



SYLLABUS

Course Title	MICROBIOLOGY-V	
Course Code	BSM501	
Course Credit	Lecture	: 04
	Tutorial	: 00
	Practical	: 03
	Total	: 07
Detailed Syllabus:		
Sr. No	Name of chapter & Details	Session Allotted
SECTION-I		
1	<p>Microbiology of Soil</p> <p>A. Properties of soil Physical & Chemical Characteristics of Soil, Rhizosphere & Microbial flora of Soil, Interactions among soil microorganisms: Neutral, Beneficial & Harmful interactions</p> <p>B. Biogeochemical cycles Introduction of Mineralization & immobilization of elements, Nitrogen Cycle: Proteolysis, Ammonification, Nitrification, Nitrate reduction., Denitrification; Biochemistry & genetics of nitrogen fixation (nif gene technology), Sulphur Cycle: Sulphur oxidation & Reduction, Winogradsky's Column, Carbon cycle: Degradation of complex organic compounds, formation of humus and its importance.</p>	10
2	<p>Food Microbiology Microbial flora of fresh food, Microbial spoilage of foods: Fresh foods & Canned foods, Food Borne infection & intoxication: Role of <i>S.aureus</i>, <i>C.botulinum</i> & <i>Salmonella Spp.</i> in food poisoning, Preservation of foods: General principles & methods of food preservation, Microbiological examination of food; Introduction to AGMark, Brief introduction about fermented foods: Pickles, Sauerkraut, Silage, Sausages & Bread, Microorganisms as food: Single Cell Protein, Mushrooms and Functional foods</p>	10
3	<p>Dairy Microbiology Milk as a medium, normal flora of milk, Types of microorganisms in milk: Biochemical types, Pathogenic types, Temperature types; Spoilage of milk & milk products, Microbial analysis of milk: SPC, Direct count, MBRT, Resazurin test, Grading of milk, Fermented milk Beverages & Manufactured Dairy Products: Starter Culture, Cheese, Yogurt, Buttermilk, Acidophilus milk, Kefir,</p>	8

	Preservation of milk: Principles & methods of preservation	
SECTION-II		
4	<p>Aquatic Microbiology & Microbiology of waste water</p> <p>A. Introduction Natural Water: Atmosphere, surface, Stored & Ground water; Aquatic environment: Temperature, Hydrostatic pressure, Light, Salinity, Turbidity, pH, inorganic & organic constituents, Distribution of microorganisms in the aquatic environment</p> <p>B. Microbiology of drinking water Sanitary survey, Bacteriological evidence of pollution, Bacteriological analysis & Sampling techniques of water, Microorganisms other than Coliforms as nuisance organisms</p> <p>C. Water purification Sedimentation, Filtration use of Sand filters, Disinfection</p> <p>D. Waste water Chemical and Microbial Characteristics of waste water, B.O.D.,C.O.D. as indicator of quality of waste water, Waste water treatment & Disposal --Single Dwelling Process &Municipal Treatment -- Primary Treatment, Secondary Treatment, Advanced & final treatment, Solid waste processing: Anaerobic Sludge digestion & Composting</p>	13
5	<p>Environment and Biotechnology</p> <p>A. Environment Types of Pollutants, Sources & Effect on ecology, Pollution by pesticides, Biomagnifications of pesticide &their biological control, Brief account on Water pollution (by Oil, Detergent, Heavy metal & industrial effluent) & their Biological control, Role of microorganisms in Biodeterioration of Paper, Textiles, paints, woods & metals and their control, Air Pollution & Air Sanitation</p> <p>B. Biotechnology What is Biotechnology, Biotechnology as interdisciplinary science; Ethical, Legal and Social Implications of Biotechnology; Bioleaching, Microbial enhanced oil recovery; Biofuels, Bioplastics</p>	15
List of Practical (6 Hours Per Week)		
	<ol style="list-style-type: none"> 1. To isolate nitrogen fixing bacteria. 2. To cultivate nitrifying and denitrifying bacteria. 3. To cultivate cellulose decomposing microorganisms from soil. 4. To demonstrate oozing, and to isolate pathogen from diseased specimen of lemon leaf showing citrus canker and to isolate <i>Xanthomonas</i> spp. 5. To perform standard qualitative analysis of milk 6. To perform Methylene Blue Reduction Time test for milk 7. To estimate DO of given water sample. 8. To isolate and identify coli forms from Water by Presumptive, Confirmed& Completed test 	

Instructional Method and Pedagogy:

1. Lectures will be conducted with the aid of multi-media projector, black board, Audio/Video clips etc. relevant to the content.
2. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
3. Surprise tests/Quizzes/Tutorials will be conducted.
4. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
5. Minimum ten experiments shall be there in the laboratory related to course contents.

