CO3: Learn the Widal and estimation of haemoglobin

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,
11. Polio, Herpes, chicken pox, HPV warts, Dermatomycoses (ring worms)
12. Study of various stages of malarial parasites in RBCs using permanent mounts.

MARISSTELLACOLLEGE(AUTONOMOUS),VIJAYAWADA–8

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SYLLABUS

Subject: Microbiology **Semester: IV**

Course Title: Industrial Microbiology **Course Code: 20MBCCIM43**

No. of Hours: 60 **LTP:400** **Credits:3**

Objectives

- Toprovideknowledgeonimportantmicrobes
- To learn themetabolicbi-productsusedinVariousIndustries.
- To know about the fermenters

CourseOutcomes

CO1: Summarizetheimportanceof microbesusedinindustries.

CO2: Demonstrate different types of fermenters and fermentation processes.

CO3: Understand the role of microbes in various industries like Pharmaceutical,Bioleachingandtextile.

CO4: Discuss about various growth parameters required for industrial products.

UNIT-I **(10Hrs.)**

Microorganismsofindustrialimportance– yeasts(*Saccharomycescerevisiae*),moulds(*AspergillusNiger*)bacteria(*E.coli*),actinomycetes(*Streptomyces griseous*).Industrially important Primary and secondarymicrobial metabolites.Screening techniques.Techniquesinvolvedinselectionofindustriallyimportantmetabolites frommicrobes.

UNIT-II **(10Hrs.)**

Fermentationandfermenter:conceptanddiscoveryoffermentation.Fermenter : its parts and function. Types of fermenter – batch, continuousandfedbatch.Typesoffermentationprocesses –solid state, liquidstate,batch,fed-batch,continuous.BasicconceptsofDesignoffermenter. Ingredients of Fermentation media. Downstream processing - filtration,centrifugation,celldisruption,solventextraction.

UNIT-III **(10Hrs.)**

Microorganisms involved in Pharmaand therapeutic enzymes. Enzymesusedindetergents,textilesandleather industries. Production ofamylases andProteases. Production oftherapeutic enzymes. Role ofmicroorganismsinbioleachingandtextileindustry.

UNIT–IV **(10Hrs.)**

Industrial microorganisms: cell growth, microbial growth kinetics, factorsaffectinggrowth,basicnutrition,principlesofproductionmedia,components ofmedia, chemical compositionofmedia.MicrobialproductionofIndustrialproducts:Citricacid, Ethanol,Penicillin,Glutamicacid,andvitaminB12.

UNIT-V **(10Hrs.)**

Bioreactors:basic structure of bioreactor, types of bioreactors, kineticsand methodology of batch and continuous bioreactors. Sterilization ofbioreactors: fibrous filter sterilization. Aeration and agitation: agitationinshakeflaskandtuberollers.

Skill/ Hands-on **(10Hrs.)**

1. Preparationofbioreactor
2. Preparationofproductionmedia
3. Collection ofIndustriallyimportantmicrobes.

Co- Curricular Activities

- Assignments on Aminoacids–classification,structureandfunction
- Group discussions
- Student presentations and seminars
- Online quizzes

PrescribedTextBooks

1. CasidaLE.(1991).IndustrialMicrobiology.1stedition.Wiley
2. EasternLimited.4.CruegerWandCruegerA.(2000). Biotechnology: AtextbookofIndustrialMicrobiology. ndEdition.PanimaPublishingCompany,NewDelhi.

ReferenceBook

1. PatelAH.(1996).IndustrialMicrobiology.1stEdition.Mac MillanIndiaLimited.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA–8
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SYLLABUS

Subject: Microbiology **Semester: IV**
Course Title: Industrial Microbiology-Practical
Course Code: 20MBP4IM42
No. of Hours: 30 **LTP: 002** **Credits: 2**

Objectives

- To provide knowledge on important microbes used in industries and agriculture sector.
- To know about fermentation
- To learn the wine and ethanol production

CourseOutcomes

CO1: Separate metabolites produced by microbes.
CO2: Production of ethanol by invitro techniques from microbes.
CO3: Understand the concept of wine and ethanol production

List of Experiments

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

MARISSTELLACOLLEGE(AUTONOMOUS),VIJAYAWADA-8

(AffiliatedtoKrishnaUniversity,Machilipatnam)

SYLLABUS

Subject:Microbiology

Semester:IV

CourseTitle:MicrobialGenetics&MolecularBiology

Course Code:20MBCCMG43

No.ofHours:60 **LTP:400** **Credits: 3**

Objectives

- To learn types of mutations
- To know about enzymes in replication
- To develop a knowledge on different types of genes

Course Outcomes

CO1: Summarize different modes oftransfer mechanisms in Bacteria, molecular techniques used in various types of mutations.

