

MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Medical microbiology-5

Unit: I

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
History of medical microbiology	1
General principles of Diagnostic microbiology	1
Collection of Clinical samples	1
Transport of clinical samples	1
Processing of clinical samples	1
General methods of laboratory Diagnosis	1
Cultural methods	1
Biochemical methods	1
Serological methods	1
Molecular methods	1
Normal flora of human body	2
Properties of pathogenic Microorganisms	1

Name of the Teacher: A.Chetana

Head, Department of Microbiology

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester I)

Class :B.Sc I Year

Section: Mb.G.C

Course/Paper: General Microbiology-1

Unit: I

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Scope and Importance of Microbiology.	2
Different branches of Microbiology	2
Importance of Microorganisms in human welfare	2
Spontaneous generation – biogenesis theory germ theory of diseases	2
Development of microbiology in 20 th century.	2
Important contributions of Leeuwenhoek, Louis Pasteur.	1
Robertkoch, Edward Jenner, Iwanowsky.	2
Beizerinck, Winogradsky to microbiology.	2

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester I)

Class : B.Sc I Year
Mb.G.C

Section:

Course/Paper: General Microbiology-1

Unit: II

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Principles of microscopy-bright field, fluorescent	2
Dark field , Phase contrast	2
Electron microscopy (SEM & TEM)	2
Microbial staining- simple, differential.	2
Negative, Spore and Acid fast staining techniques	2
Sterilization methods- Physical methods	1
Autoclaving, hot air oven, filtration, Radiation	2
Chemical methods	2

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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester I)

Class : B.Sc I Year

Section: Mb.G.C

Course/Paper: General Microbiology-1

Unit: III

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Morphology of bacterial cell	2
UltraStructure of bacterial cell	2
Gram positive bacterial cell	2
Gram negative bacterial cell	2
Structures outside cell membrane	2
Capsule, Flagella	1
Pili, cell wall & cell membrane	1
Components within cell membrane	1
Nucleoid, cytoplasm	1
Ribosomes, Mesosomes, cytoskeleton	1

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester I)

Class : B.Sc I Year

Section: Mb.G.C

Course/Paper: General Microbiology-1

Unit: IV

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Characterization of microorganisms	1
Morphology, Cultural characters	2
Biochemical, Metabolic, Antigenic characters	1
Molecular, Pathogenic, ecological characters	1
FAMS Membrane fatty acids	1
Outlines of bacterial classification	1
Bergeys manual of Systematic Bacteriology	1
Important characters of special groups of bacteria	1
Mycoplasma	1
Rickettsiae	1
Chlamydiae	1
Actinomyces	1
Cyanobacteria	1
Archaea bacteria	1

Name of the Teacher: Dr.Chand Pasha
Department of
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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class: B. Sc I Year

Section: Microbiology

Course/Paper: II- Microbial Biochemistry and Metabolism

Unit I: Biochemistry of Biomolecules

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Biomolecules of Microorganisms	1
General Characteristics of Carbohydrates	2
Monosaccharides	1
Disaccharides	1
Polysaccharides	1
General Characteristics of Amino acids	2
General Characteristics of Proteins	1
General Characteristics of Fatty acids (saturated)	1
General Characteristics of Fatty acids (Un-saturated)	1
General Characteristics of Lipids	1
Sphingo Lipids, Sterols, Phospholipids	1
Structure of peptidoglycan	1
Synthesis of peptidoglycan	1
	15hrs

Name of the Teacher: Dr. Shaik Naseeruddin

Head, Department of Microbiology

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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class: B. Sc I Year

Section: Microbiology

Course/Paper: II- Microbial Biochemistry and Metabolism

Unit II: Biochemistry of Metabolism

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Hydrogen ion concentration in biological fluids	2
pH measurement	1
Types of buffer	1
Uses of buffer in biological reactions	1
Enzymes Introduction, enzyme unit	1
Enzymes properties and classification	2
Biocatalysis – Induced fit model	1
Biocatalysis – lock and key model	1
co –enzymes and co factors	1
Inhibition of enzyme activity – competitive	1
Inhibition of enzyme activity – non-competitive	1
Inhibition of enzyme activity – un-competitive	1
Inhibition of enzyme activity – allosteric inhibition	1
	15hrs

Name of the Teacher: Dr. Shaik Naseeruddin

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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class : B.Sc I Year

