

SYLLABUS

FOR

B.Sc. SEMESTER PATTERN IN MICROBIOLOGY

GONDWANA UNIVERSITY

GADCHIROLI

INDIA

SEMESTER VI

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*	30	11	
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*	30	11	
Grand Total of Semester V & VI: 450 each semester = TOTAL - 450 Marks per semester																

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

MICROBIOLOGY
B. Sc. Semester VI

Paper I : Recombinant DNA Technology

Unit I : Fundamentals of r DNA Technology

- a. History and fundamentals of r DNA technology
- b. Tools for rDNA technology- DNA manipulative enzymes :Restriction enzymes, Ligases and other DNA modifying enzymes
- c. Cloning vectors: salient features, Plasmid-properties, types (pBR322 and pUC 18), Bacteriophage vectors (Lambda),Cosmid, Phagmid, Artificial chromosome (BAC,YAC)
- d. Characteristics of ideal host: *E.coli*

Unit II: Construction of rDNA and its Transfer to Host Cell

- a. *In vitro* construction of rDNA molecule-isolation of passenger DNA from host (gene of interest from host) and isolation of vector DNA
- b. Cutting of DNA molecules- enzymatic methods & joining of DNA molecules
- c. Homopolymer tails, Linkers, Adapters
- d. Transfer of rDNA into suitable host cell- transfection, gene gun (biolistic method), microinjection, protoplast fusion and electroporation
- e. Screening and selection of recombinant host cells : insertional inactivation , colony/ DNA hybridization

Unit III: Sequence Analysis & Amplification of DNA Fragments

- a. Construction of gene libraries : genomic and cDNA libraries
- b. DNA sequencing and synthesis : Maxam- Gilbert and Sangers method, Automated sequencing, Human genome sequencing project
- c. Polymerase Chain reaction (PCR)- principle, method and application
- d. DNA fingerprinting

Unit IV : Product of rDNA Technology

- a. Application in medical field- gene therapy, Stem cells, introduction and application, Hybridoma technology , monoclonal antibody formation
- b. Application in agriculture field : transgenic plant- Bt Cotton
- c. Application in Pharmaceuticals : Interferon, Vaccines, Insulin, Human Growth hormone
- d. Genetically modified food (one example)

MICROBIOLOGY
B. Sc. Semester VI

Paper II: Immunology

Unit I: Structure and functions of Immune system

- a. General concept and short history of immunology
- b. Primary Lymphoid organs- Thymus and Bone marrow
- c. Secondary Lymphoid organs- Spleen and Lymph node
- d. Lymphoid tissues- MALT / GALT
- e. Cells of immune system- B Lymphocytes, T Lymphocytes, Comparison, Types of T lymphocytes,
- f. Other immune-competent cells- Monocytes, macrophages, Dendritic cells, Killer cells, Antigen presenting cells, Neutrophil, Eosinophil, basophil, Mast cell.

Unit II: Resistance/ Immunity of the host.

- a. Concept of body resistance/ Immunity, types of immunity.
- b. Non-specific resistance (Natural/ Innate immunity- Species, racial and individual resistance.
- c. Factors influencing Innate immunity- Age, Sex, hormonal and nutritional.
- d. Mechanism of Innate immunity – anatomic and physiologic barriers, phagocytosis, inflammatory response, fever.
- e. Specific/Adoptive resistance(Acquired immunity)- Active and passive immunity, comparison, types,
- f. Humoral immune response, primary and secondary immune response
- g. Cell mediated immunity, mechanism, MHC complex and MHC molecules

Unit III: Antigens, Antibodies and Antigen-Antibody reactions.

- a. Definition of antigen, epitope, hapten, Types of antigen, Factors determining Antigenicity.
- b. Definition of Antibody, general structure, Classes of immunoglobulins, Structure and their functions
- c. Antigen-Antibody reactions.
 - i) Precipitation reaction- precipitation in liquid, immuno-diffusion.
 - ii) Agglutination reaction- Slide and Tube agglutination, Coomb's test.
 - iii) Complement fixation reaction- Wasserman test.
- d. Tagged Antibody test- ELISA, Radioimmunoassay (RIA), Immunofluorescence.

Unit IV: Hypersensitivity and Autoimmunity

- a. Definition of Hypersensitivity, Gell and Coomb's classification-Immediate(Type I ,Type II & Type III),Delayed hypersensitivity(Type IV), examples.
- b. Mechanism of hypersensitivity – Type I (Anaphylaxis), Type II (erythroblastosis fetalis), Type III (Arthus reaction, serum sickness), Type IV (Contact dermatitis, Mantoux test).
- c. Immunological tolerance
- d. Autoimmunity, mechanism , causes of autoimmunity, autoimmune disorders (Rheumatic arthritis and Myasthenia gravis)

Practical Course for Semester VI (Based on Paper I & Paper II)

Marks: 30

1. Clinical investigations:

- a. *Blood group and Rh factor
- b. *Total Leucocyte count
- c. Differential Leucocyte count
- d. *Hemoglobin % in Blood.