CO2: Explain the structures, regulation of Lac Operon with gene expression in bacteria

CO3: Articulate different types of RNAs involved in protein synthesis and their role.

CO4: Explain the role of vectors in Genetic Engineering and their applications in Agriculture and Medicine.

UNIT-I **(10Hrs.)**

DNAandRNAasgenetic material.Structureandorganizationofprokaryotic DNA. Watson and Crick model of DNA. Extra chromosomalgenetic elements - Plasmids and transposons. Replication of DNA - Semiconservativemechanism,Enzymesinvolvedinreplication.

UNIT-II **(10Hrs.)**

Mutations-spontaneousandinduced,basepairchanges,frameshifts, deletions,inversions,tandemduplications,insertions,Mutagens-PhysicalandChemicalmutagens,OutlinesofDNAdamageandrepair mechanisms.,Geneticrecombinationinbacteria-Conjugation, TransformationandTransduction.

UNIT-III **(10Hrs.)**

Concept of gene Muton, Recon and Cistron. One gene, one enzyme andone gene one polypeptide hypothesis. Types of RNA and their functions.Geneticcode.Structureofribosomes,NonmicroRNA.

UNIT–IV **(10Hrs.)**

Types of genes - structural, constitutive, regulatory, clustered genes andthecontrolofgeneexpression.Regulationofgeneexpressioninbacteria - operonconcepts - Negative and positive control of the Lac Operon, trpoperon.PolyandMonocistronicm-RNA.

UNIT-V **(10Hrs.)**

Transcription: Enzymatic Synthesis ofRNA-Basic features ofRNAsynthesis,*E.coli*RNApolymerase,ClassesofRNA molecules,processingoft RNAandrRNAin*E. coli*,TranscriptioninEukaryotes,Eukaryotic rRNAgenes, formation of eukaryotic t RNA molecules, RNAPolymerasesofeukaryotes.

Translation: Outline of Translation, The Genetic Code, The DecodingSystem,Codon Anticodon interaction.Protein Synthesis,ComplexTranslation units,Inhibitors and Modifiers of protein synthesis, ProteinSynthesisinEukaryotes.

Skill/Handsonactivities **(10Hrs.)**

1. Seminars
2. Modulespreparation
3. IdentificationofdifferenttypesofDNAandRNAusingmicrographsandmodel/schematicrepresentations.

Co- Curricular Activities

- Assignments on Aminoacids–classification,structureandfunction
- Group discussions
- Student presentations and seminars
- Online quizzes

PrescribedTextBooks

1. Freielder,D.(1990). Microbial Genetics. NarosaPublishingHouse, NewDelhi. Freifelder, D.(1997). Essentials ofMolecularBiology.NarosaPublishingHouse, NewDelhi.
2. Glick,B.P.andPasternak,J.(1998). Molecular Biotechnology,ASMPress,WashingtonD.C.,USA.
3. Lewin,B.(2000).GenesVIII.OxfordUniversityPress,England.
4. Maloy,S.R.,Cronan,J.E.andFreifelder,D.(1994).MicrobialGenetics,JonesandBartlettPublishers,London.

5. RamReddy,S.,Venkateshwarlu,K.andKrishnaReddy,V.(2007). Atext BookofMolecularBiotechnology.Himalaya Publishers,Hyderabad.

ReferenceBooks

1. SinnottE.W.,L.C.DunnandT.Dobzhansky(1958).PrinciplesofGenetics. 5thEdition.McGrawHill,NewYork.
2. Smith,J.E.(1996).Biotechnology,CambridgeUniversityPress.
3. Snyder,L.andChampness,W.(1997).MolecularGeneticsofBacteria.AS Mpress,
4. Strickberger,M.W.(1967).Genetics. Oxford&IBH,NewDelhi.

MARISSTELLACOLLEGE(AUTONOMOUS),VIJAYAWADA-8

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SYLLABUS

Subject: Microbiology **Semester: IV**

Course Title: Microbial Genetics & Molecular Biology – Practical

Course Code: 20MBP5MG42

No. of Hours: 30 **LTP:002** **Credits:2**

Objectives

- To inculcate basic knowledge on genetic engineering.
- To learn the technique of gel electrophoresis
- To know the isolation of genomic DNA

CourseOutcomes

CO 1: Separate, identify DNA by Agarose gel electrophoresis.

CO 2 : Isolate genomic DNA from Bacteria, Onion.

