

SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade

Revised Syllabus For

Bachelor of Science Part- II

INDUSTRIAL MICROBIOLOGY

CBCS PATTERN

Syllabus to be implemented from

June, 2019 onwards.

B.Sc part II (Industrial Microbiology)

SEMESTER-III

Course -V	Course-V- DSC C-27 (CREDITS:02; TOTAL HOURS : 30)	No. of Hours per Credit
Unit I/ Credit I	INDUSTRIAL PRODUCTION OF FERMENTED FOODS	15
	A) Dairy Product 1. Cheese 2. Yoghurt 3. Curd 4. Butter B) Alcoholic Beverages 1. Wine: - Industrial production of - a) Red Table Wine b) Sparkling Wine-Champagne 2. Beer: - a) Ale b) Lager C) Pickles 1. Sauerkraut 2. Cucumber 3. Olives	
Unit II/ Credit II	Spoilage of Fermented Foods and its Preservation	15
	A) Spoilage of Dairy Product: 1. Cheese 2. Yoghurt 3. Curd 4. Butter B) Spoilage of Alcoholic Beverages: 1. Wine 2. Beer C) Spoilage of Pickles: 1. Sauerkraut 2. Cucumber 3. Olives D) PRESERVATION OF : 1. Dairy Product 2. Alcoholic Beverages 3. Pickles	

Course- VI	Course- VI DSC C-28 QUALITY CONTROL OF FOOD PRODUCTS (CREDITS:02; TOTAL HOURS : 30)	No. of Hours per Credit
Unit I /Credit I	QUALITY CONTROL OF FOOD PRODUCTS	15
	A) Need of Microbiological quality control of food. B) Microbiological analysis of food products 1. SPC 2. Detection for the presence of i) Pathogenic bacteria. <i>a. E. coli</i> <i>b. Staph. aureus</i> <i>c. Shigella</i> <i>d. Pseudomonas</i> <i>e. Salmonella</i> ii) Yeast and mold	
Unit II/ Credit II	Introduction to Quality Assurance of food products	15
	A) Basic concepts of:- 1. Regulation as per PFA,FDA,FPO. 2. Standards & Norms as per ISO, BIS, AGMARK	
	B) Introduction of GMP, GLP	
	C) Introduction to HACCP (Hazard Analysis Critical Control Points). D)TQMS (Total Quality Management System) of milk and milk products- 1. Raw material acceptance. 2. Process control. 3. Packaging. 4. Finished product storage. 5. Transport and Distribution E) ICMSF (International Commission on the Microbiological Specification of Foods) 1. Introduction 2. ICMSF–Sampling plans <i>a. The two class plan</i> <i>b. The three class plan</i>	

SEMESTER-IV

Course-VII	Course-VII DSC D-27 FERMENTATION TECHNOLOGY (CREDITS:02; TOTAL HOURS : 30)	No. of Hours per Credit
Unit I/ Credit I	Industrial Production:- Raw materials, Microorganisms, production process, Recovery and Applications:	15
	A)Antibiotics 1. Streptomycin 2. Tetracycline 3. Rifampicin B)Organic Acids 1. Lactic Acid 2. Citric Acid	
Unit II /Credit II	Industrial Production:- Raw materials, Microorganisms, production process, Recovery and Applications:	15
	A) Amino acids 1. Lysine 2. Glutamic Acid B)Enzymes 1. Amylases 2. Lipase 3. Proteases	
Course-VIII	Course-VIII DSC D-28 INDUSTRIAL PRODUCTION OF BIOFERTILIZERS (CREDITS:02; TOTAL HOURS : 30)	No. of Hours per Credit
Unit I/Credit I	Nitrogen fixing bio-fertilizers:	15
	A) Concept & its need in organic farming B) Rhizobium Bio fertilizer 1. Characteristics 2. Host-Rhizobium interaction 3. N ₂ -fixation in root-nodules 4. Production 5. Methods of application: B) Azotobacter Bio-fertilizer 1. Characteristics 2. N ₂ -fixation process	

	<ul style="list-style-type: none"> 3. Production 4. Methods of application <p>C) Azospirillum Bio-fertilizer</p> <ul style="list-style-type: none"> 1. Characteristics 2. Association with plants 3. Production 4. Methods of application 	
Unit II /Credit II	Phosphate Solubilizing Bio-fertilizers	15
	<p>A) VAM Bio-fertilizer</p> <ul style="list-style-type: none"> 1. Characteristics & types of association 2. Production 3. Methods of application <p>B) PSB Bio fertilizer (Phosphate solubilising Bacteria)</p> <ul style="list-style-type: none"> 1. Mechanism of phosphate solubilisation 2. Production 3. Methods of application <p>C) Quality control of Bio fertilizers as per FCO (Fertilizer Control Order)</p> <ul style="list-style-type: none"> 1. Introduction of FCO specifications for bio fertilizers 2. Sampling procedure 3. Method of analysis 4. Standards of bio fertilizers 5. Biostability of product bio fertilizer 	