Students Learning Outcomes:

After Successful completion of the above course, students will be able to:

Recall applications of different types of Microbiology.

Identify microbes present in different samples like soil, water, milk, food etc.

Solve problems related to environment.

Text book:

1. Prescott L. M., Microbiology. 9th edition, McGraw-Hill Education, New York.
2. Pelczar M.J. & Chain E.C.S. Microbiology. 5th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Prajapati J.B., Fundamentals of Dairy Microbiology. Akta Prakashan, Nadiad, Gujarat.

Reference Books:

1. Atlas R.M., Principles of Microbiology. 2nd edition, McGraw Hill, New Delhi, India.
2. Alexander M, Introduction to soil microbiology. 2nd edition, Krieger Publication Company, UK.
3. Frazier W.C., Food Microbiology. 3rd edition, McGraw-Hill, New York.
4. Powar and Daginawala, General microbiology Vol—2. Himalaya Publishing House, Mumbai.



SYLLABUS

Course Title	MICROBIOLOGY-VI	
Course Code	BSM 502	
Course Credit	Lecture	: 04
	Tutorial	: 00
	Practical	: 03
	Total	: 07
Detailed Syllabus:		
Sr. No	Name of chapter & Details	Session Allotted
SECTION-I		
1	<p>Fermentation Technology & Industrially Important Microorganisms Historical perspective and concept: General Concept and historical development of industrial microbiology, Range of Fermentation Processes, Component parts fermentation process, Economic aspects of fermentation industry</p> <p>Isolation & improvement of industrially important microorganisms: Primary & Secondary Screening, Isolation methods using selection of desired characters Improvement of industrially important microbes; Application of Protoplast fusion and recombinant DNA technology, Concept and application of bioinformatics in fermentation industry</p>	10
2	<p>Formulation of Fermentation Media Introduction, Types of Media and Medium formulation Raw materials; Crude Carbon and Nitrogen sources, Minerals, Precursors, Growth Regulators, Buffers, Antifoam agent Inoculum Medium Media Optimization</p>	10
3	<p>Design and aseptic operation Introduction and basic functions of fermenter, Types of bioreactors, Aeration and Agitation</p> <p>Fermentation process: Batch Fermentation, Continuous fermentation and their comparative advantages and disadvantages Sterilization process in fermentation industries: Fermenter sterilization, Medium sterilization, Sterilization of air and feed, Aseptic operation and Containment</p>	8

SECTION-II		
4	<p>Downstream Processes Methods of Cell separation: Birth conditioning, Precipitation, Sedimentation, Centrifugation, Filtration Techniques of Cell Disruption: Mechanical and Non mechanical methods Product Recovery: Liquid- liquid extraction, Solvent recovery, Two Phase aqueous extraction, Super critical fluid extraction Physical, Chemical and Biological assay of fermentation products</p>	13
5	<p>Studies of selective fermentation processes Production of organic solvents: Ethyl alcohol Production of enzymes: Amylases and Proteases Production of antibiotics: Penicillin and Streptomycin Production of amino acid: Lysine Production of organic acids: Citric acid Production of vitamins: Riboflavin Overview of Immobilization in fermentation process</p>	15
List of Practical (6 Hours Per Week)		
	<ol style="list-style-type: none"> 1. To perform Primary screening of industrially important microorganisms capable of producing: Antibiotics, Organic acids, amylases. 2. To perform bioassay of penicillin using <i>B. subtilis</i> 3. To perform laboratory fermentation & estimation of Ethyl Alcohol by <i>Saccharomyces</i>. 4. To perform laboratory fermentation & estimation of amylase by <i>B. subtilis</i>. 5. To study sterility testing of fermentation products (Demo) 6. To perform immobilization of yeast cells by Ca- alginate entrapment method & determination of viability of immobilized cells by invertase activity. 	
Instructional Method and Pedagogy:		
<ol style="list-style-type: none"> 1. Lectures will be conducted with the aid of multi-media projector, black board, Audio/Video clips etc. relevant to the content. 2. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. 3. Surprise tests/Quizzes/Tutorials will be conducted. 4. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. 5. Minimum ten experiments shall be there in the laboratory related to course contents. 		
Students Learning Outcomes:		
<p>After Successful completion of the above course, students will be able to:</p> <p style="padding-left: 40px;">Recall the concept of microbial production of antibiotic, organic acid, vitamins, amino acid and industrial alcohol.</p>		

Identify industrially important microorganisms.