Section: Mb.G.C

Course/Paper: Microbial Biochemistry & Metabolism-2

Unit: III

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Nutritional types of bacteria	2
Photoautotrophs	1
Chemoautotrophs	2
Chemoheterotrophs	2
Acetogens	2
Methanogens	1
Microbial Culture media	1
Types of Media-Natural, Semisynthetic media	1
Synthetic media, Selective media	1
Differential media, Enrichment media and Transport media	1
Bacterial photosynthesis	1

Name of the Teacher: A. chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class :B.Sc

Section: Mb.G.C

Course/Paper: Microbial Biochemistry & Metabolism-2

Unit: IV

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Bacterial Growth	2
Growth curve- Lag, Log/Exponential, Stationary and Death Phases	1
Factors affecting bacterial Growth	2
Continous Growth	2
Synchronous Growth	2
Measurement of Bacterial Growth	1
Sporulation in bacteria	1
Isolation of Pure cultures	1
Maintainance of pure cultures	2
Preservation of Microbial Cultures	1
	15 hrs

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester III)

Class : B.Sc II Year

Section: Mb.G.C

Course/Paper: Virology and Immunology-3

Unit: I

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Discovery of viruses	2
Nature of viruses.	1
Biological, physical and Biochemical properties of viruses	2
Nomenclature of viruses	2
Classification of viruses as per ICTV	2
Cultivation and assay of bacteriophages, plant and animal viruses	1
General methods of viral replication	1
Lytic cycle	1
Lysogenic cycle	1
Morphology, Structure and multiplication of TMV	1
Structure and multiplication of HIV	1
	15 hrs

Name of the Teacher: A. Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class : B.sc II Year

Section: Mb.G.C

Course/Paper: Virology and Immunology-3

Unit: II

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
History of Immunology.	2
Development of Immunology	2
Types of Immunity-Innate Immunity	2
Aquired Immunity	2
Active and Passive Immunity	2
Humoral and cell mediated Immunity	2
Primary organs of Immune system-Thymus, Bone marrow etc.	1
Secondary organs of Immune system- Lymph nodes, Spleen etc.	2

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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class : B.Sc II Year

Section: Mb.G.C

Course/Paper: Virology and Immunology-3

Unit: III

No. of Hours Allotted:15

Topics to be covered	No. of Hours
Cells of Immune system	1
B and T Lymphocytes	1
Null cells, Monocytes, Macrophages	2
Neutrophils, Basophils and Eosinophils.	1
Antigens-Types	2
Chemical nature of antigens	1
Antigenic Determinants, Haptens	1
Factors affecting antigenicity	2
Antibodies	1
Basic structure of antibodies	1
Types and properties of antibodies	1
Functions of Immunoglobulins	1

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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class :B.Sc II year

Section: Mb.G.C

Course/Paper: Virology and Immunology-3

Unit: IV

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Types of antigen antibody reactions-Introduction	1
Agglutination	1
Blood Groups	1
Precipitation	1
Neutarlization	1
Complement fixation	1
Labelled antibody based techniques- ELISA	1
RIA	1
Immunofluorescence	1
Types of Hypersensitivity	1
Autoimmunity and its significance	1
Preventive control of Diseases	1
Active and Passive Immunization	1
Vaccines	1
Natural vaccines & Recombinant vaccines	1

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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class : B.Sc II year

Section: Mb.G.C

Course/Paper: Food and Agricultural microbiology-4

Unit: I

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Microorganisms of food spoilage and their sources	1
Spoilage of different food materials	1
Spoilage of different food materials-Fruits and vegetables	1
Spoilage of different food materials-Meat, fish	1
Spoilage of different food materials-Canned foods	1
Food intoxication-Botulinum	2
Food intoxication-Staphylococcal food poisoning	2
Food borne Diseases- Salmonellosis	2
Food borne Diseases-Shigellosis	2
Food borne Diseases- Salmonellosis-Development and its Detection	1
Food borne Diseases-Shigellosis- Development and its Detection	1

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester II)

Class : B.Sc II year

Section: Mb.G.C

Course/Paper: Food and Agricultural microbiology-4

Unit: II

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
General account of food preservation	1
Different methods of food preservation	3
Microbiological production of food and dairy products	2
Microbiological production of food and dairy products-Bread	2
Microbiological production of food and dairy products-cheese	1
Microbiological production of food and dairy products-Yoghurt	1
Concept of Probiotics	2
Microbial flora of milk	1
Microbial flora of milk products	1
Pasteurization of milk	1

Name of the Teacher: A.Chetana
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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester IV)