**B.Sc.II INDUSTRIAL MICROBIOLOGY:
PRACTICAL COURSE:**

Course-III	PRACTICAL COURSE III (CREDITS:02; TOTAL HOURS : 30)	No. of Hours per Credit
Credit I	1) Production of sauerkraut 2) SPC of sauerkraut 3) SPC of buttermilk, cheese. 4) Isolation of bacteria from spoiled milk 5) Isolation of bacteria from spoiled cheese. 6) Isolation of bacteria from spoiled wine. 7) Isolation and identification of Lactic acid bacteria from Curd.	15
Credit II	1) Rapid detection of food pathogens – <i>E. coli</i> and <i>Staphylococcus</i> from given food sample. 2) Detection for the presence of <i>E. coli</i> & <i>Staph. Aureus</i> in butter. 3) Detection for the presence of <i>Pseudomonas</i> from given food sample. 4) Detection for the presence of <i>Salmonella</i> from given food sample. 5) Detection for the presence of Yeast and molds from given food sample.	15
Course-IV	PRACTICAL COURSE IV (CREDITS:02; TOTAL HOURS : 30)	
Credit III	1) Isolation of lipolytic, proteolytic producing microorganisms from suitable source. 2) Production, extraction, purification of Citric acid. 3) Production of Amylase by a Surface culture method 4) Production of protease by Submerged culture method. 5) Estimation of following fermentation products by suitable assay method. a). Antibiotics–Streptomycin & Tetracycline Diffusion assay method. b). Organic Acids–Lactic Acid & Citric Acid by titration method.	15

	c). Enzymes–Amylase (DNSA method). 6. Immobilization of Amylase by using Sodium Alginate method. 7) Assay of protease (folin ciocalteu method)	
Credit IV	1) Isolation of Azotobacter from soil 2) Isolation of Azospirillum from soil. 3) Isolation of Rhizobium from root-nodules. 4) Isolation of Phosphate solubilising bacteria from soil. 5) Determination of heterocyst frequency of blue-green bacteria. 6) Microbial limit test for PSB market fertilizer product	15

B.Sc. II INDUSTRIAL MICROBIOLOGY

LIST OF REFERENCE BOOKS FOR THEORY & PRACTICAL

1. Food Microbiology by Frazier.
2. Food Microbiology by H.A .Modi. (Vol. I&II)
3. Industrial Microbiology by A.H.Patel.
4. Industrial Microbiology by Prescott & Dunn.
5. Soil Microbiology by Subbarao.
6. Agriculture Microbiology by Rangaswamy.
7. Methods in Food and Dairy Microbiology by Harrigon.
8. Bio fertilizers –Vyas & Vyas(Ekta Publication).
9. Bacteriological Techniques- F.K. Baker
10. Milk & milk products–Winton & Winton
11. Pharmaceutical Microbiology–Hugo & Russell.
12. Citric acid Biotechnology–J. Achrekar.
13. Enzyme Biotechnology–G. Tripathi.
14. Bio fertilizers– Arun Sharma.
15. Industrial Microbiology–Agrawal / Parihar
16. Biotechnology–S. S. Purohit.
17. Agriculture Microbiology–G. Rangaswami & D. J. Bagyaraj
18. Text-book of Biotechnology–G. R. Chhatwal.
19. Pharmaceutical Biotechnology–Purohit / Kakrani / Saluja.
20. Practical Microbiology–R. C. Dubey and D. K. Maheshwari
21. Experimental Microbiology–Rakesh J. Patel & Kiran R. Patel. (Vol. I&II)
22. Fertilizer Control Order–1985 amended up to June, 201123. Practical Biochemistry by Plummer.

List of minimum equipment's for B.sc II Industrial Microbiology course

NATURE OF QUESTION PAPER AND DISTRIBUTION OF MARKS FOR B. Sc. II INDUSTRIAL MICROBIOLOGY FOR EACH PAPER

Common Nature of Question Paper as per Faculty of Science. SHIVAJI UNIVERSITY KOLHAPUR

B. Sc. PART II INDUSTRIAL MICROBIOLOGY PRACTICAL EXAMINATION

(A) The practical examination will be conducted on two consecutive days not less than 6 hrs on each day of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in his / her college, stating that he / she has completed in a satisfactory manner the practical course on the lines laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal had been properly maintained. Every candidate must have recorded his / her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the year. Candidates must produce their journals at the time of practical examinations

(C). Study tour- Candidates must visit at least two industries (Food / agro / bio fertiliser/pharma / dairy) and must submit report of visit duly signed by competent authority at the time of practical exam.

NATURE OF QUESTION PAPER AND DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION:

1. Q.1 Estimation of Lactic acid / Citric acid from fermentation broth	10
2. Q.2 Isolation of Azotobacter / Rhizobium / PSB from soil OR isolation of bacteria from spoiled Food	15
3. Q.3 Bioassay of Streptomycin / Tetracycline	20
4. Q.4 Assay of Amylase / Protease	10
5. Q.5 SPC OR Detection of presence of <i>E. coli</i> / <i>Staph.</i> / <i>Pseudomonas</i> from given food sample	15
6. Q.6 Spotting	10
7. Q.7 Tour report	10
8. Q.8 Journal	10
9. Q.9 TOTAL	100