

Dept. Microbiology
Govt City College(A), Hyderabad

Proposed scheme for B.Sc Microbiology program under choice based credit system (CBCS)

With effect from 2016-17

Syllabus for B.Sc Microbiology

Code: BS 104, DSC- 1A

B.Sc I year: 1st semester

Title: General Microbiology-I

4HPW -credits-4

UNIT-1: HISTORY OF MICROBIOLOGY

Meaning, definition and scope. History of microbiology: Contribution of Antony Van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert, Koch, Iwanoswky, Beijernik, Winogradsky and Alexander Fleming. Importance and application of Microbiology.

UNIT-2: MICROSCOPY

Principles of Microscopy-Bright field, Dark field, Phase-contrast, Fluorescent and Electron microscopy (SEM and TEM). Ocular and stage micrometry. Size determination of microorganisms. Principles and types of stains-simple stain, differential stain, negative stain. Structural stain-spore, capsule, flagella. Bacterial motility-Hanging drop method.

Unit-3; BIOLOGY OF MICROORGANISMS

Classification of living organisms; Heckel, Whittaker and Carl Woese systems. Place of microorganisms in the living world. Differentiation of prokaryotes and eukaryotes. Prokaryotes—General characteristics of bacteria, Archea bacteria. Rickettsiasis, Mycoplasma, cyanobacteria and Actinomycetes. Classification of bacteria as per the second edition of Bergy's manual of systematic bacteriology

UNIT-4 STRUCTURE OF MICROORGANISMS

Ultra structure of bacteria cell; invariant components-cell wall, cell membrane, Ribosomes, nucleoid. Variant components-Capsule, flagella, fimbriae, endospores & storage granules. General characteristics and classification of virus. Morphology and structure of TMV and HIV. Structure and multiplication of lambda bacteriophage. Eukaryotes- General characteristics and classification. Eukaryotic microorganism- protozoa, microalgae, molds and yeast.

Dept. Microbiology: Osmania University CHOICE BASED CREDIT SYSTEM-2016-

17(CBCS) B.Sc I year –I-semester Practical Syllabus

General Microbiology-I

2HPW-Credits-1

1. Light compound microscope and its handling.
2. Calibration of microscopic measurements(ocular, stage micrometer)
3. Measuring dimensions of microorganisms (Bacteria and fungal spores)
4. Simple and differential staining (Gram staining), Spore staining, capsule staining and negative staining.
5. Microscopic observation of bacteria (Gram positive bacilli and cocci:Gram negative bacilli),cyanobacteria (nostoc,spirulina).
6. Microscopic observation of algae
7. Microscopic observation of fungi (sacharomyces, Rhizopus, Aspergillus, Pencillium, Fusarium)
8. Electron Microscopic pictures of TMV and HIV

Dept. Microbiology: Osmania University

Proposed scheme for B.Sc Microbiology program under choice based credit system (CBCS)

With effect from 2016-17

Syllabus for B.Sc Microbiology

Code: BS 204, DSC-1B

B.Sc I year: 2nd semester

Title: General Microbiology-II

4HPW-creditd-4

UNIT-1-MICROBIOLOGICAL TECHNIQUES

Sterilization and disinfection techniques. Principles and methods of sterilization. Physical methods-Autoclave, Hot air oven, pressure cooker, Laminar air flow, Filter sterilization. Radiation methods-U.V rays, Gamma rays, Ultrasonic methods. Chemical methods-use of Alcohols, Aldehydes, Fumigants, Phenol, Halogens and Hypochlorides, Phenol coefficient.

UNIT-2-PURE CULTURE TECHNIQUES

Isolation of Pure cultural techniques- Enrichment culturing, Dilution plating, streak plate, spread plate, Micromanipulator. Preservation of Microbial cultures – Sub culturing, overlaying cultures with minerals oils, lyophilization, sand cultures, storage at low temperature

UNIT-3 BIOMOLECULES

Outline classification and general characteristics of carbohydrate (Monosaccharides, disaccharides and polysaccharides). General characteristics of Amino acids and proteins, Fatty acids(saturated and unsaturated) and lipids (sphingo lipids,sterols and phospholipids). Structure of nitrogenous bases, nucleotides and nucleic acids.

UNIT-4 BIOCHEMICAL TECHNIQUES

Hydrgen ion concentration in biological fluids. PH measurement. Types of buffers and their uses in biological reactions. Principles and application of colorimetry and chromatography (paper and thin layer). Principles and applications of Electrophoretic techniques.