2. Immunological tests:

- a. *Detection of Typhoid and Paratyphoid fever by slide/tube agglutination test (WIDAL)
- b. *Detection of Syphilis by TRUST antigen test.
- c. *Detection of Pregnancy in women by strip method
- d. Demonstration of HBsAg by Hepacard test
- e. *Estimation of Antigen by Single Radial Immune Diffusion(RIA).
- f. Detection of AIDS by ELISA test.
- g. Test for Rheumatoid arthritis (RA)

3. Molecular Biology Techniques

- a. *Isolation of plasmid DNA
- b. *Isolation of genomic DNA from bacterial cell and separation of isolated genomic DNA by agarose gel electrophoresis
- c. *Digestion of DNA using restriction enzyme and analysis by agarose gel electrophoresis
- d. Ligation of digested DNA fragment
- e. DNA amplification by PCR (Demonstration)
- f. Gene cloning- cloning of GFP gene

- Note:**
1. Underlined experiments are treated as major experiments.
 2. Students should perform atleast 4 major and 6 minor experiments
 3. Practicals with asteric mark are compulsory.
 4. An educational tour (visit to Pharmaceutical ,Dairy industry, Research institute) is compulsory in V or VI semester
 5. For project a suitable microbial investigation involving laboratory work or survey work may be given to 1-3 students at the beginning of semester
 6. Report on project / review work preferably printed should be submitted duly certified by incharge teacher and head of the department

Distribution of marks during practical examinations of Microbiology B.Sc. Sem. -VI

1. One major experiment-	08
2. Two minor experiment- 2 X 4=	08
3. Project (lab or review work)	06
4. Viva voce-	4
5. Practical record-	4

Total 30

Duration of Practical examination will be 10hrs., 5 hrs. each for two consecutive days

Books Recommended for Theory & Practical Microbiology B.Sc. Sem. VI

1. Singh B.D.(2007),Biotechnology, Kalyani Publisher
2. Mitra (2005). Genetic engineering. Published by Macmillan India Ltd., Chennai.
3. Jogdand SN (2005). Gene biotechnology. Himalaya Publishing House, Mumbai
4. JOGDAND S.N. (2007) Advances in Biotechnology , Himalaya Publishing House, 2007
5. Satyanarayana (2005). Biotechnology. First edition, Books and Allied (P) Ltd., Kolkata.
6. Preeti Joshi (2002). Genetic engineering and its application. First edition, Agrobios (India).
7. Dubey RC (2005). A Text of Biotechnology. Multicolour Illustrative edition, S.Chand and Company Ltd., New Delhi.
8. Bernad R Glick (2003). Molecular Biotechnology - Principles and Applications of Recombinant DNA. Third edition, ASM Press, Washington, D.C.
9. Ramawat K and ShailyGoyal (2010). Molecular Biology and Biotechnology. First edition, S.Chand and company Ltd., New Delhi.
10. Dale J.W., Molecular Genetics of bacteria, 1994, John Wiley & Sons.
11. James D. Watson, Nancy H. Hopkins, Jeffrey W. Roberts, Joan ArgetsingerSteitz, Alan M. Weiner 1987, 4th edition. The Benjamin/Cummings Pub.
12. Lewin B. 2002 Genes VIII. Oxford.
13. Nancy Hopkins -Microbial genetics .:
14. Freifelder, D., 2000, Molecular Biology, second edition, Naros Publishing House, New Delhi.
15. Lehninger, 2010, Principles of Biochemistry, 5th edn., by Nelson & Cox, W.H. Freeman and Co.NYork.
16. Watson, J.D. *et.al.*, 2004, Molecular Biology of the Gene, 5th edn., Pearson pub.,
17. Brown, T.A. 2000, Gene Cloning, fourth edition, Chapman and Hall Publication, USA.
18. Old R.W. and PrimroseS.B.,1996, Prin.of Gene Manipulations, Blackwell Science Publications, London.
19. Mahadav Sharma &NirmalTripathi, Immunobiotechnolgy,
20. Kannan, Immunology
21. Roitt Ivan M. ,Brostoff Jonathan, Male DevidK.,Immunology 3rd edn,
22. Richard A. Goldsby, Thomas J. Kindt, JanisKuby Immunology 5th edn, .
23. Principles of Immunology, N.V. Shastri. Himalaya publisher.
24. P. Chakroborty. NCBA, Kolkata Manual of Practical Microbiology and Parasitology,
25. R.P. Singh ,Immunology and Medical Microbiology -Kalyani publishers
26. Bansal M P , Molecular Biology & Biotechnology, Basic exp. Protocol,TERI,New Delhi
27. Immunology and Microbiology, Dulsy Fatima, A. Mani. Saras Publication