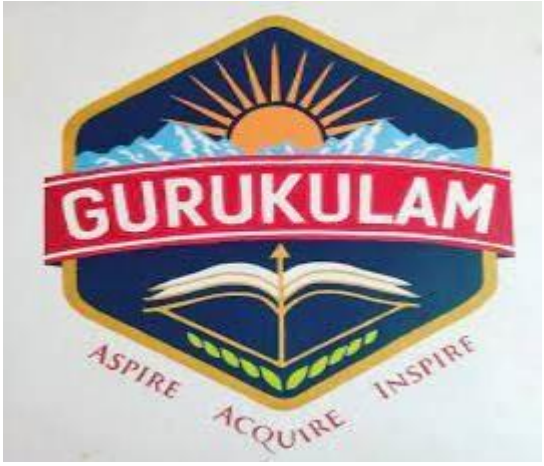
TTWRDC(G) ASIFABAD

(AffiliatedtoKakatiyaUniversity,Warangal)

KUMRAMBHEEM DIST-TELANGANA STATE



DEPARTMENTOFMICROBIOLOGY

SYLLABUS

Syllabus From year 2021 Semester wise

course	papers	Topics	Max Marks
B.ScMB.ZC	IYearISem	Introductorymicrobiology.	20+80=100
	IYearIISem	Microbialphysiology &biochemistry.	20+80=100
	IIYearIII Sem	Medicalmicrobiologyand basicsofimmunlogy.	20+80=100
	IIYearIV Sem	MolecularBiology,microbial Genetics.	20+80=100
	IIIYear V Sem	Industrial&foodmicrobiology.	20+80=100
	IIIYearVI Sem	Environmentalmicrobiology	20+80=100

PROPOSEDSYLLABUS(2019-20)forB.ScMicrobiology

B.ScIyear:ISemesterPaper-I Theory

PaperTitle:IntroductoryMicrobiology

1stCredit:Introduction

Microbiology:Definitionandscope.Historyofmicrobiology:ContributionofAntonyVan Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Iwanoswky, Beijernik, Winogradsky and Alexander Fleming. Microbiological Techniques: Sterilization and Disinfection - Physical methods (dry and moist heat), filtration, radiation. Chemical methods (alcohols, phenols, aldehydes, fumigants)

2ndCredit:MicroscopyandStaining methods

Principles and applications of Microscopy-Bright field, Dark field, Phase-contrast, FluorescentandElectronmicroscopy(SEMandTEM).Ocularandstagemicrometry. Principles and types of stains-Simple stain, Differential stain, Negative stain. Structuralstain:spore,capsule,flagella

3rdCredit:Classification,IsolationandIdentificationof Microorganisms

Classification of living organisms; Haeckel, Whittaker and Carl Woese systems. Differentiationofprokaryotesandeukaryotes.Classificationandidentificationofbacteria as per the second edition of Bergey's manual **of** systematic bacteriology. Classification of protozoa, microalgae and fungi. Growth media - synthetic, semi- synthetic, selective, enrichment and differential media. Isolation of Pure culture techniques - Enrichment culturing, Dilution plating, streak plate, spread plate**,** Micromanipulator. Preservation of Microbial cultures - Sub culturing, overlaying cultures with minerals oils, sand cultures, lyophilization, storage at low temperature.

4thCredit:StructureandGeneralCharacteristics ofMicroorganisms

General characteristics of prokaryotes: Bacteria, Archaea bacteria. Rickettsia,Mycoplasma, Cyanobacteria and Actinomycetes. Ultra structure of bacterial cell: cell wall, cell membrane, ribosomes, nucleoid, capsule, flagella, fimbriae, endospores & storage granules. General characteristics of eukaryotes: protozoa, microalgae and fungi.Generalcharacteristicsandclassificationofvirus.Morphology and structure of lambda bacteriophage (lytic and lysogeny), TMV and HIV.

References:

1. MichaelJ.Pelczar,Jr.E.C.S.Chan,NoelR.KriegMicrobiologyTataMcGraw-Hill Publisher.
2. Prescott,M.J.,Harly,J.P.and KleinMicrobiology5thEdition, WCB McGrawHill, NewYork.
3. Madigan,M.T.,Martinkl,J.MandParker,j.BrochBiologyofMicroorganism,9th Edition, MacMillan Press, England.
4. Dube,R.C.andMaheshwari,D.K.GeneralMicrobiologySChand,New Delhi.