Class: B. Sc II Year

Section: Microbiology

Course/Paper: IV- Food and Agricultural Microbiology

Unit III: Environmental Microbiology

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Microbiology of potable water	1
Microbiology of polluted water	1
Sanitary quality of potable water	1
Primary Sewage treatment	1
Secondary Sewage treatment	1
Tertiary Sewage treatment	1
Microorganisms of environment – Soil	2
Microorganisms of environment – water	2
Microorganisms of environment – Air	2
Microbial Decomposition of Organic matter	1
Carbon cycle	1
Nitrogen cycle	1
	15 hrs

Name of the Teacher: Dr. Shaik Naseeruddin

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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester IV)

Class: B. Sc II Year

Section: Microbiology

Course/Paper: IV- Food and Agricultural Microbiology

Unit IV: Environmental Microbiology

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Microorganisms in relation to plant growth	1
Rhizosphere	1
Phyllosphere	1
Plant Growth promoting microorganisms	1
Nitrogen fixation	1
Symbiotic nitrogen fixation	2
Non- Symbiotic nitrogen fixation	2
Biofertilizers	2
Biological control of plant diseases	2
Biopesticides	2
	15 hrs

Name of the Teacher: Dr. Shaik Naseeruddin

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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Medical microbiology-5

Unit: I

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
History of medical microbiology	1
General principles of Diagnostic microbiology	1
Collection of Clinical samples	1
Transport of clinical samples	1
Processing of clinical samples	1
General methods of laboratory Diagnosis	1
Cultural methods	1
Biochemical methods	1
Serological methods	1
Molecular methods	1
Normal flora of human body	2
Properties of pathogenic Microorganisms	1

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Medical microbiology-5

Unit: II

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
Definition of Infection	1
Types of Infection	1
Non-specific defense mechanism	1
Mechanical barriers	1
Antagonism of indigenous flora	1
Anti-bacterial substances	1
Anti-bacterial substances-Lysozyme	1
Anti-bacterial substances-Complement	1
Anti-bacterial substances-properdin	1
Antiviral substances	1
Antiviral substances-Interferons	1
Antiviral substances-Base analogues	1
Phagocytosis	1

Name of the Teacher: A.Chetana

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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Medical microbiology-5

Unit: III

No. of Hours Allotted:11

Topics to be covered	No. of Hours
Bacterial Toxins	1
Virulence	1
Attenuation	1
Air borne diseases	1
Air borne diseases – Tuberculosis	1
Air borne diseases – Influenza	1
Food and water borne diseases – Cholera	2
Food and water borne diseases – Typhoid	1
Food and water borne diseases – Amoebiasis	2

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Medical microbiology-5

Unit: IV

No. of Hours Allotted: 10

Topics to be covered	No. of Hours
Insect borne diseases – Malaria	1
Insect borne diseases – Dengue fever	1
Contact diseases- Syphilis	2
Zoonotic Diseases- Rabies	2
Zoonotic Diseases- Anthrax	1
Blood borne Diseases- Serum Hepatitis	2
Blood borne Diseases- AIDS	1

Name of the Teacher: A.Chetana
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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: Recombinant DNA technology

Unit I:

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
Techniques & enzymes in rDNA technology	1
Restriction digestion	1
Ligation	1
Transformation	1
Restriction endonucleases	1
DNA ligases	1
Properties & Specificity	1
S1 nuclease	1
DNA polymerase	1
Polynucleotide kinase	1
Phosphatase	1
Reverse transcriptase	1
	12 hrs

Name of the Teacher: Dr. Chand Pasha
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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: Recombinant DNA technology

Unit II:

No. of Hours Allotted: 11

Topics to be covered	No. of Hours
Plasmids	1
Plasmids Incompatibility	1
Isolation & purification	2
Plasmid vectors	1
PBR 322	1
Single stranded plasmids	1
Cosmids	1
Phagmids	1
Lambda vectors	1
M13 vectors	1
	11 hrs

Name of the Teacher: Dr. Chand Pasha

Head, Department of Microbiology

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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester V)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: Recombinant DNA technology

Unit III:

No. of Hours Allotted: 10

Topics to be covered	No. of Hours
Specialized cloning strategies	2
Expression vectors	1
Library construction vectors	1
DNA libraries	1
cDNA libraries	1
Shot gun cloning	1
Directed cloning	1
Phage display	1
Chromosomal integration	1
	10 hrs

Name of the Teacher: Dr.Chand Pasha

Head, Department of Microbiology

Signature:

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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester IV)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: Microbiology

Unit IV:

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
PCR methods	1
Applications of PCR	1
Normal PCR	1
Gradient PCR	1
Reverse Transcriptase PCR	1
Electrophoresis	1
SDS	1
PAGE	1
Agarose gel electrophoresis	1
Chromatography	1
Paper chromatography, TLC	1
Centrifugation methods	1