CO 3: Visualization of DNA by Agarose Gel Electrophoresis

List of Experiments

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

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Food, Agriculture & Environmental Microbiology **Course code: 20MBSEC11FA3**

No. of Hours: 45 **LTP: 300** **Credits: 3**

Objectives

- To know about the soil micro flora
- To understand the bacterial and fungal contaminants
- To learn the role of microbes in agriculture

Course outcomes

CO1: Understand different parameters for food spoilage and preservation

CO2: Develop various food products

CO3: Importance of microbes in agriculture for crop production

CO4: learn the role of sewage treatment methods

CO5: Summarize the role of microbes in an Environment

UNIT – I **(9 Hrs.)**

Intrinsic and extrinsic parameters that affect microbial growth in food Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods. Food intoxication (botulism). Food-borne diseases salmonellosis, *Staphylococcus aureus* and their detection, prevention.

UNIT – II **(9 Hrs.)**

Principles of food preservation - Physical and chemical methods. Fermented Dairy foods – cheese and yogurt .Fermentative Products – Beer, Wine Microorganisms as food – SCP edible mushrooms (oyster and paddy straw).

UNIT – III **(9 Hrs.)**

Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur. Microflora of Rhizosphere and Phyllosphere microflora, Production of VAM, field applications of Ectomycorrhiza and VAM.

UNIT - IV **(9 Hrs.)**

Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial, Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of Plant diseases, Biodegradation, Biogas production, Biodegradable plastics, Plant – Microbe interactions.

UNIT – V **(9 Hrs.)**

Outlines of Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill). Liquid waste management: Composition and strength of sewage (BOD and COD., Primary, secondary and tertiary sewage treatment.

Co- Curricular Activities

- Assignments on applications of environmental microbiology
- Group discussions
- Student presentations and seminars
- Online quizzes

Prescribed Text Books

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition, Benjamin/Cummings Science Publishing, USA
2. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA
3. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
4. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
5. Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.
6. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings.
7. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.

Reference Books

1. Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.
2. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York.
3. Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg
4. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press,Cambridge, England.
5. Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
(Affiliated to Krishna University, Machilipatnam)
SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Food, Agriculture & Environmental Microbiology-Practical **Course code: 20MBP611FA2**
No. of Hours: 45 Hrs. **LTP: 003** **Credits: 2**

Objectives

- To know about the soil microflora
- To understand the bacterial and fungal diseases
- To analyse the soil and potable water

Course Outcomes

CO1: List out different types of microflora

CO2: Identify the bacterial and fungal diseases

CO3: Develop skill on quality of milk sample by MBRT

List of Experiments **(30 Hrs.)**

1. Isolation of bacteria and fungi from spoiled bread / fruits / vegetables.
2. Determination of microbiological quality of milk sample by MBRT.
3. Enumeration of Bacteria, Fungi and Actinomycetes from soil.
4. Enumeration and identification of rhizosphere micro flora.
5. Isolation of Rhizobium from root nodules.
6. Observation description of any three bacterial and fungal plant diseases.
7. Staining and observation of VAM.
8. Analysis of soil - pH, Moisture content and water holding capacity.
9. Study of air flora by petri plate exposure method.
10. Analysis of potable water: SPC, Presumptive, confirmed and completed test, determination of coli form count in water by MPN.
11. Determination of Biological Oxygen Demand (BOD. of waste water samples.

Skill/Hands-on: Field work/ Mini project **(15 Hrs.)**

1. Visit to local microbiology laboratories

2. Learning techniques of analysis of Soil and Air flora

3. Training students to related subject experts

4. Attending special lectures, group discussions and seminars on related topics

5. Prepare the project work related to Environmental Microbiology

Reference Books

1. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press,Cambridge, England.
2. Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.
3. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Management of Human Microbial Diseases & Diagnosis **Course Code: 20MBSEC12MD3**
No. of Hours: 45 **LTP: 300** **Credits: 3**
Objectives

- To know about the soil microbial diseases and diagnosis
- To understand the bacterial, fungal and viral diseases
- To learn the communicable diseases

Course Outcomes

CO1: Distinguish the diseases caused by Bacteria, Fungi, Viruses

CO2: Develop the skills of sample collection.

CO3: Learn different serological techniques for diagnosis of infectious diseases

CO4: Identify the sensitivity and resistance of various antibiotics

CO5: Determine the sensitivity and resistance of various antibiotics.

UNIT – I **(9 Hrs.)**

Definition and concept of health, disease, infection, and pathogen. Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems. Disease associated clinical samples for diagnosis - any three diseases of each.

UNIT- II **(9 Hrs.)**

General account of epidemiology: principles of epidemiology, current epidemics (AIDS, nosocomial, acute respiratory syndromes). 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 **(9 Hrs.)**

Mechanism of bacterial pathogenicity, colonization and growth, virulence, virulence factors, exotoxins, enterotoxins, endotoxins and neurotoxins. Distinct colony properties of various bacterial pathogens.

UNIT- IV **(9 Hrs.)**

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes. Diagnosis of Typhoid, Dengue and HIV, COVID - 19, Hepatitis –B, Syphilis, Swine flu.