5thCredit:Practicals

I-Semester Practica lPaper-I

Introductory Microbiology

1. Compoundmicroscopeanditshandling.
2. Sterilizationtechniques:Autoclave,Hotairovenandfiltration
3. Calibrationofmicroscopebyocular,stagemicrometerand measurement of bacterialandfungalspores.
4. Simpleanddifferentialstaining(Gramstaining),Sporestaining,capsule staining andflagellarstaining.
5. Microscopicobservationofbacteria(Grampositivebacilliandcocci,Gram negative bacilli), cyanobacteria (Nostoc, Spirulina), fungi (Saccharomyces, Rhizopus, Aspergillus, Penicillium)
6. Bacterialmotility:hangingdropmethod
7. Preparationofculturemedia:Solid/Liquid.
8. Isolationofbacteriabyserialdilutionandpureculturesmethods(streak, spread andpourplatetechniques)
9. Preservationofmicrobialcultures-Slant,Stab,mineraloiloverlayand glycerol stocks
10. Bacterialbiochemicalidentification-IMVICtest,carbohydratefermentation test

References:

1. ExperimentsinMicrobiologyby K.R. Aneja.
2. GopalReddy.M.,Reddy.M.N.,SaiGopal,DVRandMallaiahK.V.Laboratory Experiments in Microbiology.
3. Dubey,R.C.andMaheshwari,D.K.PracticalMicrobiology,S.ChandandCoNew Delhi.
4. Alcamo,I.E.LaboratoryFundamentalsofMicrobiology.JonesandBartlett Publishers,USA.

B.ScIyear:IISemesterPaper-IITheory

Title:MicrobialPhysiologyandBiochemistry

1stCredit:Microbialnutritionand growth

MicrobialNutrition,Uptakeofnutrientsbycell.Nutritionalgroupsofmicroorganisms Autotrophs, Heterotrophs, Mixotrophs, Methylotrophs. Photosynthetic apparatus in prokaryotes.

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Bacterial growth Different phases of growth, factors influencing bacterial growth. Synchronous,Continuous,BiphasicGrowth.Methodsformeasuringmicrobialgrowth Direct Microscopic, Viable count, Turbidometry.

2ndCredit:Microbial metabolism

Bacterialphotosynthesis: Outlineofoxygenicand anoxygenicphotosynthesisin bacteria. Microbialrespiration-Aerobic:Glycolysis,HMPPathway,EDPathway,TCACycleand Anaplerotic reactions, Electron transport, Oxidative and Substrate level phosphorylation. Glyoxylate cycle, Anaerobic respiration (Nitrate and Sulphate).

3rdCredit:Biomolecules

Classification and characteristics of carbohydrates (Monosaccharides, disaccharides and polysaccharides).Generalcharacteristicsofaminoacidsandproteins,fattyacids(saturated and unsaturated) and lipids (sphingo lipids, sterols and phospholipids). Structure of nitrogenous bases, nucleotides and nucleic acids.

PropertiesandClassificationofenzymes.Biocatalysis-InducedfitandLock&Key Model, Coenzymes, Co-factors. Factors effecting enzyme activity.

4thCredit:Biochemical techniques

Hydrogenionconcentrationinbiologicalfluids.pHmeasurement.Typesofbuffersand their uses in biological reactions. Principles and application of colorimetry and chromatography (paper and thin layer). Principles and applications of Electrophoretic techniques- Agarose gel electrophoresis and SDS PAGE

References:

1. MichaelJ.Pelczar,Jr.E.C.S.Chan,NoelR.KriegMicrobiologyTataMcGraw-Hill Publisher.

2. Prescott,M.J.,Harly,J.P.andKleinMicrobiology5thEdition,WCB McGrawHill, **New**York.
3. Madigan,M.T.,Martinkl,J.MandParker,j.BrochBiologyofMicroorganism,9th Edition, MacMillan Press, England.
4. Dube,R.C.andMaheshwari,D.K.GeneralMicrobiologySChand,New Delhi.
5. Voet,DBiochemistry WCB.McGrawHill,Iowa.
6. N.J.Dimmock,A.JEaston,andK.N.Leppard.IntroductiontoModernVirology. Blackwell Publishing.

