B.Sc MICROBIOLOGY (CBCS) SYLLABUS

THIRD YEAR
SEMESTER –VI – W.E.F. 2017-18

(ELECTIVE)
PAPER-VII - MICROBIAL DIAGNOSIS IN HEALTH CLINICS

TOTAL HOURS: 36 **CREDITS: 3**

UNIT- I **No. of hours: 8**

Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis.

UNIT- II **No. of hours: 8**

Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) and precautions required.
Method of transport of clinical samples to laboratory and storage.

UNIT- III **No. of hours: 8**

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria
Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

UNIT- IV **No. of hours: 6**

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes.
Typhoid, Dengue and HIV, Swine flu.

UNIT- V **No. of hours: 6**

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

PAPER VII (PRACTICAL) - MICROBIAL DIAGNOSIS IN HEALTH CLINICS

TOTAL HOURS: 36 **CREDITS: 2**

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum). Receipts, Labeling, recording and dispatching clinical specimens.
2. Isolation of bacteria in pure culture and Antibiotic sensitivity.
3. Identification of common bacteria by studying their morphology, cultural character, Biochemical reactions, slide agglutination and other tests.
4. Maintenance and preservation of stock culture.

SUGGESTED READING

Ananthanarayan R and Paniker CKJ (2009) **Textbook of Microbiology**, 8th edition, Universities Press Private Ltd.

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

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

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

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

B.Sc MICROBIOLOGY (CBCS) SYLLABUS

THIRD YEAR

SEMESTER- VI – W.E.F. 2017-18

(CLUSTER ELECTIVE – I)

PAPER VIII (A) - MICROBIAL BIOTECHNOLOGY

TOTAL HOURS: 36 **CREDITS: 3**

UNIT- I **No. of Hours: 8**

Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, Mycorrhizae), environmental, and food technology.
Genetically engineered microbes for industrial application: Bacteria and yeast

UNIT- II **No. of Hours: 7**

Recombinant microbial production processes in pharmaceutical industries - Streptokinase, recombinant vaccines (Hepatitis B vaccine).
Microbial polysaccharides, polyesters and bioplastics.
Microbial production of bio-pesticides
Microbial biosensors

UNIT- III **No. of Hours: 10**

Microbial based transformation of steroids and sterols.
Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute.
Immobilization methods and their application: Whole cell immobilization

UNIT- IV **No. of Hours: 7**

Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass.
Biogas production: Methane and hydrogen production using microbial culture. Microorganisms in bioremediation: Degradation of xenobiotics.
Mineral recovery, removal of heavy metals from aqueous effluents.

UNIT- V **No. of Hours: 4**

Outlines of Intellectual Property Rights: Patents, Copyrights, Trademarks

PAPER VIII(A) (PRACTICAL) - MICROBIAL BIOTECHNOLOGY

TOTAL HOURS: 36 **CREDITS: 2**

1. Yeast cell immobilization in calcium alginate gels

2. Enzyme immobilization by sodium alginate method

3. Pigment production from fungi (*Trichoderma* / *Aspergillus* / *Penicillium*)

4. Isolation of xylanase or lipase producing bacteria

5. Study of algal Single Cell Proteins

SUGGESTED READING

Crueger W, Crueger A (1990) Biotechnology: **A text Book of Industrial Microbiology** 2nd edition Sinauer associates, Inc.

Demain, A. L and Davies, J. E. (1999). **Manual of Industrial Microbiology and Biotechnology**, 2nd Edition, ASM Press.

Glazer AN and Nikaido H (2007) **Microbial Biotechnology**, 2nd edition, Cambridge University Press

Glick BR, Pasternak JJ, and Patten CL (2010) **Molecular Biotechnology** 4th edition, ASM Press

Gupta PK (2009) **Elements of Biotechnology** 2nd edition, Rastogi Publications

Prescott, Harley and Klein's **Microbiology** by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.

Ratledge, C and Kristiansen, B. (2001). **Basic Biotechnology**, 2nd Edition, Cambridge University Press.

Stanbury PF, Whitaker A, Hall SJ (1995) **Principles of Fermentation Technology** 2nd edition., Elsevier Science

Swartz, J. R. (2001). **Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology**, 12, 195–201.