UNIT- V **(9 Hrs.)**

Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method. Epidemiological investigations to identify a disease, Problems of drug resistance and drug sensitivity. Drug resistance in bacteria, their mode of transmission and preventive methods.

Co- Curricular Activities

- Assignments on microbial diseases
- Group discussions
- Student presentations and seminars
- Online quizzes

Prescribed Text Books

1. Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
2. 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.
3. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical Medical Microbiology, 14th edition, Elsevier.
4. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2ndedition, Elsevier India Pvt Ltd.
5. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby.

MARIS STELLA COLLEGE (AUTONOMOUS) VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Management of Human Microbial Diseases &Diagnosis - Practical **Course code: 20MBP712MD2**

No. of Hours: 45 Hrs. **LTP: 003** **Credits: 2**

Objectives

- To know about the communicable diseases
- To learn the microscopic examination
- To analyse the antimicrobial activity

Course Outcomes

CO1: Learn the process of specimen collection

CO2: Acquire skills on microscopic examination of clinical samples

CO3: Study different types of parasites

List of Experiments **(30 Hrs.)**

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum). Receipts, Labelling, recording and dispatching clinical specimens.
2. Physical, Chemical & microscopic examination of clinical samples – urine, stool, puss, sputum.
3. Isolation and identification of following pathogens from clinical samples: *E.coli, Salmonella and Pseudomonas.*
4. Demonstration of permanent slides of the following parasites: a). *Entamoeba Histolytica* b). *Ascaris spps. c). Plasmodium spps. d) Mycobacterium tuberculosis* and *Mycobacterium leprae.*
5. Estimation of haemoglobin (Acid haematin and cyan methanoglobin method).

6. Immuno haematology: Blood group typing by slide test & tube for ABO & Rh systems.

7. Isolation of bacteria in pure culture and Antibiotic sensitivity

8. Widal test and VDRL test

Skill/Hands-on: Field work/ Mini project **(15 Hrs.)**

1. Visit to local microbiology laboratories

2. Learning techniques of identification of clinical samples

3. Training students to related subject experts

4. Attending special lectures, group discussions and seminars on related topics

5. Prepare the project work on diagnostic microbiology

Reference Books

1. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical Medical Microbiology, 14th edition, Elsevier.

2. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2ndedition, Elsevier India Pvt Ltd.

3. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Microbial Biotechnology & r – DNA Technology **Course Code: 20MBSEC21MB3**
No. of Hours: 45 **LTP: 300** **Credits: 3**

Objectives

- To learn the importance of nucleic acids
- To understand the gene sequencing methods
- To know the blotting techniques

Course Outcomes

CO1: Enhance the skills on Electrophoresis and Blotting techniques

CO2: Develop skill on methods of gene sequence

CO3: Schematize the process of Construction of genomic and cDNA libraries

CO4: List out different Screening methods

CO5: Discuss the advantages and disadvantages of genetically modified strains.

UNIT – I **(9 Hrs.)**

Introduction to microbial biotechnology, Bacterial genes, genomes and genetics. Recombinant microbial biotechnology products, biotechnology regulation and ethics. Restriction and Modification: Classification of restriction endonucleases. Enzymes used in molecular cloning; Polymerases, ligases, phosphatases, kinases and nucleases; Advanced Molecular biology techniques, Electrophoresis and Blotting techniques.

UNIT - II **(9 Hrs.)**

Cutting and joining DNA: (cohesive end ligation, methods of blunt end ligation). Transfection and transformation. Selection of transformed cells. Screening methods (Genetic marker and blue white screening). Biomass and bio fuels: plant biomass (cellulose, starch, pectin, gum materials). Animal biomass (chitin, milk, whey, slaughter, house waste). Microbial biomass (algal blooms, in fresh and sea water), fungal mushrooms, fermentation waters by yeasts, and bacterial biomass.

UNIT - III **(9 Hrs.)**

Cloning vehicles - Plasmid, Bacteriophage, Construction of genomic and cDNA libraries. Advantages of cDNA libraries. Concept of single cell proteins, probiotics and their applications. Microbial production of fuels: alcohols, hydrogen and methane. Microbial production of polymers: xanthene gums.

UNIT- IV **(9 Hrs.)**

Methods of gene sequencing – Maxam - Gilberts and Sanger's dideoxy chain termination methods; Polymerase chain reaction technique (Components in PCR and PCR conditions). Methods of gene transfer in fungi, yeast and higher plants using microinjection, micro projectile bombardment (gene gun method, Electroporation and Agrobacterium mediated transformation. Expression of cloned genes in bacteria, yeast, plant and animal cells. Basic principles and application of biosensors. Nucleic acid probe technology.

