

SYLLABUS  
FOR  
B.Sc. SEMESTER PATTERN IN  
MICROBIOLOGY  
GONDWANA UNIVERSITY  
GADCHIROLI  
INDIA

*Gondwana University, Gadchiroli*  
Teaching & Examination Scheme  
Bachelor of Science  
Three Year (SIX SEMESTER ) Degree course

**MICROBIOLOGY**

1. There shall be total six Semesters. Total 3000 Marks.
2. The Division / Grade of the student shall be calculated on the basis of Science subjects as per the previous yearly pattern.
3. Each semester shall comprise of 90 teaching days.
4. Semester I and II shall be of 600 Marks
5. Semester III to VI shall be of 450 Marks
6. Microbiology subject in each semester will comprise of
  - a. Two theory papers – 50 Marks each
  - b. One internal assessment based on two theory papers for 10 Marks each. Total 20 Marks.
  - c. One practical / Laboratory work – Total 30 marks
7. In addition to above Semester I and II will have
  - a. One compulsory English paper of 60 marks with 15 marks internal assessment.
  - b. One second language paper (Supp Eng / Hindi / Marathi / Urdu / etc) of 60 Marks with 15 marks internal assessment.
8. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects.
9. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
10. The pattern of Internal assessment and guidelines for the same shall be prepared by the respective subject Board of Studies
11. All Theory papers shall be divided into four units. Each unit shall be covered in 7.5 hours.

12. The theory question papers shall be of 3 hours duration and comprise of 5 questions with internal choice and with equal weightage to all units. (as per the previous pattern)
13. Practical exam shall be of 10 hours duration, 5hrs each for two consecutive days.
14. Table of teaching and examination scheme attached.

**Teaching & Examination Scheme**  
**Bachelor of Science (Microbiology)**  
**Three Year (SIX SEMESTER) DEGREE COURSE**  
**B. Sc. Part III (Semester V and VI)**

| S. No.  |             | Subject  | Teaching scheme   |              |               | Examination scheme |                    |                      |                          |                |           |                   |              |                                    |                     |                   |
|---|-------------|--|-------------------|--------------|---------------|--------------------|--------------------|----------------------|--------------------------|----------------|-----------|-------------------|--------------|------------------------------------|---------------------|-------------------|
|   |             |  | Th + Tu (Periods) | Pr (Periods) | Total Periods | Theory             |                    |                      |                          |                | Practical |                   |              | Total Marks / credits (Th, Pr, IA) |                     |                   |
|   |             |  |                   |              |               | Duration Hrs       | Max Marks Th paper | Min Passing Marks Th | Max Marks Int Assessment | Min Passing IA | Total     | Min passing Marks | Duration Hrs |                                    | Max marks practical | Min passing marks |
| 1   | Semester-V  | Microbiology Paper I- Medical Microbiology       | 3+@               | -            | 6+@           | 3                  | 50                 | 18                   | 10                       | 4              | 120       | 22                | -            | -                                  | -                   | 150               |
| 2   |             | Microbiology Paper-II Bioinstrumentation         | 3+@               | -            |               | 3                  | 50                 | 18                   | 10                       | 4              |           | 22                | -            | -                                  | -                   |                   |
| 3   |             | Practical  | -                 | 6            |               | 6                  | -                  | -                    | -                        | -              |           | -                 | -            | -                                  | 10*                 |                   |
| 4   | Semester-VI | Microbiology Paper I- Recombinant DNA Technology | 3+@               | -            | 6+@           | 3                  | 50                 | 18                   | 10                       | 4              | 120       | 22                | -            | -                                  | -                   | 150               |
| 5   |             | Microbiology Paper-II Immunology                 | 3+@               | -            |               | 3                  | 50                 | 18                   | 10                       | 4              |           | 22                | -            | -                                  | -                   |                   |
| 6   |             | Practical  | -                 | 6            |               | 6                  | -                  | -                    | -                        | -              |           | -                 | -            | -                                  | 10*                 |                   |
| <b>Grand Total of Semester V &amp; VI: 450 each semester = TOTAL - 450 Marks per semester</b> |             |  |                   |              |               |                    |                    |                      |                          |                |           |                   |              |                                    |                     |                   |

Note: Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment; @ = Tutorials wherever applicable; \* = If required, for two days.

