**Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)**

**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2022 - 23)**

**FINAL YEAR – SEMESTER- 5/6**

**COURSE-6A AGRICULTURAL AND ENVIRONMENTAL MICROBIOLOGY**

**TOTAL HOURS: 60 CREDITS: 4**

**Course outcomes:**Upon completion of the course, the student will be able to achieve the following outcomes:

|  |  |
| --- | --- |
| **COs** | **Course Outcomes** |
| 1. | Learn about the microbial groups involved in mineral recycling and soil fertility |
| 2. | To know the complex interaction between agriculture system and micro-organism. |
| 3. | Understand the beneficial activities of microbes in soil for plant growth promotion |
| 4. | To introduce micro-organism in agricultural system for building a pathway for sustainable agriculture |
| 5. | Study the types of diseases caused to the plants and their control in various manners |
| 6. | To understand the diseases pathogenesis in plants system for effective plant disease management. |
| 7. | Explore soil, aquatic, atmospheric and extreme environments, and the microorganisms ofthat area |
| 8. | Know the microbial analysis of drinking water and aeromicrobiology |
| 9. | Understand waste, disposal methodsand methods of recycling and investigate the contaminants |
| 10. | Knowthe different aspects of waste management and sewage Treatment systems, biosafety and environmental monitoring regulations. |

**UNIT – I No. of Hours: 12**

**SOIL MICROBIOLOGY**: Microbial groups in soil, microbial transformations of Carbon, Nitrogen, Phosphorus and Sulphur.Biological Nitrogen fixation. Microflora of Rhizosphere and Phyllosphere, microbes in composting. Production of VAM, field applications of Ectomycorrhiza and VAM.

**UNIT – II No.of Hours: 12**

**BENEFICIAL MICROORGANISMS IN AGRICULTURE**: Biofertilizer (Bacterial, Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of Plant diseases (*Bacillus thuringiensis*), Plant – Microbe interactions - mutualism, commensalism, antagonism, competition, parasitism, predation.

Management of soil biota for maintaining soil fertility. Conversion of waste lands into fertile lands.Management of soil nutrients.

**UNIT-III No. of Hours: 12**

**DISEASES IN PLANTS**: Concept of disease in plants. Symptoms of plant diseases caused by fungi, bacteria, and viruses. Plant diseases - groundnut rust, Citrus canker and tomato leaf curl.

Principles of plant disease control.

**UNIT – IVNo. of Hours: 12**

**TERRESTRIAL ENVIRONMENT**: Soil profile and soil microflora. Aquatic Environment: Microflora of fresh water and marine habitats. Atmosphere: Aero microflora and dispersal of microbes. Extremophiles. Nutrient cycling - Carbon, nitrogen, phosphorus.Biodegradation, Biogas production, Biodegradable plastics,

**UNIT-V No. of Hours: 12**

**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.Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique.

**Practical 6A – AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY**

**Total hours: 40 Credits: 1**

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

**SUGGESTED READINGS:**

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. Madigan MT, Martinko JM and Parker J. (2014). **Brock Biology of Microorganisms**. 14th edition. Pearson/ Benjamin Cummings.
6. Maier RM, Pepper IL and Gerba CP. (2009). **Environmental Microbiology**. 2nd edition, Academic Press.
7. Martin A. (1977). **An Introduction to Soil Microbiology**. 2nd edition. John Wiley & Sons Inc. New York & London.
8. Subba Rao NS. (1999). **Soil Microbiology**. 4th edition. Oxford & IBH Publishing Co. New Delhi.
9. Willey JM, Sherwood LM, and Woolverton CJ. (2013). **Prescott’s Microbiology**. 9th edition. McGraw Hill Higher Education.

**Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)**

**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. MICROBIOLOBY (CBCS) FINAL YEAR; SEMESTER – V/VI (W.E.F. 2022-23)**

**COURSE- 6A AGRICULTURAL AND ENVIRONMENTAL MICROBIOLOGY**

**Model Paper**

**Max Marks: 75 Time: 3 hours**

**SECTION –A**

Answer ALL questions (Draw the diagrams wherever necessary) (5 x 10 = 50 M)

1. a) Write about the biological nitrogen fixation.

(Or)

1. b) Write about the applications of Ectomycorrhiza and VAM.

2. a) Explain the plant – microbialinteractions with examples.

(Or)

2. b) Write about the beneficial microorganisms in Agriculture.

3. a) Write about the various microbial diseases ofPlants.