CHOICE BASED CREDIT SYSTEM (CBCS)-2016-17 B.Sc I year –II-semester Practical

Syllabus GENERAL MICROBIOLOGY-II

2 HPW - CREDITS-1

1. Preparation of culture media: Solid/Liquid.
2. Sterilization techniques: Autoclave, Hot air oven and filtration.
3. Enumeration of bacterial numbers by serial dilution and plating.
4. Isolation of pure cultures by streak, spread and pour plate techniques
5. Preservation of microbial cultures- Slant, Stab, Sand cultures, mineral oil overlay and glycerol stocks
6. Qualitative tests for carbohydrates and amino acids
7. Paper chromatography-separation of sugars/amino acids
8. Determination of pH
9. Preparation of Buffers
10. Colorimetry- Principles, laws, determination of absorption maximum.

SKILL ENHANCEMENT COURSE-I (SEC-I)

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With effect from 2016-17

Syllabus for B.Sc Microbiology

Code: BS 301, SEC-1

B.Sc II year: 3rd semester

Title: HAEMATOLOGY

2 HPW-credits-2

Unit-I:

Composition of blood (RBC, WBC, Plasma, Serum, Platelet cells), Staining of blood films. Total blood picture, Differential count. Blood grouping, Rh-typing, Blood hemoglobin. Anti-coagulants.

Unit-II

Blood transfusion (Principles). Blood preservation. Precautions of handling blood and it's products. Hemophilia. Anaemia. General account on spread of diseases through blood and blood products. ESR.

Dept. Microbiology , Osmania University
Proposed scheme for B.Sc Microbiology program under choice based credit system (CBCS)
With effect from 2016-17

Syllabus for B.Sc Microbiology

Code: BS 304, DSC-1C

B.Sc II year: 3rd Semester

Title: Microbial Physiology and Enzymology

4 HPW-credits-4

UNIT-1: MICROBIAL NUTRITION AND PHOTOSYNTHESIS -

Microbial Nutrition – Nutritional Requirement, Uptake of nutrients by cell. Nutritional group of microorganism – Autotrophs , Heterotrophs , Mixotrophs , Methylophiles. Photosynthetic Apparatus in Prokaryotes. Outline of oxygenic and Anoxygenic photosynthesis in bacteria.

UNIT-2: MICROBIAL GROWTH -

Growth media – Synthetic , Non Synthetic , Selective , Enrichment and Differential media. Microbial growth – Different Phases of Growth in Batch culture. Factors Influencing microbial growth.

Synchronous, Continuous , Biphasic Growth. Methods for measuring microbial growth – Direct Microscopic , Viable count , Turbidometry , Biomass

UNIT-3- MICROBIAL METBOLISM-

Aerobic : Respiration – Glycolysis , HMP Pathway , ED Pathway , TCA Cycle and Anaplerotic reaction, Electron Transport , Oxidative and substrate level phosphorylation.

β -Oxidation of Fatty acids. Glyoxylate cycle , Anaerobic respiration (Nitrate , Sulphate respiration)

Fermentation – Common Microbial fermentation with special reference alcohol and lactic acid fermentation.

UNIT-4-ENZYMES-

Properties and Classifications of Enzymes , Enzymes unit. Biocatalysis – Induced fit and Lock & Key Model , Coenzymes , Co-Factors. Factors effecting catalytic reaction activity of enzymes. Inhibition of Enzymes activity – Competitive non Competitive , Un competitive and Allosteric

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Proposed scheme for B.Sc Microbiology program under choice based credit system (CBCS)

With effect from 2016-17

II Year B.Sc III SEMESTER MICROBIOLOGY -2016-17

Title: MICROBIAL PHYSIOLOGY & ENZYMOLOGY

Practical syllabus

2HPW- credits-1

1. Preparation of media for culturing autotrophic and heterotrophic microorganisms – algal medium, mineral salts medium , nutrient agar medium, McConkey agar and Blood agar.
2. Setting and observation of Winogradsky column.
3. Methods of pure culture isolation
4. Enrichment culturing and isolation of phototrophs and chemoautotrophs.
5. Determination of viable count of bacteria.
6. Turbidometric measurement of bacterial growth.
7. Factors affecting bacterial growth – pH, temperature, salts.
8. Starch hydrolysis, Catalase test and sugar fermentation test

Dept. Microbiology: Osmania University

Proposed scheme for B.Sc Microbiology program under choice based credit system (CBCS)

With effect from 2016-17

Syllabus for B.Sc Microbiology

Code: BS 404, DSC-ID

B.Sc II year: 4th semester

Title: Microbial Genetics and Molecular Biology

4 HPW-credits-4

UNIT-1 : MICROBIAL GENETICS

Fundamentals of Genetics – Mendellin laws , Alleles , Crossing over and Linkage
DNA and RNA as Genetic material
Structure of DNA – Watson and Crick model
Extra Chromosomal genetic elements – Plasmids and Transposons
Replication of DNA- Semi Conservative mechanism