**MICROBIOLOGY**  
**B. Sc. Semester V**

**Paper I: Medical Microbiology**

**Unit I: Epidemiology and Host-Parasite Relationship**

- a. Explanation of medical terms
  - i) Infection, types of infections, primary infection, Secondary infection, Acute and chronic infection, Local and systemic infection, Fulminating infection, Nosocomial infection, Iatrogenic infection, Teratogenic infection, Congenital infection
  - ii) Disease, Sign, Symptoms, Syndrome, Types of disease, Epidemic, Endemic, Pandemic, Prosodemic, Sporadic, Exotic, Venereal, Zoonotic, Epizootic, Exotic
  - iii) Infection process(pathogenesis)- Bacteremia, Septicemia, Pyaemia, Sappremia, Toxemia, Viremia
- b. Stages of Infectious disease- Incubation period, Prodromal phase, invasive phase, decline phase, convalescence.
- c. Control of communicable diseases, different methods.
- d. Normal flora of human body- characteristic of normal flora, beneficial and harmful effects of normal flora, Normal flora of skin, eye, respiratory tract, digestive tract, urino-genital tract, blood and tissues.

**Unit II: Dynamics of Disease Transmission**

- a. Causative/etiologiical agents of various diseases, bacterial, viral, fungal, protozoan, rickettsial, waterborne, foodborne, airborne (list only).
- b. Sources/reservoir of infections- endogenous sources, exogenous sources, case, carriers, animals, insect, non-living sources.
- c. Portals of exit, Portals of entry.
- d. Modes of transmission- Contact, Vehicle, Vector, airborne, Trans-placental, Laboratory, Hospital.
- e. Susceptibility of host.

**Unit III: Microbial Mechanism of Pathogenicity**

- a. Pathogenicity and Virulence, difference
- b. Variation of virulence, Exaltation, Attenuation, methods of attenuation.
- c. Virulence determining factors
  - i) Infectivity – MID, MLD, ID50, LD50
  - ii) Invasiveness, factors responsible (aggresins)
  - iii) Toxigenicity – Exotoxin, Endotoxin, comparison, enterotoxin.
  - iv) Vaccine and toxoid, types

#### **Unit IV: Microbial Diseases of Human**

- a. Diseases of skin, eye, digestive tract, respiratory tract, urinary tract, reproductive system, nervous system, cardiovascular and lymphatic system (only list with causative organism).
- b. Study of pathogenic organisms (Morphology, cultural and biochemical characteristics, Pathogenesis, laboratory diagnosis, prevention)
  - i. *Salmonella typhi* ii) *Mycobacterium tuberculosis* iii) *Shigella dysentery* iv) Plasmodium
  - v) Chickungunia virus vi) Dengue virus vii) HIV

## **MICROBIOLOGY** **B. Sc. Semester V**

### **Paper II: Bioinstrumentation**

#### **Unit I: Spectrophotometry**

- a. Concept of electromagnetic radiation, spectrum of light
- b. Beer's law and deviations, extinction coefficient
- c. Difference between spectrophotometer and colorimeter.
- d. Construction and working of UV and visible Spectrophotometry.
- e. Applications in biological science.

#### **Unit II: Chromatography**

- a. Partition principle, partition coefficient, nature of partition force
- b. Brief account of paper chromatography, application
- c. Thin layer chromatography- Application
- d. Column chromatography- Principle and application of gel filtration, Ion-exchange, Affinity chromatography

#### **Unit III: Electrophoresis & Blotting of Biomolecules**

- a. Electrophoresis- Migration of ions under electric field, factors affecting electrophoretic mobility,
- b. Paper electrophoresis, cellulose acetate electrophoresis, application
- c. Gel electrophoresis-Types of gels, solubilizers, procedure, column, slab gels application
- d. SDS-PAGE electrophoresis- principle, procedure and applications
- e. Blotting technique-Southern blotting, Northern blotting, Western blotting (in brief)

#### **Unit IV: Centrifugation & Isotopic Tracer Technique**

- a. Centrifugation: Basic principles, concept of RCF, Sedimentation coefficient
- b. Types of centrifuges- clinical, high speed and ultracentrifuge- application, Density gradient centrifugation

- c. Radioactive and stable isotopes, rate of radioactivity decay, units of radioactivity
- d. Radioisotope methods, types of radioactive decay - Half life and radioactivity- GM counter – Scintillation counter – Autoradiography