Solve problems related to large scale production of biological products.

Text book:

1. P. F. Stanbury, A. Whittaker and S. J. Hall. Principles of Fermentation Technology. 2nd edition, Elsevier, New Delhi.

Reference Books:

1. Casida L. E.,J R, Industrial Microbiology. 2nd edition, New Age International Publishers, New Delhi.

2. A.H. Patel. Industrial Microbiology. 2nd edition, Trinity Press,New Delhi.



SYLLABUS

Course Title	MICROBIOLOGY-VII	
Course Code	BSM503	
Course Credit	Lecture	: 04
	Tutorial	: 00
	Practical	: 03
	Total	: 07
Detailed Syllabus:		
Sr. No	Name of chapter & Details	Session Allotted
SECTION-I		
1	Introduction to Metabolism, Bioenergetics and Enzyme Kinetics Bioenergetics: The concept of free energy, Determination of ΔG & Energy rich compounds, Energy metabolism: Role of ATP in metabolism, Role of reducing power in metabolism, Role of precursor metabolites in metabolism, Non Regulatory Enzymes : Derivation of the Michaelis- Menten Equation, Regulatory Enzymes : Conformational changes in Regulatory Enzymes	10
2	Heterotrophic mode of metabolism A. Catabolism of Carbohydrates : Glycolysis and its regulation, The Pentose phosphate pathway, The Entner - Doudroff pathway, The Citric acid cycle and its regulation The Glyoxylate cycle B. Catabolism of protein and amino acids: General reactions of amino acids catabolism, Stickland Reactions C. Catabolism of lipids: Oxidation of Fatty Acids, Beta- Oxidation of Fatty Acids	10
3	Bioenergetics Different modes of ATP generation, Electron transport chain : Introduction, Components of ETC and energy yield, Anaerobic Respiration, Methods of studying biosynthesis: Strategy of Biosynthesis, Use of Biochemical Mutants, Use of Isotopic Labelling, Bacterial photosynthesis, Biosynthesis of peptidoglycan	8
SECTION-II		
4	Some selected aspects of metabolism in specific microbial systems: Chemo - autotrophs: Nitrifying Bacteria, Sulfur Oxidizers, The Iron bacteria, The Hydrogen Bacteria; The lactic acid bacteria: Patterns of carbohydrate	13

	fermentation in lactic acid bacteria, The Enteric group and related Eubacteria: Fermentative patterns of Gram negative Eubacteria; Archaeobacteria: Energy metabolism and Carbon Assimilation	
5	Bacterial Membrane Membrane lipids, Membrane carbohydrates, Membrane proteins, Membrane transport of small molecules; Specific Transport Systems : Mechanosensitive channels, ATPbinding cassette Transport family, Chemiosmotic-driven transport, Establishing Ion gradients, Iron transport, The phosphotransferase system, Quorum sensing, Signal Transduction	15
List of Practical (6 Hours Per Week)		
	<ol style="list-style-type: none"> 1. To perform enzyme kinetics of amylase by Michaelis-Menten equation. 2. To perform enzyme kinetics of amylase by line weaver Burk plot. 3. To perform enzyme kinetics of alkaline protease by Michaelis-Menten equation. 4. To perform enzyme kinetics of alkaline protease by line weaver Burk plot. 5. To perform enzyme kinetics of alkaline phosphatase by Michaelis-Menten equation. 6. To perform enzyme kinetics of alkaline phosphatase by line weaver Burk plot. 	
Instructional Method and Pedagogy:		
<ol style="list-style-type: none"> 1. Lectures will be conducted with the aid of multi-media projector, black board, Audio/Video clips etc. relevant to the content. 2. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. 3. Surprise tests/Quizzes/Tutorials will be conducted. 4. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. 5. Minimum ten experiments shall be there in the laboratory related to course contents. 		
Students Learning Outcomes:		
<p>After Successful completion of the above course, students will be able to:</p> <ul style="list-style-type: none"> Recall the concepts and fundamental of Enzyme kinetics Identify and interpret the heterotrophic metabolism Solve the problems related to enzyme kinetics 		
Text book:		
1. D. L. Nelson and M. M. Cox, Lehninger, Principles of Biochemistry. 5 th edition, W. H. Freeman & Company, New York.		
Reference Books:		
<ol style="list-style-type: none"> 1. U. Satyanarayan and U. Chakrapani, Biochemistry. 4th edition, Elsevier, New Delhi. 2. Roger Y. Stanier, John L Ingraham, Mark L Wheelis, Rage R Painter, General Microbiology. 5th 		

edition, Macmillan, Hampshire & London.