UNIT-2: MUTATIONS

Mutations – Spontaneous and induced , Base pair changes , Frameshift , Deletion , Inversion ,
Tandem duplication , Insertion
Various physical and chemical mutagens
Outline of DNA Damage and repair mechanism
Brief account on gene transfer among bacteria – Transformation , Transduction and Conjugation

UNIT-3-GENE EXPRESSION

Concept of gene – Muton , Recon and Cistron.
One gene – One enzyme , One gene – One Poly peptide , One gene – One product
hypothesis Types of RNA and their function
Outline of RNA Biosynthesis in Prokaryotes
Genetic Code , Structure of Ribosomes and Brief account on Protein synthesis
Type of Genes – Structural , Constitutive , Regulatory
Operon Concept. Regulation of Genes expression in bacteria – Lac Operon

UNIT-4-RECOMBINANT DNA TECHNOLOGY

Basic principles of genetic engineering –Restriction endonucleases ,
DNA polymerases and Ligases, vectors
Outline of gene cloning methods.
Genomic and c DNA libraries
General account on application of genetic engineering in industry , agriculture and medicine.

**II Year B.Sc IV SEMESTER; MICROBIOLOGY -2016-17
CHOICE BASED CREDIT SYSTEM (CBCS)**

Microbial Genetics and Molecular biology

Practical syllabus

2 HPW-Credits-1

1. Colorimetric estimation of proteins by Biuret / Lowery method.
2. Colorimetric estimation of DNA by Diphenyl amine method.
3. Colorimetric estimation of RNA by Orcinol method
4. Extraction of genomic DNA.
5. Agarosegel Electrophoresis
6. Problems related to DNA and RNA characteristics, Transcription and Translation

SKILL ENHANCEMENT COURSE-II (SEC-2)

Dept.of Microbiology: Osmania University

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With effect from 2016-17

Syllabus for B.Sc Microbiology

Code: BS 401, SEC-2

B.Sc II year: 4th semester

Title: FOOD ADULTERATION

2 HPW-credits-2

Unit-I

Definition and Introduction to food adulteration.

Types of Food Adulteration

Common Food adulterants

Causes of Food adulteration

Analysis of food

Unit-II

Effects of Food Adulteration

Prevention of Food adulteration

Detection of Common food Adulterants.

Food Adulteration act-1954

GOVT. CITY COLLEGE (Autonomous), Hyderabad

B.Sc – III yr (2016-2017) onwards
Microbiology V- Semester ,MODULE-V(CORE)
Immunology & Computer Applications

UNIT-I (15h)

1. Basics of Microsoft Office (2h)
2. Internet and usage (1h)
3. Vaccine production- Bacterial vaccines, Viral vaccines (3h)
4. Interferons- Properties, modes of action, Production technique, base analogue.(3h)
5. History of Immunology (2h)
6. Types of Immunity – Innate and acquired; active and passive, humoral and cell mediated Immunity (4h)

UNIT-II (16h)

1. Primary and secondary organs of immune system – Thymus, bursa fabricus, bonemarrow, spleen and lymph nodes. (4h)
2. Cells of Immune system – B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils & eosinophils. (5h)
3. Antigens – Types, chemical nature, antigenic determinants, haptens, factors affecting antigenicity. (2h)
4. Antibodies – Basic structure, types, properties and functions of immunoglobulins. (3h)
5. MHC complex – class I and class II.(2h)

UNIT-III (14h)

1. Types of Antigen- antibody reactions – Agglutination, Blood groups, Precipitation, Neutralization, Complement fixation. (4h)
2. Labelled antibody based techniques- ELISA, RIA, and immunofluorescence. (2h)
3. Polyclonal and monoclonal antibodies production and applications.(2h)
4. Types of hypersensitivity. (2h)
5. Autoimmunity and its significance. (2h)
6. Components of complement & activation of complement. (2h)

GOVERNMENT. CITY COLLEGE (Autonomous), Hyderabad
B.Sc – III Year –PaperV- Immunology& Computer Applications(Core)
Practical Syllabus (45h)

1. Blood tests - TC, DC and ESR.
2. Estimation of blood hemoglobin.
3. Determination of blood groups and Rh typing.
4. Antigen – Antibody interactions in Widal test, VDRL test, and Precipitation – Ouchterlony double diffusion test.
5. Pregnancy testing .
6. Tests for disinfectant (Phenol coefficient).