5thCredit:Practicals

II-SemesterPracticalPaper-II

MicrobialPhysiologyandBiochemistry2HPW-CREDITS-1

1. Setting upofWinogradsky's column
2. Cultivationofphotosyntheticbacteria
3. Determination ofviablecountofbacteria
4. Turbidometricmeasurementofbacterialgrowthcurve
5. Factorsaffectingbacterial growth-pH,temperature,salts
6. Qualitativetests forcarbohydrates andamino acids
7. DeterminationofpH
8. PreparationofBuffers
9. Colorimetry-Principles,laws,determinationofabsorptionmaxima
10. Paperchromatography-separationofsugars/amino acids

References:

1. Experimentsin Microbiology by K.R. Aneja.
2. GopalReddy.M.,Reddy.M.N.,SaiGopal,DVRandMallaiahK.V.Laboratory Experiments in Microbiology.
3. Dubey,R.C.andMaheshwari,D.K.PracticalMicrobiology,S.ChandandCoNew Delhi.
4. Alcamo,I.E.LaboratoryFundamentalsofMicrobiology.JonesandBartlett Publishers,USA.
5. Mahy,B.W.J.andKangro,H.O.Virology-Methods ManualAcademicPress,USA.
6. BurlesonetalVirology-ALaboratoryManual.AcademicPress, USA.

KAKATIYAUNIVERSITY-WARANGAL-TELANGANA
UnderGraduateCourses(UnderCBCS2020–2021onwards) B.Sc.
MICROBIOLOGY II Year
SEMESTER–III

MEDICALMICROBIOLOGY&BASICSOF IMMUNOLOGY (PAPER – III: Discipline Specific Course)

Theory:4Hours/Week;Credits:4Marks:100(Internal:20;External:80)
Practical:3Hours/WeekCredits:1Marks:25

UNIT–I:MEDICALBACTERIOLOGY

1. HistoryofMedical Microbiology.Normalfloraofhuman body.
2. Host pathogen interactions. Bacterial toxins, virulence and attenuation. Antimicrobial resistance. Air-borne diseases –Tuberculosis. Food and water-borne diseases - Cholera,Typhoid.
3. Contactdiseases-Syphilis,Gonorrhoea.Generalaccountofnosocomialinfections.

UNIT–II:MEDICAL VIROLOGYANDPARASITOLOGY

1. Airbornediseases–Influenza.Foodandwater-bornediseases–Poliomyelitis, Amoebiasis.
2. Insect-bornediseases-Malaria,Dengue fever. Zoonoticdiseases–Rabies
3. Viraldiseases-HepatitisB,HIV,SARS,MERS;

UNIT-III:INTRODUCTION OF IMMUNOLOGY

1. History of Immunology, Cells and Organs of the immune system – Primary and Secondarylymphoid organs. Function of B and T lymphocytes. Natural Killer cells, Polymorphonuclear cells.
2. StructureandClassificationofAntigens,Factorsaffectingantigenicity.Antibodies: Basicstructure, Types of properties and functions of immunoglobulins
3. TypesofImmunity:InnateandAcquiredImmunity,Humoralandcell-mediated immuneresponse.

UNIT-IV:IMMUNOLOGICALDISORDERSANDAG-ABREACTIONS

1. Typesofhypersensitivityreactions–Immediateanddelayed.SystemicandLocalized autoimmune disorders. Complement pathways - Classical and Alternative pathways
2. Typesofantigen-antibodyreactions–Agglutinations,Precipitation,Neutralization, Bloodgroups.
3. Complement fixation Test. Labeled antibody based techniques – ELISA, RIA and immunofluorescence;PolyclonalandMonoclonalantibodiesproductionandapplication.