Name of the Teacher: Dr. Chand Pasha

Head, Department of Microbiology

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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Pharmaceutical microbiology-7

Unit: I

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
Types of microorganisms in Pharmaceutical products	1
Types of microorganisms in Pharmaceutical products and industry	2
Microbiological spoilage	1
Microbiological spoilage prevention of pharmaceutical products	2
Antimicrobial agents	2
Antimicrobial agents used as preservatives	2
Evaluation of Microbial stability of formulation	2

12 hrs

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY
LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Pharmaceutical microbiology-7

Unit: II

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
Antimicrobial agents- Bacteriostatic agents	1
Antimicrobial agents- Bactericidal agents	1
Factors affecting antimicrobial activity	1
Non medicinal antimicrobial agents	1
Non medicinal antimicrobial agents- sanitizers	1
Disinfectants, antiseptics	1
Antimicrobial action of phenols, Phenolic compounds, Alcohols, Halogens, Heavy metals	1
Dyes, aldehydes, Detergents	1
Medicinal antimicrobial agents	1
History of Chemotherapy –Paul Ehrlich and his contributions	1
Selective toxicity	1
Target sites of drug action in microbes	1

12 hrs

Name of the Teacher: A.Chetana
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NIZAM COLLEGE : DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class : B.Sc III Year

Section: Mb.G.C

Course/Paper: Pharmaceutical microbiology-7

Unit: III

No. of Hours Allotted:11

Topics to be covered	No. of Hours
Antibiotics- Origin, development and definition	1
Mode of action of important drugs	1
Cell wall inhibitors	1
Cell membrane inhibitors	1
Macromolecular synthesis inhibitors	1
Metabolite analogues	2
Antifungal antibiotics	2
Anti viral agents	2

11 hrs

Name of the Teacher: A.Chetana
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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class : B.Sc

Section: Mb.G.C

Course/Paper: Pharmaceutical microbiology-7

Unit: IV

No. of Hours Allotted: 12

Topics to be covered	No. of Hours
Microbiological assays	1
Assay for growth inhibiting substances	1
Assay for non medicinal antimicrobials	1
Drug sensitivity testing methods	1
Assay for antibiotics	1
Determination of MIC	1
Liquid, solid tube agar assay	1
Agar plate assay	1
Drug Resistance	1
Clinical basis of drug Resistance	1
Biochemistry of drug Resistance	1
Genetics of Drug Resistance in bacteria	1
	12 hrs

Name of the Teacher: A.Chetana
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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: VIII- Industrial Microbiology

Unit I: History of Industrial Microbiology

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Introduction to industrial microbiology	1
History of industrial Microbiology	2
Scope of industrial Microbiology	2
Microorganisms of industrial importance	1
Microorganisms of industrial importance – Bacteria	2
Microorganisms of industrial importance – Actinomycetes	2
Microorganisms of industrial importance – Yeasts	2
Microorganisms of industrial importance – Moulds	2
Exploitation of Microorganisms in industry	1
	15hrs

Name of the Teacher: Dr. Shaik Naseeruddin

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NIZAM COLLEGE: DEPARTMENT OF MICROBIOLOGY

LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: VIII- Industrial Microbiology

Unit II: Upstream processing

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Screening and isolation of industrially useful microbes	2
Strain improvement	3
Raw materials	2
Fermentation media	2
Types of Fermentation – aerobic, anaerobic	1
Batch and continuous fermentation	2
Submerged fermentation	1
Surface fermentation	1
Solid state fermentation	1
	15hrs

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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: VIII- Industrial Microbiology

Unit III: Fermentor and downstream processing

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Detection and assay of fermentation products	1
Physiochemical methods	3
Biological assays	3
Fermentation equipment and its use	2
Design of fermentor	2
Type of fermenter	2
Control of fermentation parameters – aeration, agitation, antifoam, pH and temperature	2
	15hrs

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LESSON PLAN FOR THE ACADEMIC YEAR 2017-2018 (Semester VI)

Class: B. Sc III Year

Section: Microbiology

Course/Paper: VIII- Industrial Microbiology

Unit IV: Industrial production

No. of Hours Allotted: 15

Topics to be covered	No. of Hours
Industrial production (Microorganisms, Media, Fermentation, Product recovery)	
A. Alcohols – Ethyl alcohol	3
B. Beverages – Beer	2
C. Enzymes – Amylases	3
D. Antibiotics – Penicillin	3
E. Amino acids – Glutamic acid	2
F. Vitamins – B12	2
	15hrs

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