(Or)

3. b) Explain the symptoms of plant diseases caused by fungi and bacteria.

4. a) Write about the microflora of Aquatic Environment.

(Or)

4. b) Explain the Nitrogen cycling in atmosphere.

5. a) Write about the various steps in sewage treatment method in detail.

(Or)

5. b) Write about the treatment of drinking water.

**SECTION –B**

**Answer any FIVE questions (Draw the diagrams wherever necessary)** **5 x 5 = 25 M**

6. Microbial groups in soil

7. Microbes in composting

8. Microbial insecticides

9. Tomato leaf curl – symptoms and pathogen control

10. Soil profile

11. Phosphorus cycle

12. Landfill

13. BOD

**Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)**

**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. MICROBIOLOBY (CBCS) FINAL YEAR; SEMESTER – V/VI (W.E.F. 2022-23)**

**COURSE - 6AAGRICULTURAL AND ENVIRONMENTAL MICROBIOLOGY**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **Units** | **10 M Questions** | **5 M Questions** | **Marks allotted to the Unit** |
| Unit 1 | 2 | 2 | 30 |
| Unit 2 | 2 | 1 | 25 |
| Unit 3 | 2 | 1 | 25 |
| Unit 4 | 2 | 2 | 30 |
| Unit 5 | 2 | 2 | 30 |
| Total No. of Questions | 10 | 08 | 140 |

**Note:**

1. The question paper setter are requested to kindly adhere to the format given in the above table.

2. The question paper setter are also requested to set the questions in the following way:

a. 70 % of questions – Remembering and Understanding type questions

b. 30 % of questions – Applying, Evaluating, Analyzing and Creating type questions

**Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)**

**MADDILAPALEM, VISAKHAPATNAM**

**B.Sc. MICROBIOLOGY (CBCS) SYLLABUS (W.E.F 2022 - 23)**

**FINAL YEAR – SEMESTER- 5/6**

**COURSE-7A: CLINICAL MICROBIOLOGY**

**TOTAL HOURS: 60 CREDITS: 4**

**Course outcomes:**Upon completion of the course, the student will be able to achieve the following outcomes:

|  |  |
| --- | --- |
| **COs** | **Course Outcomes** |
| 1. | Deep understanding of the disease cycles and their outbreaks |
| 2. | Gaining theoretical knowledge of most common disease-causing organisms |
| 3. | Enumerating the methods and vehicles of disease transmission |
| 4. | Understanding the basics of Clinical laboratory protocols |
| 5. | Systematic knowledge on the pathogenesis and laboratory diagnosis of diseases |
| 6. | Developing insights into clinical practices and serological techniques. |
| 7. | Gain knowledge on advanced techniques and diagnosis |
| 8. | Identify the blood groups and estimate the concentration of Hemoglobin |
| 9. | Develop knowledge on antimicrobial sensitivity and resistance mechanism |
| 10. | Perform antibiotic sensitivity tests of some antibiotics on few organisms |

**UNIT-I No. of Hours:12**

**TYPES OF DISEASES:** Disease - incidence, prevalence; communicable, non-communicable; frequency of occurrence (sporadic, endemic, epidemic, pandemic), severity /duration of disease(acute, chronic, latent); development of disease; the spread of infection(human reservoirs, animal reservoirs, non-living reservoirs); transmission of disease (contact (direct, indirect, droplet); vehicle (water, food, air, vectors(mechanical, biological); portals of entry(mucus membrane, skin, parenteral route) & portals of exit. Herd immunity. Control of disease transmission.

**UNIT-II No. of Hours:12**

**TYPES OF INFECTIONS:** Description of pathogenesis, etiology and laboratory diagnosis of the following:

Respiratory infections – Pneumonia, Influenza

Food and water borne infections – cholera, polio

Urinary tract and Gastro intestinal infections (*E.coli*)

Central Nervous System infections (meningitis, encephalitis)

Sexually transmitted diseases: Treponema, Neisseria.

Blood stream infections – Bacteraemia

**UNIT – III No. of Hours:12**

**IDENTIFICATION OF ORGANISMS:** Microscopic examination of specimen for Bacterial pathogens – simple staining, Gram staining and motility by Hanging drop method.

Biochemical reaction – Sugar fermentation test,

Cultural tests- IMVIC tests (Indole test, methyl red test, Voges- Proskauer test and Simon Citrate agar test)

Determination of antibiotic sensitivity – Qualitative methods (Kirby Bauer’s Method; Stokes method) and quantitative methods (Tube dilution and agar dilution methods). E-test.