3. Powar and Dagainawala, General microbiology Vol—1. Himalaya Publishing House, Mumbai.



SYLLABUS

Course Title	CAMPUS TO CORPORATE TRAINING-II	
Course Code	CD605	
Course Credit	Lecture	: 03
	Tutorial	: 00
	Practical	: 00
	Total	: 03
Detailed Syllabus:		
Sr. No	Name of chapter & Details	Session Allotted
VERBAL ABILITY		
1	Verbal Ability: <ul style="list-style-type: none"> • Understand and apply techniques to develop their verbal ability skills • Spotting errors, selecting words, Idioms and phrases, Verbal analogies, synonyms, sentence corrections, ordering of sentences, antonyms, change of speech. 	8
ESSAY WRITING		
2	Report Writing <ul style="list-style-type: none"> • Analyse and identify the techniques of report writing • Sketch the layout of report writing on the basis of the video/statistics/charts • Organize the ideas/views and draft the report/essay 	4
INTERVIEW READINESS		
3	CV/ Resume Building <ul style="list-style-type: none"> • Understand the format and design of the documents. • Apply Lexical showcasing their individual skills • Design their own document 	3
4	Cover Letter & Research on Company details <ul style="list-style-type: none"> • Identify the importance of a job profile from different companies. • Assess their own cover letter based on the power verbs from the job profile. • Reproduce the document highlighting the requisite areas 	2
5	Presentation Skill <ul style="list-style-type: none"> • Classify the do's and don'ts of presentation skills. • Locate the technique for handling questions during presentation. • Analyse their presentation based on the vision and mission of a company • Employ the skills acquired in delivering the presentation.8) Thiazine 	3

6	Grooming & Communication Skills <ul style="list-style-type: none"> • Understand the importance of the first impression • Apply good grooming habits for corporate culture • Locate gender inferiority problems if any • Review importance of gestures and body language • Dramatize the developed skills to overcome cross cultural sensitivity • Discriminate the traits creating barrier in communication 	2
7	FAQs & Open Ended Questions <ul style="list-style-type: none"> • Understand and analyse the significance of nonverbal skills while facing interview. • Apply the identified techniques handling stressful situation • Self-assess their individual strengths/weakness based on the key skills to handle FAQs 	8
GROUP DISCUSSION		
8	Interpersonal Skill – GD <ul style="list-style-type: none"> • Understand the concept of GD over a Debate. • Locate the importance of Interpersonal Skills in a GD • Demonstrate the acquired skill in role-plays • Analyse the key areas of improvement after demonstrating 	4
NON – VERBAL ABILITY		
9	Series, Analytical Reasoning, Embedded Images: <ul style="list-style-type: none"> • Understand the types of problems asked in company tests. • Apply the identified techniques • Recognize the steps • Solve the problems with time management 	3
10	Paper Folding, Image Analysis, Mirror Images, Shape Construction: <ul style="list-style-type: none"> • Understand the types of problems asked in company tests. • Understand the short cut methods • Apply the identified techniques • Recognize the steps • Solve the problems with time management 	3
11	Analogy, Pattern Completion, Paper Cutting, Dot Situation: <ul style="list-style-type: none"> • Understand the types of problems asked in company tests. • Recognize the steps • Understand the short cut methods • Solve the problems with time management 	2
12	Cubes and Dice, Classification, Water Images, Figure Matrix <ul style="list-style-type: none"> • Understand the types of problems asked in company tests. • Understand the short cut methods • Recognize the steps • Solve the problems with time management 	3
	Total Hours	45
Instructional Method and Pedagogy:		
1. Participative – Student Centric Learning Method 2. Activities and Role Plays and Audio-Visual tools will be used to enhance student		

participation.

Students Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Develop** their comprehensive approach on job skills & they will be ready for placements.
- **Understand** the importance of Portfolio & Resume preparation and **apply** the techniques to develop their individual documents.
- **Assess** their individual skills and develop all IFS on the basis of their strength areas.
- **Evaluate** how to perform During GD & how to stand out of the Crowd.
- **Cultivate** Public Speaking Skills and overcome with the stage fear.
- **Employ** all the IFS skills during mock interview.

Additional Resources:

www.indiabix.com