UNIT- V **(9 Hrs.)**

Concept of genetically modified microorganisms. Bt cotton: production, advantages and limitations. Probable advantages and disadvantages of genetically modified crops. Role of microorganisms in creation of transgenic animals and plants.

Co- Curricular Activities

- Assignments on applications of recombinant DNA technology
- Group discussions
- Student presentations and seminars
- Online quizzes

Prescribed Text Books

1. Freielder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi. Freifelder, D. (1997).
2. Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
3. Glick, B.P. and Pasternak, J. (1998). Molecular Biotechnology, ASM Press,Washington D.C., USA.
4. Lewin, B. (2000). Genes VIII. Oxford University Press, England.
5. Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.

Reference Books

1. Sinnott E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 th Edition. McGraw Hill, New York.
2. Smith, J.E. (1996). Biotechnology, Cambridge University Press.
3. Snyder, L. and Champness, W. (1997). Molecular Genetics ofBacteria. ASM press,
4. Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Microbial Biotechnology and r – DNA Technology - Practical **Course Code: 20MBP621MB2**
No. of Hours: 45 Hrs. **LTP: 003** **Credits: 2**

Objectives

- To know about the microbial technology
- To understand the isolation techniques
- To learn the activity of DNAse and RNAse

Course Outcomes

CO1: Acquire skills on PCR techniques

CO2: Learn the Isolation of RNA from yeast

CO3: Develop the skills on blotting techniques

List of Experiments **(30 Hrs.)**

1. Production of wine from Apple and grape
2. Isolation of RNA from yeast cells
3. Demonstration of replica plating technique
4. Southern blotting
5. Western blotting
6. Demonstration of PCR
7. Fermentative production of ethyl alcohol
8. Ligation of DNA molecules and their testing using electrophoresis
9. Activity of DNAase and RNAse on DNA and RNA

Skill/Hands-on: Field work/ Mini project **(15 Hrs.)**

1. Collection of agro waste from different areas for the production of enzymes
2. Learning techniques of isolation of DNA from various sources
3. Training students to related subject experts

4. Attending special lectures, group discussions and seminars on related topics

5. Prepare the project work on blotting techniques

Reference Books

1. Freielder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi. Freifelder, D. (1997).
2. Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
3. Glick, B.P. and Pasternak, J. (1998). Molecular Biotechnology, ASM Press,Washington D.C., USA.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Biostatistics & Bioinformatics **Course Code: 20MBSEC22BB3**
No. of Hours: 45 **LTP: 300** **Credits: 3**

Objectives

- To determine the function of genes and proteins,
- To establish evolutionary relationships, and
- To calculate the three-dimensional shape of proteins by using computer programs.

Course Outcomes

CO1: Summarize nature and scope of bioinformatics.

CO2: Understand various biological data bases.

CO3: Discuss measures of central tendency and distribution.

CO4: Construction of Phylogenetic tree.

CO5: Discussion of Protein3D structure prediction.

UNIT – I **(9 Hrs.)**

Definition, nature and scope of bioinformatics. Bioinformatics versus computational biology. Branches of bioinformatics. Basic concepts in bioinformatics. Introduction to Biological data bases: NCBI, EMBL, EXPASY, PIR, Pfam. Concept of World Wide Web: HTML, HTPP.

UNIT – II **(9 Hrs.)**

Searching sequence data bases using BLAST. Multiple sequence alignment–progressive alignment–profiles–multi dimensional dynamic programming. Biostatistics: Measures of Central tendency and distribution–mean, median, mode, range, standard deviation, variance.

UNIT – III **(9 Hrs.)**

Basic principles of probability theory, Bayes theorem, Normal distribution, statistical inference – Types of errors and levels of significance. Comparison of variance (F-test), small sample test, ttest for comparison of means, chi square test. Analysis of variance– one way and two way, multiple comprises.

UNIT – IV **(9Hrs.)**

Correlation and Linear regression. Sequence Analysis: Introduction to hidden Markov models. Genomics and proteomics: Molecular phylogenetics: Construction of Phytogenetic trees using parsimony method and branch & bound method. Clustering methods– UPGMA & neighbour joining. Fragment assembly, peptide sequencing using mass and spectroscopy data. Comparative genomics.

UNIT – V **(9Hrs.)**

Modelling: Protein secondary structure prediction–Chou Fasman rules– Neural networks– discriminant analysis. Prediction of transmembrane segments in Membrane proteins. Protein3D structure prediction– homology– threading – Potential energy functions–energy minimization– molecular dynamics–simulated annealing.

Co- Curricular Activities

- Assignments on applications of biosafety levels
- Group discussions
- Student presentations and seminars
- Online quizzes

Prescribed Text Books

1. Daniel, 2006, Biostatistics, Eighth Edition. John Wisley and sons.

2. Durbin, Eddy, Krogh, Mithison, Biological sequence analysis.

3. T. A. Attwood and D.J.parry–smith, 2001, Introduction of Bioinformatics.

4. A.D.Baxevaris,1998, Bioinformatics: A practical guide to the analysis of Genes and proteins,(Edited) B. F. Publication.