B.Sc MICROBIOLOGY (CBCS) SYLLABUS

THIRD YEAR

SEMESTER- VI – W.E.F. 2017-18

(CLUSTER ELECTIVE – 2)

PAPER VIII (B) - MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

TOTAL HOURS: 36 **CREDITS: 3**

UNIT – I **No. of Hours: 8**

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

UNIT – II **No. of Hours: 8**

Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products

UNIT – III **No. of Hours: 8**

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

UNIT – IV **No. of Hours: 8**

Enrichment culture technique, Detection of specific microorganisms - on XLD agar, *Salmonella Shigella* Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar
Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (COB, 10 min Resazurin assay).

UNIT – V **No. of Hours: 4**

Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitationsMicrobial Standards for Different Foods and Water – BIS standards for common foods and drinking water.

PAPER VIII (B) (PRACTICAL) - MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

TOTAL HOURS: 36 **CREDITS: 2**

1. Microbiological laboratory safety- General rules & Regulations.

2. Sterility tests for Instruments – Autoclave & Hot Air Oven

3. Disinfection of selected instruments & Equipments

4. Sterility of Air and its relationship to Laboratory & Hospital sepsis.

5. Sterility testing of Microbiological media

6. Sterility testing of Pharmaceutical products –Antibiotics, Vaccines & fluids

7. Standard qualitative analysis of water.

8. Quantitative analysis of water – Membrane filter method

9. Analysis of food samples for Mycotoxins

SUGGESTED READING

Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.

Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press

Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer

Laboratory Exercises in Microbiology, George.A.Wistreich & Max.D.Lechtman, 3 rd Ed, Glencoe press, London.

Manual of diagnostic microbiology, Dr.B.J.Wadher & Dr.G.L.Bhoosreddy, Firs.Ed., Himalaya publishing house, Nagpur.

Microbiology - A laboratory manual, Cappuccino & Sherman , 6 th Ed, Pearson Education

Pharmaceutical Microbiology – Purohit

Pharmaceutical Microbiology – W.B. Hugo

B.Sc MICROBIOLOGY (CBCS) SYLLABUS

THIRD YEAR

SEMISTER-VI – W.E.F. 2017-18

(CLUSTER ELECTIVE - 3)

PAPER VIII (C) - BIOFERTILIZERS AND BIOPESTICIDES

TOTAL HOURS: 36 **CREDITS: 3**

UNIT – I **No of Hours: 10**

General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers.

Symbiotic N_2 fixers: *Rhizobium* - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants

Frankia from non-legumes and characterization.

Cyanobacteria from *Azolla*, characterization, mass multiplication, Role in rice cultivation, Crop response, field application.

UNIT – II **No of Hours: 6**

Free living *Azospirillum*, *Azotobacter* - isolation, characteristics, mass inoculum production and field application.

UNIT – III **No of Hours: 6**

Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application

UNIT – IV **No of Hours: 7**

Importance of mycorrizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae and VAM.

UNIT – V **No of Hours: 7**

General account of microbes used as bioinsecticides and their advantages over synthetic pesticides.

Bacillus thuringiensis - production, Field applications.

Viruses – NPV cultivation and field applications.

PAPER VIII (C) (PRACTICAL) - BIOFERTILIZERS AND BIOPESTICIDES

TOTAL HOURS: 36 **CREDITS: 2**

1. Isolation of *Rhizobium* from root nodules.

3. Isolation of phosphate solubilizers from soil

4. Staining and observation of VAM

3. A visit to biofertilizer production unit.

SUGGESTED READINGS

Agarwal SK (2005) **Advanced Environmental Biotechnology**, APH publication.

Kannaiyan, S. (2003). **Bioetchnology of Biofertilizers,** CHIPS, Texas.

Mahendra K. Rai (2005). **Hand book of Microbial biofertilizers**, The Haworth Press, Inc. New York.

Reddy, S.M. et. al. (2002). **Bioinoculants for sustainable agriculture and forestry**, Scientific Publishers.

Saleem F and Shakoori AR (2012) **Development of Bioinsecticide,** Lap Lambert Academic Publishing GmbH KG

Subba Rao N.S (1995) **Soil microorganisms and plant growth** Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.