References:

1. AnanthanarayanR.andPanikerC.K.J.(2009)TextbookofMicrobiology.8thedition, University Press Publication
2. BrooksG.F.,CarrollK.C.,ButelJ.S.,MorseS.A.andMietzner,T.A.(2013)Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. GoeringR.,DockrellH.,ZuckermanM.andWakelinD.(2007)Mims'Medical Microbiology. 4th edition. Elsevier
4. WilleyJM,SherwoodLM,andWoolvertonCJ.(2013)Prescott,HarleyandKlein's Microbiology. 9th edition. McGraw Hill Higher Education
5. MadiganMT,MartinkoJM,DunlapPVandClarkDP.(2014).BrockBiologyof Microorganisms. 14th edition. Pearson International Edition.
6. AbbasAK,LichtmanAH,PillaiS.(2007).CellularandMolecularImmunology.6th editionSaunders Publication, Philadelphia.
7. DelvesP,MartinS,BurtonD,RoittIM.(2006).Roitt'sEssentialImmunology.11th editionWiley-Blackwell Scientific Publication, Oxford.
8. GoldsbyRA,KindtTJ,OsborneBA.(2007).Kuby'sImmunology.6theditionW.H. Freeman and Company, New York.
9. MurphyK,TraversP,WalportM.(2008).Janeway'sImmunobiology.7thedition GarlandScience Publishers, New York.
10. PeakmanM,andVerganiD.(2009).BasicandClinicalImmunology.2ndedition ChurchillLivingstone Publishers, Edinberg

KAKATIYAUNIVERSITY-WARANGAL-TELANGANA

UnderGraduateCourses(UnderCBCS2020–2021onwards) B.Sc.

MICROBIOLOGY II Year

SEMESTER–III

MEDICALMICROBIOLOGY&BASICSOFIMMUNOLOGY PRACTICAL(PAPER–III:DisciplineSpecificCourse) Practical: 3 Hours/Week Credits: 1 Marks: 25

1. EnumerationofRBCandWBC
2. Estimation of blood haemoglobin.
3. DeterminationofbloodgroupsandRh typing.
4. Isolationandidentificationofmedicallyimportantbacteriabycultural,microscopic andbiochemical tests.
5. Antibioticsensitivitytesting–discdiffusionmethod.
6. Parasites–Malarialparasite,*Entamoeba*(study ofpermanentslides).
7. Testsfordisinfectant(Phenolcoefficient).
8. Typingof humanblood groups-slideagglutination
9. Estimationofhemoglobin contentofhuman blood
10. Preparationofblood smearanddifferentbloodcellcount
11. RBC count
12. WBCcount
13. DifferentialstainingofWBCbyLeishman'sstain
14. Widal-slideagglutinationtest
15. RPRcardtestforsyphilis
16. Tridottest
17. Tubeflocculationtest

KAKATIYAUNIVERSITY-WARANGAL-TELANGANA
UnderGraduateCourses(UnderCBCS2020–2021onwards) B.Sc.
MICROBIOLOGY II Year
SEMESTER–IV

MOLECULARBIOLGYANDMICROBIALGENETICS
(PAPER – IV: Discipline Specific Course)

Theory:4Hours/Week;Credits:4Marks:100(Internal:20;External:80)
Practical:3Hours/WeekCredits:1Marks:25

UNIT– I

1. Overviewofprokaryoticandeukaryoticcells,cellsizeandshape,Eukaryoticand prokaryoticCell organelles, Cell division (mitosis and Meiosis)
2. Fundamentalsofgenetics-Mendelianlaws,alleles,crossingover,andlinkage.DNA andRNA as genetic materials.
3. StructureofDNA–WatsonandCrickmodel.Extrachromosomalgeneticelements – Plasmids and transposons. Replication of DNA – Semiconservative mechanism.

UNIT– II

1. Briefaccountonhorizontalgenetransferamongbacteria–transformation, transductionand conjugation.
2. Mutations–spontaneousandinduced,basepairchanges,frameshifts,deletions, inversions, tandem duplications, insertions. Physical and chemical mutagens.
3. OutlinesofDNAdamageandrepair mechanisms.

UNIT– III

1. Conceptofgene–Muton,reconandcistron.Onegene-oneenzyme,onegene-one polypeptide, one gene-one product hypotheses.
2. Types of RNA and their functions. Outlines of RNA biosynthesis in prokaryotes.3.Geneticcode.Structureofribosomesandabriefaccountof protein synthesis.