5. David W, 2005, Bio-informatics; sequence and Genome Analysis, 2nd Edition by Mount CBS publishers.

MARIS STELLA COLLEGE (AUTONOMOUS) VIJAYAWADA – 8
(Affiliated to Krishna University, Machilipatnam)
PRACTICAL SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Biostatistics and Bioinformatics-Practical **Course code: 20MBP722BB2**
No. of Hours: 45 Hrs. **LTP: 003** **Credits: 2**

Objectives

- To know about the bioinformatics and biostatistics tools
- To learn the phylogenetic analysis
- To understand the protein structure

Course Outcomes

CO1: Learn the Isolation of plasmid DNA

CO2: Acquire skills on analysis of proteins

CO3: Summarize the process of Southern hybridization.

List of Experiments **(30 Hrs.)**

1. Isolation of plasmid DNA from E. coli cells
2. Quantitative and qualitative analysis of proteins / DNA by using spectrophotometer
3. Demonstration of Southern hybridization
4. Demonstration of amplification DNA by PCR
5. Use of software for sequence analysis of nucleotides and proteins
6. Problem related to t – test and chi2 test
7. Use of Internet/software for sequence analysis of nucleotides and proteins
8. Studies of public domain data bases for nucleic acid and protein sequences
9. Determination of protein structure (PDB)
10. Demonstration of Genome sequence analysis
11. Problems related to measures of central tendency, dispersion, t-test and chi

Square test

Skill/Hands-on: Field work/ Mini project **(15 Hrs.)**

1. Train the students to identify the tools and techniques in biostatistics
2. Learning techniques in phylogenetic analysis
3. Training students to related subject experts
4. Attending special lectures, group discussions and seminars on related topics
5. Prepare the project work on human genome project

Reference Books

1. Daniel, 2006, Biostatistics, Eighth Edition. John Wisley and sons.
2. Durbin, Eddy, Krogh, Mithison, Biological sequence analysis.
3. T. A. Attwood and D.J.parry–smith, 2001, Introduction of Bioinformatics.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Microbial Quality Control Instrumentation & Techniques **Course Code: 20MBSEC31MI3**
No. of Hours: 45 **LTP: 300** **Credits: 3**

Objectives

- To analyse the Quality Controlling methods
- To study the instrumentation in microbiology laboratory
- To know Techniques for enumeration of microorganisms

Course Outcomes

CO1: Understand different methods involved in assessment of microbial quality control.

CO2: Discuss different types of media used for identification of Disease

CO3: Perform important techniques for enumeration of microbes in different samples.

CO4: Understand and handle different types of Microscopes

CO5: Perform preparative and analytical techniques for separation of components.

UNIT - I **(9 Hrs.)**

Microbial quality control definition, history and introduction. Standard Methods involved in assessment of microbial quality control. Q.A and Q.C definitions and importance. Traditional Microbiological Quality Controlling methods: Sampling methods, TVC, APC and serial dilution techniques. Microbiological criteria. Laboratory facility design for quality control: Sterilization, disinfection and decontamination. Personnel training: Hygiene and handling techniques. Documentation. Good laboratory practices.

UNIT - II **(9 Hrs.)**

Culture media used in QC and QA: Design of specialized media for identification of pathogens. Good laboratory practices in culture media preparation: raw material, water, pH. Uses of media. Selective and indicator media used in pharmaceutical and food industries. Instruments associated in QC and QA: Principle involved, working conditions, uses and precautions of Laminar Air Flow (LAF), Autoclave, Incubator, pH meter, Colony counter, Hot air oven, Centrifuges and storage devices.

UNIT - III **(9 Hrs.)**

Techniques for enumeration of microorganisms: sample preparation from Aqueous, soluble, insoluble, medical and pasteurized materials. Counting methods: pour plate, spread plate, membrane filtration. Most Probable Number (MPN) and MIC. Turbidimetric methods. Staining techniques for identification bacteria and Fungi.

UNIT -IV **(9 Hrs.)**

Microscopy – Principles of light, phase, fluorescent & electron microscopes; Microscopic techniques: Basic principles and applications of phase – contrast microscopy, fluorescent microscopy and electron microscopy, types of electron microscopy– scanning and transmission. Radio isotopes: radiometric analysis, stable and radioactive isotopes, preparation, labelling, detection and measurement of isotope.