BSc. Microbiology (CBCS) syllabus - III year

Semester - VI - Elective paper VII

Title : Microbial Diagnosis in Health clinics

Time : 3 Hrs

Max. marks : 75 marks

Section : A

5 x 5 = 25 M

Answer any Five of the following:

1. Diseases of Nervous System.
2. Transportation of clinical samples
3. colony characteristics of various bacterial pathogens.
4. PCR
5. MIC
6. Ziehl-Neelson staining
7. Swine-flu
8. ELISA.

Section - B

5 x 10 = 50 M

Answer ~~thye~~ the following Questions:

9. a) Give an account on clinical samples associated with diseases? (or)

   b) Explain the causative agent and clinical symptoms of bacterial diseases of human body?

10. a) Give an account on collection of clinical samples? (or)

    b) Write about precautions required to storage the clinical samples?

11. a) Explain the Giemsa- staining technique for given smear?

(or)

b) Describe any culture media preparation for diagnosis?

12. a) Write about nucleic acid based method for diagnosis?

(or)

b) Write various serological methods in detail?

13. a) Explain about determination of drug sensitivity and resistance?

(or)

b) Describe the MIC method for antibiotic activity?

BSc. Microbiology (CBCS) syllabus - III year

Semester - VI Cluster elective VIII A

Title: Microbial Biotechnology

Time: 3 Hrs Max. marks: 75M

Section-A

Answer any Five of the following: 5x5 = 25M

1. Bio Fertilizers
2. Strepto kinase
3. Steroids
4. Bio diesel
5. patenting.
6. Microbial biosensors
7. Bioremediation
8. Recombination.

Section-B

5x10 = 50M

Answer the following Questions:

9. a) Write about scope and its applications in Agriculture?

(or)

b) Describe genetically engineered microbes for Industrial application.

10. a) Recombinant Microbial production process in pharmaceutical industries?

(or)

b) Discuss indetail about microbial poly esters and bio-plastics?

11. a) Write about Microbial transformation of steroids and sterols? (or)

b) Explain Immobilization methods and their applications?

12. a) Give an account on bio-gas production by using microbial culture? (or)

b) production of bio-diesel from Algal biomass?

13. a) Write indetail about copyrights? (or)

b) Write indetail about Trade marks.

BSc. Microbiology (CBCS) syllabus.

III year - semester - VI - cluster - VIII B

Title : Microbial Quality control in food and pharceutical Industries.

Time : 3 Hrs. Max. marks : 75M

section - A 5×5=25M

Answer any five of the following:

1. Incineration
2. Bio safety cabinets
3. Endotoxins
4. Gel-diffusion method.
5. DNA probes
6. EMB Agar
7. MBRT
8. BIS standards for drinking water.

section - B 5×10 = 50M

Answer the following Questions:

9. a) Describe good Laboratory practices? (or)
   b) write various methods in discarding bio hazardous wastes?
10. a) Write about various cultural methods of microbes? (or)
    b) Describe various Ammunological methods to detect the microbes?
11. a) Describe the PCR method with applications? (or)
    b) Explain indetail about biosensors?

12. a) Describe the enrichment culture technique for specific micro organisms? (or)

b) Write indetail about the microbial Quality of milk with suitable methods?

13. a) Explain in detail about HACCP?

b) Give an account of BIS standards for different foods?

BSc. Microbiology (CBCS) Syllabus.

III year - semester - VI - cluster - VIII C

Title: Biofertilizers and Biopesticides

Max. marks: 75M

Time: 3Hrs

Section - A

Answer any five of the following Questions: 5×5=25M

1. Frankia
2. Azospirillum
3. phosphate solubilizing microbes
4. VAM
5. Bio-insecticides
6. NPV
7. Bacillus thuringiensis
8. Mycorrhizae.

Section - B 5×10=50 M

9. a) Explain the biofertilizers for various crop plants and their advantages over chemical fertilizers? (or)

b) Describe the Mass cultivation and field application of cyanobacteria?

10. a) Describe the Mass cultivation and field application of Azotobacter. (or)

b) Describe the Mass production and field application of Azo-spirillum

11. a) Describe the Isolation and characteristics of phosphate solubilizing microorganisms? (or)

b) Describe mass production and field application of phosphate solubilizing microorganisms?

12. a) Explain the types of Mycorrhiza associated with plants?

(or)

b) Describe the field application Mass production and field application of Mycorrhiza?

13. a) Differentiate the advantages of Biopesticides over the Synthetic pesticides? (or)

b) Explain the production and field application of Bacillus thuringiensis and NPV?