GOVERNMENT. CITY COLLEGE, HYDERABAD (AUTONOMOUS)
B.Sc III Year (2016-2017) Microbiology
V Semester- MODULE V-Advanced Elective I
Environmental Microbiology

UNIT-I (15h)

1. Microorganisms of environment (soil, water and air). (5h)
2. Microorganisms in relation to plant growth-Rhizosphere, Phyllosphere. (5h)
3. Outlines of biological nitrogen fixation (symbiotic & nonsymbiotic) (5h)

UNIT-II (15h)

1. Role of microorganisms in nutrient cycling (carbon, nitrogen, phosphorous). (5h)
2. Microbial interactions – mutualism, commensalism, antagonism, competition, parasitism, predation. (5h)
3. Microbiology of air and air sampling methods(5h)

UNIT-III (15h)

1. Microbiology of potable and polluted waters, Sanitation of potable water. (5h)
2. Sewage treatment (Primary, Secondary and tertiary). (5h)
3. Solid waste Disposal- Sanitary land fills, Composting. (5h)

GOVERNMENT. CITY COLLEGE (Autonomous), Hyderabad
B.Sc – III Year
Advanced Elective I- Environmental Microbiology

Practical Syllabus (30h)

1. Isolation and identification of rhizosphere .
2. Isolation and identification of phyllosphere.
3. Isolation of microorganisms from air by petriplate exposure method.
4. Determination of BOD of water .
5. Microbial testing of water by coliform test (MPN).

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**B.Sc – III yr (2016-2017) onwards
Microbiology VI- Semester ,MODULE-VI
Medical Microbiology**

UNIT-I (15h)

1. History of medical microbiology. (2h)
2. Normal flora of human body. (3h)
3. Definition of infection, Nonspecific defense mechanisms(mechanical barriers, antagonism of indigenous flora, antibacterial substances, antiviral substances). (5h)
4. Bacterial toxins, virulence and attenuation. (3h)
5. General account of Nosocomial infections. (2h)

UNIT-II (15h)

1. General account of the following diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control. Air borne diseases – Tuberculosis, Influenza.(3h)
2. Food and water borne diseases – Cholera, Typhoid. (3h)
3. Insect borne diseases – Malaria, Dengue. (3h)
4. Contact diseases – Syphilis, Gonorrhoea, AIDS. (3h)
5. Zoonotic diseases – Rabies, Anthrax. (3h)

UNIT-III (15h)

1. General principles of diagnostic microbiology – collection, transport, and processing of clinical samples. (3h)
2. General methods of laboratory diagnosis – Cultural , biochemical, serological, and molecular methods. (5h)
3. Elements of Chemotherapy-Therapeutic drugs- Mode of action of Penicillin and Sulpha drugs and their clinical use. (4h)
4. Drug resistance. Tests for antimicrobial susceptibility. (3h)

B.Sc. III year Microbiology
Paper -VI Medical Microbiology

Practical Syllabus (45h)

1. Acid fast staining of *Mycobacterium* (stained/permanent slides).
2. Isolation and Identification of medically important bacteria (*E.coli*, *Klebsiella*, *Pseudomonas*, *Staphylococcus*, and *streptococcus*) by cultural, microscopic, and biochemical tests.
3. Isolation of Antibiotic resistant microorganisms.
4. C-reactive protein.
5. Parasites-Malarial parasite, Entamoeba (Study of permanent slides)

GOVERNMENT. CITY COLLEGE, HYDERABAD (AUTONOMOUS)
B.Sc III Year (2016-2017)
Microbiology VI Semester- MODULE VI-Applied Elective I
Food Microbiology

UNIT-I (15h)

1. Microorganisms of food spoilage and their sources. (3h)
2. Spoilage of different food materials(fruits, vegetables, meat, fish, canned foods). (4h)
3. Food intoxication (Botulism & staph. Poisoning) and their detection. (4h)
4. Food borne diseases (Salmonellosis and Shigellosis) and their detection. (4h)

UNIT-II (15h)

1. General account of food preservation. (5h)
2. Microorganisms as food (SCP, Mushrooms). (5h)
3. Microbiological production of fermented foods (bread, cheese, yogurt, idly, pickles). (5h)

UNIT-III (15h)

1. Probiotics –Defintion, mode of action, significance of probiotic foods. (5h)
2. Screening and isolation of industrially useful microbes – Primary and Secondary screening. (5h)
3. Strain improvement – mutation selection, recombination, genetic engineering (5h)

GOVERNMENT. CITY COLLEGE (Autonomous), Hyderabad
B.Sc – III Year –Paper Applied Elective I- Food Microbiology

Practical Syllabus (30h)

1. Observation of different spoiled foods.
2. Isolation of fungi and bacteria from spoiled fruits and vegetables.
3. Isolation of antagonistic microorganisms by crowded plate technique.
4. Determination of microbiological quality of milk by MBRT.
5. Estimation of ascorbic acid from fruit juices.