**UNIT – IV No. of Hours:12**

**CLINICAL LAB TECHNOLOGY:** Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine, and feces) and precautions required. Method of transport of clinical samples to laboratory and storage.

Observation of blood cells – preparation of blood smear, Leishman staining, Giemsa & Wright staining, bleeding time(BT), clotting time(CT).

Microscopic observation of Bacteria and yeast, Casts, Epithelial cells,Crystals, Red blood cells and White blood cells in urine sample.

**UNIT – VNo. of Hours:12**

**SEROLOGY:**Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL test) Hemagglutination, Flocculation (VDRL test), Complementation fixation test, Ouchterlony double diffusion test, Rocket immunoelectrophoresis. ELISA and RIA. RT-PCR; Western blot analysis for HIV. HCG pregnancy test.

**Practical – 7A: CLINICAL MICROBIOLOGY**

**TOTAL HOURS: 40 CREDITS: 1**

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum). Receipts, Labeling, recording, and dispatching clinical specimens.
2. Examination of urine for pathogenic microorganisms –collection of urine, microscopic examination of urine.
3. Isolation and identification of Escherichia coli, Klebsiella pneumonia from urine samples.
4. Mycology – Direct microscopy – cultures using Sabouraud’s Dextrose agar medium, Wet mount preparations using Lactophenol cotton blue/KOH mount.
5. Estimation of hemoglobin (Acid hematin and cyanmethemoglobin method).
6. Immunohematology: Blood group typing by slide test & tube for ABO & Rh systems.
7. Determination of Antibiotic sensitivity Test by Kirby Bauer’s method.
8. Study of various concentration of an antibiotic on any 2 bacteria by E-test.
9. RBC and WBC count
10. Bleeding time and Clotting time

**SUGGESTED READING**

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.
6. Tortora, G.J., Funke, B.R. and Case, C.L. (2010) **Microbiology: An Introduction**. 10th Edition, Pearson Benjamin Cummings, San Francisco.

**Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)**

**MADDILAPALEM, VISAKHAPATNAM**

**B. Sc. MICROBIOLOBY (CBCS) FINAL YEAR, SEMESTER – V/VI (W.E.F. 2022-23)**

**COURSE-7A: CLINICAL MICROBIOLOGY**

**Model Paper**

**Max Marks: 75M Time: 3 hours**

**PART – A**

Answer **ALL** the questions. Each question carries 10 Marks: (5 x 10 = 50 Marks)

1 a). Write about the frequency of occurrence of a disease.

(OR)

1 b) Explain the various process of transmission of disease.

2 a) Discuss the pathogenesis, etiology & laboratory diagnosis of Cholera.

(OR)

2 b) Discuss the pathogenesis, etiology & laboratory diagnosis of Pneumonia.

3 a) Explain the IMViC test in detail.

(OR)

3 b) Write down the methods for qualitative determination of antibiotic sensitivity.

4 a) Explain the principle, procedure, and applications of ELSIA.

(OR)

4 b) Discuss the methods for observation of blood cells.

5 a) Discuss the blood grouping and WIDAL test allutination reactions. about methods of

determination of antibiotic sensitivity.

(OR)

5 b) Explain the principle, procedure and applications of ELSIA.

**PART – B**

Answer any **FIVE** questions. Each question carries 4 Marks: (5 x 5 = 25 Marks)

6. Herd immunity

7. Portals of exit

8. UTI

9. Bacteraemia

10. Sugar fermentation tests

11. BT & CT

12. Western blot

13. E-test

**Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS)**

**MADDILAPALEM, VISAKHAPATNAM**

**B. Sc. MICROBIOLOBY (CBCS) FINAL YEAR, SEMESTER – V/VI (W.E.F. 2022-23)**

**COURSE-7A: CLINICAL MICROBIOLOGY**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **Units** | **10 M Questions** | **5 M Questions** | **Marks allotted to the Unit** |
| Unit 1 | 2 | 2 | 30 |
| Unit 2 | 2 | 2 | 30 |
| Unit 3 | 2 | 2 | 30 |
| Unit 4 | 2 | 1 | 25 |
| Unit 5 | 2 | 1 | 25 |
| Total No. of Questions | 10 | 8 | 140 |

**Note:**

1. The question paper setter are requested to kindly adhere to the format given in the above table.

2. The question paper setter are also requested to set the questions in the following way:

a. 70 % of questions – Remembering and Understanding type questions

b. 30 % of questions – Applying, Evaluating, Analyzing and Creating type questions