

SYLLABUS

FOR

B.Sc. SEMESTER PATTERN IN

BIOTECHNOLOGY VI TH SEMESTER

GONDWANA UNIVERSITY

GADCHIROLI

INDIA

SESSION 2014-2015

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

BIOTECHNOLOGY

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 IV shall be of 450 Marks
6. Semester V to VI shall be of 450 Marks
7. Biotechnology 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
8. 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.
9. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects.
10. 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.
11. The pattern of Internal assessment and guidelines for the same shall be prepared by the respective subject Board of Studies
12. All Theory papers shall be divided into four units. Each unit shall be covered in 7.5 hours.
13. 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)
14. Practical exam shall be of 8 hours duration for one day.
15. Table of teaching and examination scheme attached.

Teaching & Examination Scheme

Bachelor of Science

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	Biotechnology Paper I- Genetic Engineering	3+@	-	6+@	3	50	18	10	4	120	22	-	-	-	150
2		Biotechnology Paper II-Plant Biotechnology	3+@	-		3	50	18	10	4		22	-	-	-	
3		Practical	-	6	6	-	-	-	-	-	-	-	6-8*	30	11	
4	Semester-VI	Biotechnology Paper I- Environmental Biotechnology	3+@	-	6+@	3	50	18	10	4	120	22	-	-	-	150
5		Biotechnology Paper II-Animal Biotechnology	3+@	-		3	50	18	10	4		22	-	-	-	
6		Practical	-	6	6	-	-	-	-	-	-	-	6-8*	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.

B.Sc. Biotechnology

Semester-VI

Paper -I Environmental Biotechnology

Unit 1- Introduction to Environmental Problems

- A. Environmental education-Problems and need.
- B. Environmental pollution: classification of pollutants
- C. Water pollution- water pollutants- organic, inorganic, microbial, radioactive, eutrophication,
- D. Air pollution- sources and pollutants.
- E. Ozone depletion, green-house effect and acid rain

Unit 2- Water Pollution and Waste water treatment

- A. Waste water: composition, types
- B. Measurement of water pollution- BOD (Biochemical oxygen demand), COD (chemical oxygen demand)
- C. Waste water treatment: classification, types (flow sheet)
- D. Biological waste water treatment: activated sludge, trickling filter, oxidation pond, rotating biological contactor, anaerobic digester.
- E. Treatment scheme of industries: paper and sugar industries

Unit 3- Xenobiotics, Biodegradation and Bioremediation

- A. Basic concept of xenobiotics, types
- B. Bioaccumulation and biomagnification
- C. Biodegradation of xenobiotics in environment: degradative plasmids, Biodegradation of hydrocarbons, surfactant, pesticides, synthetic dyes
- D. Bioleaching of heavy metals: Copper, mercury, advantages and disadvantages of bioleaching.

Unit 4- Biofertilizer, Bioenergy and Pest Management

- A. Biogeochemical cycles: - (nitrogen, carbon and sulphur)
- B. Biofuel: alcohol
- C. Biological nitrogen fixation- symbiotic and non-symbiotic nitrogen fixation, mechanism, Role of rDNA technology in nitrogen fixation.
- D. Biofertilizers- bacterial biofertilizers, algal biofertilizers, fungi as biofertilizers (VAM)
- E. Biopesticides: Examples and integrated pest management(IPM)

B.Sc. Biotechnology

Semester-VI

Paper –II Animal Biotechnology

Unit 1- Basics of Animal Cell Culture

- A. Concept of animal cell culture
- B. Various systems of animal tissue culture, advantages and limitations.
- C. Culture media: Natural media, synthetic media, balanced salt solutions.
- D. Chemical, physical and metabolic functions of different constituents of culture medium, role of CO₂, serum and supplements.
- E. Characteristics of cells in culture: contact inhibition, anchorage dependence, cell-cell communication.

Unit 2- Methods of Animal Tissue Culture

- A. Isolation of cells: various methods of separation of cell types
- B. Primary culture: behavior of cells, properties
- C. Explant culture; suspension culture.
- D. Established cell line cultures: definition, maintenance and management; cryopreservation, germplasm conservation

Unit 3- Developmental Techniques in Animal Cell Culture

- A. Apoptosis: measurement of cell death. apoptosis (death domain, role of cytochrome C)
- B. Cell transformation, cell cloning
- C. Cell synchronization and cell manipulation
- E. Stem cell cultures, embryonic stem cells and their applications.
- F. Three dimensional cultures

Unit 4- Application of Animal Tissue Culture

- A. Mass production of biologically important compounds- vaccines, insulin
- B. Manipulation of reproduction in animals: artificial insemination, embryo transfer in human
- C. *In vitro* fertilization technology: embryo cloning and embryonic stem cell.
- D. Transgenic animals- mice, large animals(sheep)

B.Sc. Biotechnology

Semester-VI

PRACTICALS

Environmental and Animal Biotechnology

1. Development of primary cell lines/maintenance of established cell lines.
2. *Determination of chemical oxygen demand (COD) of sewage sample.
3. *Production of microbial fertilizers (*Rhizobium*/*Azotobacter*/*VAM*).
4. Determination of total dissolved solids of water
5. *Determination of hardness and alkalinity of water sample.
6. Determination of dissolved oxygen concentration of water sample
7. *Determination of biochemical oxygen demand of sewage sample
8. Isolation of xenobiotic degrading bacteria by selective enrichment technique
9. Test for the degradation of aromatic hydrocarbons by bacteria
10. Preparation and formulation of microbial biopesticide (bacteria, fungi)
11. Effect of mycorrhizal fungi on growth promotion of plants.
12. Preparation of animal cell culture media.
13. *Cell count by haemocytometer (RBC/WBC)
14. *Microtomy-Fixation, dehydration, embedding, sectioning and staining of animal tissues.
15. Microphotography