UNIT– IV

1. Typesofgenes–structural,constitutive,regulatory.Operonconcept.Regulationof geneexpression in bacteria – *lac* operon.
2. Basicprinciplesofgeneticengineering-restrictionendonucleases,DNApolymerases andligases, vectors. Outlines of gene cloning methods. Genomic and cDNA libraries.
3. Generalaccountonapplicationofgeneticengineeringinindustry,agricultureand medicine.

References:

1. GenesXI, Author-B Lewin

2. PrinciplesofGenetics, Authors-Gardner,SimmonsandSnustad.
3. ConceptsofGenetics, Authors-Klugand Cummings.
4. MicrobialGenetics,Authors-Freifelder.
5. Genetics,Authors- AroraandSandhu.
6. TextofMicrobiology,Authors-AnanthanarayananandPaniker.
7. SRMaloy,DFreifelderandJECronan.MicrobialGenetics.JonesandBarlett Publishers

KAKATIYAUNIVERSITY-WARANGAL-TELANGANA

UnderGraduateCourses(UnderCBCS2020–2021onwards) B.Sc.

MICROBIOLOGY II Year

SEMESTER–IV

MOLECULARBIOLGYANDMICROBIALGENETICS PRACTICAL

(PAPER–IV:DisciplineSpecificCourse) Practical: 3 Hours/Week Credits: 1 Marks: 25

1. EstimationDNAby diphenylamine(DPA)method.
2. EstimationofRNA byorcinol method
3. Studyofcell divisionin onionroot tip(mitoticdivisions)
4. IsolationofDNAfrombacteria.
5. Isolationofmutantsof bacteriaby UVexposure.
6. Problemsrelatedto Mendilianlawsmono anddihybridcross (problems)
7. Problemsrelatedtogeneinteractions
8. ProblemsrelatedtoDNAandRNAcharacteristics,TranscriptionandTranslation.

KAKATIYAUNIVERSITY

B. Sc (CBCS) Microbiology – III Year

Semester-V–B(DisciplineSpecificElective)

INDUSTRIALANDFOODMICROBIOLOGY

Theorysyllabus

UNIT– I

1. IntroductiontoIndustrialmicrobiology:Briefhistoryanddevelopmentsinindustrial microbiology.
2. Typesoffermentation processes-solidstate,liquidstate,batch,fed-batchandcontinuous.
3. Typesoffermenters–laboratory,pilot-scaleandproductionfermenters.Componentsofa typical continuously stirred tank bioreactor.

UNIT-II

1. Isolationofindustrialstrainsandfermentationmedium:Primaryandsecondaryscreening. Preservation and maintenance of industrial strains.

Ingredientsusedinfermentationmedium-molasses, cornsteepliquor, whey&yeastextract.

2. Microbialfermentationprocesses:Downstreamprocessing-filtration,centrifugation,cell disruption, solvent extraction.

UNIT-III

1. Microbialproductionofindustrialproducts-citricacid,ethanolandpenicillin.
2. Foodasasubstrateformicrobialgrowth:Intrinsicandextrinsicparametersthataffect microbial growth in food.
3. Microbialspoilageof food-milk,egg,breadandcanned foods.

UNIT-IV

1. Principlesandmethodsoffoodpreservationandfoodsanitation:Physicalmethods -high temperature, low temperature, irradiation, aseptic packaging. Chemical methods- salt, sugar, benzoates, citric acid, ethylene oxide, nitrate and nitrite.
2. Dairyproducts,probioticsandFood-borneDiseases:Fermenteddairyproductsyogurt, acidophilus milk, kefir, dahi and cheese.
3. Probioticsdefinition,examplesandbenefits.

Semester-V–B(DisciplineSpecificElective)
INDUSTRIALANDFOODMICROBIOLOGY

Practicalsyllabus

1.Microbialfermentationfortheproductionandestimationofamylase.2.
Microbial fermentation for the production and estimation of citric acid.3.
Microbial fermentation for the production and estimation of ethanol.4.
DeterminationofthemicrobiologicalqualityofmilksamplebyMBRT.5.
Isolation of fungi from spoilt bread/fruits/vegetables.
6.Preparationofyogurt.

