

SYLLABUS

FOR

B.Sc. SEMESTER PATTERN IN

MICROBIOLOGY

SEMESTER III

GONDWANA UNIVERSITY

GADCHIROLI

INDIA

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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 II (Semester III and IV)

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-III	Microbiology Paper I- Enzymology And Metabolism	3+@	-	6+@	3	50	18	10	4	120	22	-	-	150	
2		Microbiology Paper II- Industrial And Food Microbiology	3+@	-		3	50	18	10	4		22	-	-		-
3		Practical	-	6		6	-	-	-	-		-	-	-		10*
4	Semester-IV	Microbiology Paper I- Microbial Genetics	3+@	-	6+@	3	50	18	10	4	120	22	-	-	150	
5		Microbiology Paper II- Applied Microbiology	3+@	-		3	50	18	10	4		22	-	-		-
6		Practical	-	6		6	-	-	-	-		-	-	-		10*
Grand Total of Semester III & IV: 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 III

Paper I : Enzymology and Metabolism

Unit I : Enzyme Introduction

- a. Definition and nature of enzyme, History in brief.
- b. Definitions of different terms used in enzymology: Holoenzyme, apoenzyme, coenzyme, cofactor, prosthetic group, multienzyme, isoenzyme, membrane bound enzymes, zymogenes, enzyme inhibitors, reversible and irreversible inhibition-types
- c. Classification and nomenclature in brief(IUB)
- d. Models of enzyme catalysed reactions, Fisher lock – key hypothesis and Koshland induced fit hypothesis.

Unit II : Enzyme Kinetics

- a. Primary concept of catalysis, activation energy, transition state, difference between chemical catalysis and biocatalysis
- b. Enzyme kinetics- MichaelisMentenequation, single substrate reaction, ES complex, MM constant, operational definition of MM constant, enzyme activity, definition of enzyme unit (IU), katal, specific activity, turn over number
- c. Enzyme regulation- allosteric site, allosteric modulators
- d. Immobilized enzyme- techniques and applications(in brief)

Unit III: Carbohydrate And Lipid Metabolism

- a. General strategies of metabolism-catabolism, anabolism, amphibolism
- b. EMP pathway (detail)
- c. HMP pathway(outline)
- d. ED Pathway(outline)
- e. PK pathway(outline)
- f. TCA cycle(deatail) with regulation, anapleortic reactions- definition and examples
- g. β -oxidation of fatty acid

Unit IV: Energy Metabolism

- a. Phosphorylation- substrate level, definition and examples, oxidative phosphorylation and electron transport chain- general features, cytochromes, NADH and succinate dehydrogenases, generation of ATP- in detail
- b. Photophosphorylation- cyclic and non-cyclic photophosphorylation in detail
- c. General concept of respiration and fermentation- alcohol, lactic acid, acetone butanol and mixed acid fermentation
- d. Metabolic mill

MICROBIOLOGY
B. Sc. Semester III

Paper II : Industrial And Food Microbiology

Unit I : General Concepts

- a. Definition and scope of industrial microbiology
- b. Classification of microorganisms on the basis of industrial application (in Table)
- c. General concepts of fermentation: definition, types of fermentation, general layout of fermentation unit, design of typical batch fermentor, different parts, commonly used raw materials and antifoaming agents
- d. Screening: primary screening e.g. antibiotic and vitamins, secondary screening-general considerations
- e. Tolerance studies, scale up, inoculums build up, strain development

Unit II: Industrial production, Biochemistry, Recovery and Uses of

- a. Baker's Yeast
- b. Solvent: Alcohol
- c. Beverages: Beer(only introduction& types) and Wine (production process and types)
- d. Antibiotic : Penicillin
- e. Organic acid: Citric acid
- f. Amino acid: Lysine

Unit III: Milk Microbiology

- a. Definition and composition of milk
- b. Sources of microorganism in milk
- c. Testing the quality of milk: MBRT, grading of milk
- d. Pasteurization of milk- LTH, HTST, UHT, phosphatase test
- e. Milk product: Cheese, classification of cheese, cottage cheese production

Unit IV: Food Microbiology

- a. Introduction to food microbiology
- b. Classification of food on the basis of ease of spoilage
- c. Food spoilage- factors responsible for food spoilage, chemical changes due to spoilage
- d. Food preservation-high temperature(canning in detail), low temperature, preservatives and additives, radiation
- e. Food safety, Concept of HACCP
- f. Food poisoning and food infections: *Botulism*, *Salmonellosis*
- g. Food products: Idli

Practical Course for Semester III (Based on theory Paper I & II) Marks : 30

1. *Primary screening of antibiotic producer from soil
2. Leavening capacity of yeast
3. *Production and estimation of alcohol.
4. *Immobilization of yeast cell and demonstration of yeast invertase activity
5. Production of Penicillin and Bioassay of standard penicillin
6. Production and Bioassay of amylase enzyme
7. *Gradation of milk by Methylene Blue Reduction Test (MBRT).
8. *Testing Efficacy of pasteurization- phosphatase test
9. *Demonstration of enzymes: amylase ,catalase, lipase , gelatinase, Urease
10. Sterility testing of pharmaceutical products- injectibles, eye and ear drops.
11. Microbiological analysis of finished and raw foods(SPC, CPC, YMPC)
12. * Detection of food adulteration (milk, chilli powder)

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.

Distribution of marks during Practical examination of Microbiology Sem.- III

1. One major experiment	10
2. Two minor experiment	2x5= 10
3. Viva voce	5
4. Practical record	5

	30

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

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

1. Principles of Biochemistry- A.L. Lehninger
2. Fundamentals of Biochemistry- J. L. Jain
3. Biochemistry- Voet and Voet.
4. Textbook of Biochemistry- S.P. Singh.
5. Biochemistry, Author- Stryer.
6. Principles of Biochemistry – Zubey, Parson and Vance.
7. Food Microbiology- Frazier and Westhoff.
8. Food Microbiology- Adams and Moss
9. Introductory Food Microbiology– H.A. Modi
10. Industrial Microbiology by G. Reed (Ed), CBS Publishers (AVI Pub. Co.)
11. Biotechnology, A textbook of industrial Microbiology by Creuger and Creuger, Sinauer associates.
12. Biotechnology-Expanding Horizon by B.D.Singh, 1st ed., Kalyani Pub., Delhi.
13. Textbook of Industrial Microbiology, Author- A. H. Patel.
14. Industrial Microbiology, Author- L. E. Cassida
15. Industrial Microbiology, Author- G. Reed.
16. Industrial Microbiology, Author- Agarwal AndParihar.
17. Principles of Fermentation Technology- Standbary, Whitaker and Hall.
18. Biochemistry- Powar and Chatwal.
19. Harpers Biochemistry
20. Element of Biochemistry- O.P.Agrawal
21. Bacterial Metabolism- Dolle
22. Text book of biochemistry- West and Todd
23. Industrial Microbiology- Prescott and Dunn
24. Modern industrial microbiology and biotechnology-Nduka and Okaford
25. Food safety-theory and application-Paul L. Knechtges, Jones and Bartlet Ind. Pvt. Ltd. New Delhi
26. Food fermentations: micronutrient fortification of tribal food- S.D. Patankar, Lambert Academic Publication, Germany
27. Biochemistry- Satyanarayan
28. Biotechnology- Satyanarayan
29. Process Biotechnology, Theory & practice, Mukhopadhyay, TERI, New delhi