UNIT - V **(9 Hrs.)**

Principles of Centrifugation – Centrifugation techniques – preparative and analytical methods, density gradient centrifugation. General principles and applications of chromatography – Paper, Column, Thin layer, Gas, Ion exchange, Affinity chromatography, HPLC, FPLC, GCMS and Gel filtration. Electrophoresis- moving boundary, zone (Paper Gel) electrophoresis. Immuno electrophoresis. Immuno blotting. Isoelectric focusing, 2-Delectrophoresis, Principles of colorimetry

Co- Curricular Activities

- Assignments on applications of biophysical techniques
- Group discussions
- Student presentations and seminars
- Online quizzes

PrescribedTextBooks

1. Hand book of Microbial Quality control by Rosamund. M, Baird Norman. A, Hodges and Stephen. P, Denyer. CRC press.
2. The Microbiological Quality of Food, 1st Edition, Editors: Antonio Bevilacqua Maria Rosaria Corbo Milena Sinigaglia eBook ISBN: 9780081005033 Imprint:Wood head Publishing.

3. Guide to Microbiological Control in Pharmaceuticals and Medical Devices, Second Edition, Stephen P. Denyer, Rosamund M. Baird, CRC Press.
4. Wilson & Walker, Practical Biochemistry: Principles and techniques, Academic publishers.
5. Upadhyay, Upadhyay&Nath, Biophysical Chemistry: Principles and techniques, Himalaya Publishers.

MARISSTELLACOLLEGE(AUTONOMOUS),VIJAYAWADA–8
(AffiliatedtoKrishnaUniversity,Machilipatnam)
SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title:Microbial Quality ControlCourse Code: 20MBP631MI2
Instrumentation& Techniques – Practical
No. of Hours: 45 Hrs. **LTP: 003** **Credits: 2**

Objectives

- To know about the biophysical techniques
- To understand the separation of cell components
- To learn the colorimetric and spectral analysis

Course Outcomes

CO1: Develop the skills on staining techniques

CO2: Learn to estimate the nucleic acids

CO3: Understand the techniques for separation of cell components

List of Experiments **(30 Hrs.)**

1. Isolation and enumeration of bacteria form food / pharmaceutical source.

2. Quality Assurance of water by MPN method.

3. Preparation of any two selective and indicator media commonly used Q.A & Q.C

4. Microbial quality of in and around laboratory conditions.

5. Isolation and Identification of fungi by using selective media and staining procedures.

6. Identification of MIC of any one antibiotic.

7. Colorimetric and spectroscopic estimation of nucleic acids.

8. Microscopic observations of examination of bacteria, fungi and actinomycetes.

9. Separation of cell components by centrifugation technique.

10. Demonstration of immuno electrophoresis.

Skill/Hands-on: Field work/ Mini project **(15 Hrs.)**

1. Visit to nearest industries for the knowledge of microbial instrumentation
2. Learning techniques of estimation of nucleic acids
3. Training students to related subject experts
4. Attending special lectures, group discussions and seminars on related topics
5. Prepare the project work on Spectroscopy and electrophoresis

Reference Books

1. Hand book of Microbial Quality control by Rosamund. M, Baird Norman. A, Hodges and Stephen. P, Denyer. CRC press.
2. The Microbiological Quality of Food, 1st Edition, Editors: Antonio Bevilacqua Maria Rosaria Corbo Milena Sinigaglia eBook ISBN: 9780081005033 Imprint:Wood head Publishing.
3. Guide to Microbiological Control in Pharmaceuticals and Medical Devices, Second Edition, Stephen P. Denyer, Rosamund M. Baird, CRC Press.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
(Affiliated to Krishna University, Machilipatnam)
SYLLABUS

Subject: Microbiology **Semester: V/VI**
Course Title: Drug Design, Discovery & Intellectual Property Rights **Course Code: 20MBSEC32DI3**
No. of Hours: 45 **LTP: 300** **Credits: 3**

Objectives

- To study the Molecular mechanisms of diseases
- To know the traditional vaccine preparations
- To understand Gene therapy and IPR

Course Outcomes

CO1: Discuss molecular mechanism of disease and drug mode of action on organ.

CO2: Understand drug development process.

CO3: Acquire knowledge on preparation of vaccine and genetic disorders

CO4: Explain the importance of biotechnology in research and various industries

CO5: Discuss the importance of IPR in research.

Unit – I **(9 Hrs.)**

Introduction- History of drug design, Current approaches and philosophies in drug design, Molecular mechanisms of diseases and drug action with examples. Pharmaceutical products of microbial origin (antibiotics) animal origin (sex hormones), plant origin (Alkaloids & Morphine). Sources of Drugs- Microbial drugs, Plants as a source of drugs, E. coli as a source of recombinant therapeutic proteins.

Unit – II **(9 Hrs.)**

Expression of recombinant proteins in yeasts, animal cell culture systems. Rational drug design and Combinatorial approaches to drug discovery. Drug development process-Impact of genomics and related technologies upon drug discovery: Gene chips, Proteomics, Structural genomics and Pharmacogenetics. Drug manufacturing process-Guides to good manufacturing practice.