### **Practical Course for Semester V (Based on Paper I & Paper II)**

**Marks: 30**

1. \*Laboratory diagnosis of i) *E.coli* ii) *P. vulgaris* iii) *S. typhi*
2. \*Isolation and detection of *S. aureus* from pus sample.
3. To study normal flora of skin and oral cavity.
4. Detection of Malarial parasite from blood sample.
5. Detection of Chikungunia and Dengue fever (demonstration only)
6. \*Determination of Minimum Inhibitory Concentration(MIC) of Antibiotics.
7. \*Estimation of Blood sugar by GOD-POD method
8. \*Liver function test - SGOT and SGPT
9. Kidney function test- Creatinine , Urea
10. Detection of Bilirubin.
11. \*Estimation of Blood cholesterol.
12. Estimation of blood urea by Diacetylmonoxime method (DAM)
13. \*Paper chromatography of amino acids/sugars.
14. \*TLC of lipid/amino acids.

15. Demonstration of separation of components by paper electrophoresis
16. Separation of protein by SDS-PAGE (Sodium dodecyl sulfate-Polyacrylamide gel electrophoresis)
17. Blotting of DNA by Southern Blotting technique

- Note:** 1. Underlined experiments are treated as major experiments.  
 2. Students should perform at least 4 major and 6 minor experiments  
 3. Practicals with asteric mark are compulsory.

### **Distribution of marks during practical examinations of B.Sc. Semester V**

|                          |       |      |
|--------------------------|-------|------|
| 1. One major experiment- |       | 10   |
| 2. Two minor experiment- | 2 X 5 | = 10 |
| 3. Viva voce-            |       | 5    |
| 4. Practical record-     |       | 5    |
|                          |       |      |
| Total                    |       | 30   |

**(Duration of Practical exam will be 10 hrs., 5 hrs. each for two consecutive days)**

### **Books Recommended for Theory & Practical Microbiology B.Sc. Sem. V**

1. Ananthnarayan and Panikars, Textbook of Microbiology (8<sup>th</sup> edition), University Press, Hyderabad
2. Jayaram Paniker CK (2004). Text book of Medical Parasitology. Fifth edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
3. Essentials of Medical Microbiology. 4<sup>th</sup> Edition. Rajesh Bhatia. JAYPEE Publisher
4. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: an Introduction. 8<sup>th</sup> edition. Pearson Education Inc.

5. Powar and Dagainawala General Microbiology Vol.I&II ( Himalaya Publication)
6. Dubey R. C. and Maheshwari D.K. Text Book of Microbiology, S. Chand Publishe
7. Pelzar, Chan and Kreig, Microbiology 5<sup>th</sup> edition, TMH Publishe
8. Frobisher , Hindsdill et al., Fundamentals of Microbiology : W.B. Saunders Company, 7<sup>th</sup> edition USA, Topman co. Ltd. Japan
9. Stainer, Roger et al., General Microbiology
10. Atlas R.A. Microbiology- Fundamental and Applications, Macmillan
11. Salle A.J. Fundamental Principles of Bacteriology, Tata McGraw-Hill Publishing Co. Ltd, New Delhi.
12. Brock T.D. and Madigan M.T. Biology of Microorganisms, Prentice Hall of India Private Limited
13. Alcamo, Fundamentals of Microbiology
14. Purohit, Microbiology fundamentals and applications
15. Davis, Dulbecco, Microbiology
16. Thomas , Clinical Microbiology, University Press, Hyderabad
17. Ramkrishnan, Textbook of Medical Biochemistry University Press, Hyderabad
18. Medical Microbiology and parasitology , Day and Day, Himalaya Publisher
19. Manual of Practical Microbiology and Parasitology, P. Chakroborty. NCBA, Kolkata
20. Upadhyay&Nath, Biophysical Chemistry,Himalaya publishing house,New Delhi, 2009
1. Bajpai PK (2010). Biological Instrumentation and Methodology. Revised edition, S.Chand& Co. Ltd., New Delhi.
2. Palanivelu P (2004). Analytical Biochemistry and Separation techniques. Third edition, MKU Co-op, Press Ltd., Palkalai Nagar, Madurai.
3. Subramanian MA (2005). Biophysics – Principles and Techniques. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai
4. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
5. Dubey RC and Maheswari DK (2004).Practical microbiology First edition, S Chand and Company Ltd., New Delhi.
6. James G Cappuccino and Natalie Sherman (2004). Microbiology: A laboratory manual. Sixth edition, Published by Pearson Education
7. Jayaraman., Lab Manual in Biochemistry
8. David T. Plummer, An Introduction to Practical Biochemistry
9. Curikshank, Medical Microbiology
10. Parasitology, Chatterjee