References:

7. CruegerWandCruegerA.(2000).Biotechnology:AtextbookofIndustrialMicrobiology. 2ndEdition. Panima Publishing Company, New Delhi.
8. PatelAH.(1996).IndustrialMicrobiology.1stEdition.MacMillanIndiaLimitedPublishing Company Ltd. New Delhi, India.
9. TortoraGJ,FunkeBR,andCaseCL.(2008).Microbiology:Anintroduction.9thEdition. Pearson Education.
10. WilleyJM,SherwoodLMANDWoolvertonCJ(2013),Prescott,HarleyandKlein's Microbiology.9thEdition. McGraw Hill Higher education.
11.Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited
12.StanburyPF,WhitakerAandHallSJ.(2006).PrinciplesofFermentationTechnology.2nd edition, Elsevier Science Ltd.
13. AdamsMRandMoss MO.(1995).Food Microbiology.4thedition, NewAgeInternational (P)LimitedPublishers,NewDelhi,India.
14. BanwartJM.(1987).BasicFoodMicrobiology.1stedition.CBSPublishersand Distributors, Delhi, India.
15. FrazierWCandWesthoffDC.(1992).FoodMicrobiology.3rdedition.TataMcGraw-Hill Publishing Company Ltd, New Delhi, India.
16. JayJM,LoessnerMJandGoldenDA.(2005).ModernFoodMicrobiology.7thedition, CBS Publishers and Distributors, Delhi, India.

KAKATIYA UNIVERSITY

B.Sc(CBCS)Microbiology–II SEMESTER

VI

ENVIRONMENTALMICROBIOLOGY

Theorysyllabus

UNIT-I

1. Aeromicrobiology:Bioaerosols,Airbornemicroorganisms(bacteria,Viruses,fungi).

2. Impactofairbornemicroorganismsonhumanhealthandenvironment.

3. Significanceofairbornemicroorganismsinfoodandpharmaindustriesandoperation theatres, allergens.

UNIT-II

1. Airsamplecollectionandanalysis:Bioaerosolsampling,airsamplers,methodsof analysis, CFU.

2. Culturemediaforbacteriaandfungi,Identification characteristics.

3. Controlmeasures:Fateofbioaerosols,inactivationmechanisms –UVlight,HEPA filters, desiccation, Incineration.

UNIT-III

1. WaterMicrobiology: Waterbornepathogens.

2. Waterbornediseases.

3. Microbiologicalanalysisofwater:SampleCollection,Treatmentandsafetyof drinking (potable) water.

UNIT-IV

Methodstodetectpotabilityofwatersamples:Standardqualitativeprocedure: presumptive test(MPN test), confirmed and completed tests for faecal coliforms

1. MembranefiltertechniqueandPresence/absencetests.

2. Controlmeasures:Precipitation,chemicaldisinfection,filtration,hightemperature, UV light.

References:

1. DaSilvaN,TaniwakiMH,JunqueiraVC,SilveiraN,NascimentoMS,GomesRAR (2012) Microbiological Examination Methods of Food and Water-A Laboratory Manual, CRC Press

2. AtlasRMandBarthaR.(2000).MicrobialEcology:Fundamentals& Applications. 4thedition.Benjamin/CummingsSciencePublishing,USA.

3. MaierRM,PepperILandGerbaCP.(2009).EnvironmentalMicrobiology.2nd edition, Academic Press.

4. HurstCJ,CrawfordRL,GarlandJL,LipsonDA(2007)ManualofEnvironmental Microbiology, 3rd edition, ASM press.

KAKATIYAUNIVERSITY

B.Sc(CBCS)Microbiology–III

SEMESTER – VI

ENVIRONMENTALMICROBIOLOGY

Practical's

1.DeterminationofBiochemicalOxygenDemand(BOD)ofsewage water

2.Determination of Chemical Oxygen Demand (COD) of industrial waste water

3.Bacteriologicalexaminationofwaterusingmultipletubefermentationtest:presumptive test, confirmed test and completed coli form test

4.AnalysisofAir Microflora