Unit – III **(9 Hrs.)**

Vaccines and adjuvant- Traditional vaccine preparations, Attenuated and inactivated viral and bacterial vaccines, Toxoids. Peptide vaccines. Adjuvant technology. Nucleic acid as drugs- Gene therapy: Basic approach to gene therapy, Vectors used in gene therapy - Manufacture of viral vectors, Non-viral vectors. Gene therapy and genetic disease, cancer, Gene therapy and AIDS. Gene based vaccines.

Unit – IV **(9 Hrs.)**

Introduction: general introduction to IPR (parent, plant breeder's right). Trademarks, industrial design, trade secrets (or) undisclosed information integrated circuit designs. Patenting principle, international – standards and patent validity (neem and relaxins), recent developments in patent system and patentability of biotechnology, invention IPR issues of the Indian context. Copy right and rights related to copy right, International standards as per WHO, ISI, bio safety and validation.

Unit – V **(9 Hrs.)**

Biotechnology and hunger: challenges for the Indian biotechnological research and industries. Bio safety: the Cartagena protocol on bio safety. Bio safety management: key to the environmentally responsible use of biotechnology, ethical implications of biotechnology product techniques, social and ethical implications of biological weapons.

Co- Curricular Activities

- Assignments on applications of intellectual property rights
- Group discussions
- Student presentations and seminars
- Online quizzes

Prescribed Text Books

1. W. B. Hugo & A. D. Russell, Pharmaceutical Microbiology edited, 6thEdition, Black Well science.

2. Shanson D.C., Microbiology in clinical practice, 2ndedition, London; Wright.

3. T Sammes Ellis Horwood, opicsin Antibiotic chemistryVolltoV.

4. Wulf Crueger, Biotechnology – A text book of Industrial Microbiology, 2nd Edition, Panima publishers

5. A.H.Patel, 1984, Industrial Microbiology, Macmilan India Limited.

6. Coulson C.J., London; Taylor and Francis, Molecular mechanisms of drug action.

7. Denyes S.P.& Baird R. M. Chichester, Ellis Horwood, Guide to microbiological Control in Pharmaceuticals.

8. Murray S.Cooper, Quality control in the Pharmaceutical Industry-Edt., Vol-II, Academic press, New York.

9. Sydney H. Willin, Murray M.Tuckerman, William S. Hitchings IV, Good Manufacturing practices of pharmaceuticals, second Edt, Mercel Dekker NC NewYork.

10. Rajesh Bhatia, Rattanlallhhpunjani, Quality assurance in Microbiology, CBS Publisher & Distributors, NewDelhi.

MARIS STELLA COLLEGE (AUTONOMOUS) VIJAYAWADA – 8
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SYLLABUS

Subject: Microbiology **Semester: V/VI**

Course Title: Drug Design, Discovery and Intellectual Property Rights - Practical **Course code: 20MBP732DI2**

No. of Hours: 45 Hrs. **LTP: 003** **Credits: 2**

Objectives

- To know about the drug design and drug action
- To understand the intellectual property rights
- To analyse the patenting material

Course Outcomes

CO1: Learn to isolate the chemical compounds from microbes

CO2: Develop the skill to identify antibacterial activity

CO3: Identify the antagonistic activity of fungi

List of Experiments **(30 Hrs.)**

1. Isolation of antibiotic producing bacteria from soil samples
2. Isolation of drug resistant plasmid from bacteria (E. coli)
3. Isolation of chemical compounds in E. coli
4. Identification of antibacterial activity of actinomycetes.
5. Identification of antibacterial activity of Trichoderma.
6. Identification of antagonistic activity of any two fungal species.
7. Assay of any one antibiotic (Penicillin).
8. Determination of MIC of any one antibiotic (penicillin / streptomycin).
9. Study of components and design of a BSL – III laboratory.
10. Filing applications for approval from bio safety committee.
11. Filing primary applications for patents.
12. Study of steps of patenting process.

Skill/Hands-on: Field work/ Mini project **(15 Hrs.)**

1. Visit to local microbiology laboratories
2. Learning techniques of compound analysis in actinomycetes
3. Training students to related subject experts
4. Attending special lectures, group discussions and seminars on related topics
5. Prepare the project work on Bio safety levels in laboratories

Reference Books

1. Coulson C.J., London; Taylor and Francis, Molecular mechanisms of drug action.
2. Denyes S.P.& Baird R. M. Chichester, Ellis Horwood, Guide to microbiological Control in Pharmaceuticals.
3. Murray S.Cooper, Quality control in the Pharmaceutical Industry-Edt., Vol-II, Academic press, New York.