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 is strongly recommended**
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 semesterwise practical examinations of B.Sc. III (Semester 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 exam will be 8 hrs. on a day

TEXT BOOKS & REFERENCES FOR THEORY AND PRACTICALS FOR B.Sc. semester VI:

1. ENVIRONMENTAL MICROBIOLOGY BY: RALPH MITCHELL, JOHN WILEY AND SONS INC.
2. ENVIRONMENTAL BIOTECHNOLOGY BY: C.F. FROSTER AND D.A. JOHN WASE, ELIS HORWOOD.
3. BIOCATALYSIS AND BIODEGRADATION: MICROBIAL TRANSFORMATION OF ORGANIC COMPOUNDS. BY: LAWRENCE P. WACEKETT.
4. A MANUAL OF ENVIRONMENT MICROBIOLOGY. BY: CHRISTON J. HURST, ASM PUBLICATION.
5. BIODEGRADATION AND BIOREMEDIATION ACADEMIC PRESS BY: SAN DIEGO.
6. BIOTECHNOLOGY IN THE SUSTAINABLE ENVIRONMENT, PLENUM PRESS, NY BASIC PRINCIPLES OF GEOMICROBIOLOGY. BY: A.D. AGATE.
7. ENVIRONMENTAL MICROBIOLOGY BY: R.M. MAIER, I.C. PAPPER AND C. P. GERBA.
8. METHODS IN MICROBIOLOGY: LYNCH AND HOBBIIE.
9. EXPERIMENTAL MICROBIAL ECOLOGY. BY: AROSISON ACADEMIC PRESS.
10. ADVANCES IN APPLIED MICROBIOLOGY. BY: D. PEARLMAN ACADEMIC PRESS.
11. MICROBIOLOGY OF EXTREME ENVIRONMENTS, EDITED BY CLIVE EDWARD, OPEN UNIVERSITY PRESS, MILTON KEYNES.
12. ENVIRONMENTAL SCIENCE WORKING WITH THE EARTH. BY: MILLER.
13. MICROBIAL BIOTECHNOLOGY, PRINCIPLES AND APPLICATIONS. LEE YUAN KUN.
14. MICROBIAL BIOTECHNOLOGY, FUNDAMENTALS OF APPLIED MICROBIOLOGY. BY: ALEXANDER N. GLAZER. HIROSHI NIKAIDO.
15. TEXTBOOK OF ORGANIC MEDICINAL AND PHARMACEUTICAL CHEMISTRY. BY: JAIME N. DELGADO WILLIAM A. REMERS
16. MICROBIAL ECOLOGY BY LYNCH ET AL.
17. EXPERIMENTAL MICROBIAL ECOLOGY BY BURNS ET AL.
ENVIRONMENTAL MICROBIOLOGY (2004) BY K. VIJAYA RAMESH, MJP PUBLISHERS
18. SOIL MICROBIOLOGY (2006) BY N.S. SUBBA RAO OXFORD & IBH PUBLISHING CO. PVT. LTD.
19. INTRODUCTION TO SOIL MICROBIOLOGY (1961) BY MARTIN ALEXANDER, JOHN WILEY & SONS, INC. NEW YORK, LONDON
20. MICROBIAL ECOLOGY (1993) BY RONALD M. ATLAS AND RICHARD BARTHA
21. TEXT BOOK OF BIOTECHNOLOGY, R.C. DUBEY, 2009, S. CHAND, DELHI
22. BIOTECHNOLOGY (E.H.), B. D. SINGH, 2008, KALYANI PUBLICATION
23. CELL BIOLOGY GENETICS MOLE BIOLOGY EVOLUTION AND ECOLOGY, P. S. VERMA, 2005, S. CHAND
24. INDUSTRIAL BIOTECHNOLOGY, THAKUR
25. BIOTECHNOLOGY, U. SATYANARAYAN, BOOKS AND ALLIED, 2007
26. BIOTECHNOLOGY, B. D. SINGH, KALYANI PLB, 2007
27. TECHNIQUES IN LIFE SCIENCES, DR. D. B. TEMBHARE, HIMALAYA PUBLICATION, 2004
28. ANIMAL BIOTECHNOLOGY, M.M. RANGA, HIMALAYA PUBLISHING HOUSE, 2007
29. BIOTECHNOLOGY A LAB. MANUAL, JEFFERY M. BECKER, ACADEMIC PRESS, 1998
30. CULTURE OF ANIMAL CELLS, IAN FRESHNEY, A JOHN WILLEY 2007
31. TEXT BOOK OF BIOTECHNOLOGY, R.C. DUBEY, S. CHAND, 2009
32. INVITRO CULTIVATION OF OF ANIMAL CELLS, BUTTERWORTH, HEINEMANM, OPEN UNIVERSITY PUBL, 2004
33. EXPERIMENTAL BIOTECHNOLOGY, MADHAV SHARMA, NIRMAL TRIPATR, CRESCENT PUB CORPORATION, 2008
34. ANIMAL CELL CULTURE, JOHN R. W. MASTERS, OXFORD UNI. PRESS NEWYORK, 2000
35. BIOCHEMICAL METHODS, SADASHIVAM, 2006