Devi Ahilya Vishwavidyalaya, Indore

Syllabus for B.Sc. Part-I, II and III (Optional subject- Industrial microbiology) 2011 Onwards

Semester	Course title	Distribution of marks			
		CCE	Semester Exam	Practical Exam	Total
Sem-I	General Microbiology	15	85	50	150
Sem-II	Microbial Physiology and Biochemistry	15	85	50	150
Sem-III	Immunology and Bacterial Genetics	15	85	50	150
Sem-IV	Environmental Microbiology	15	85	50	150
Sem-V	Fermentation Technology	15	85	50	150
Sem-VI	Food and Pharmaceutical Microbiology	15	85	50	150

Scheme of practical examination in each semester		
Total marks- 50 Duration- 6 Hrs.	1. Major exercise	12 Marks
	2. Minor exercise	10 Marks
	3. Minor exercise	10Marks
	4. Spotting	08 Marks
	5. Viva-voce	05 Marks
	6. Practical record	05 Marks

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B.Sc. Part- I (Industrial microbiology) Semester-I

nester-I	General microbiology	CCE- 15 Marks End Exam. - 85 Marks
it-I	**History and Scope of Microbiology** Contributions of Pioneers- Anton von Leeuwenhoek, Robert Koch, Edward Jenner, Louis Pasteur, Paul Ehrlich, Alexander Fleming and Joseph Lister. Branches of Microbiology and its development. Spontaneous generation v/s Biogenesis. Place of microbes in living world. Beneficial and harmful microbes. Microbes in extreme environments.	
iit-II	**Tools and Techniques in Microbiology** Microscopy- Bright field, Dark field, Fluorescence, Phase contrast and Electron microscopes. Colorimetry, Centrifugation and Electrophoresis. Hot air oven, Autoclave, Laminar Air Flow Bench. Stains and Staining Techniques- Dyes: Classification and types; Types of staining- Simple (Monochrome, Negative), Differential (Gram & Acid Fast) and Special staining (Spore, Granules, Flagella, Spirochetes). Wet mount and Hanging drop preparations.	
nit-III	**Taxonomy and Morphology of Bacteria** Classification systems of prokaryotes. Bacterial nomenclature. Size, shape and arrangement of bacterial cells. Cell wall of Gram positive and negative bacteria (Protoplast, Spheroplast). Structures external to the cell wall- flagella, pili, capsule, sheath and prosthecae. Structures internal to the cell wall- cell membrane, nuclear material, spores, cytoplasmic inclusions, magnetosomes and plasmids.	
nit-IV	**Eucaryotes, Acaryotes and Bacteria with unusual properties** General characters and economic importance of – Fungi (Yeast and Moulds), Algae and Protozoans. Introduction to acellular forms of life- Viruses, Viriods, Prions. Structure of Bacterial Viruses. Classification and cultivation of Viruses. Multiplication of Bacterial Viruses. Bacteria with unusual properties- Rickettsia, Chlamydia, Mycoplasma, Archaebacteria, Cyanobacteria, Actinomycetes.	
nit-V	**Control of Microorganisms** Fundamentals of control Physical methods of control- Temperature, radiation, dessication, osmotic pressure and filtration Chemical methods of control- Phenol, alcohol, halogens, heavy metals, dyes, detergents, quaternary ammonium compounds, aldehydes and gaseous chemosterilizers Evaluation of antimicrobial potency of disinfectants and antiseptics- Tube dilution method, Agar diffusion method, Phenol coefficient.	

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List of Practicals

1. Principles, working knowledge of Instruments like Autoclave, pH meter, Incubator, Hot air oven, Centrifuge, Microscope, Refrigerator, Colony counter, Laminar Air Flow.
2. Neutralization, cleaning and sterilization of glassware.
3. Measurement of microorganisms.
4. Preparation of culture media like Nutrient Agar and its uses.
5. Preparation of stains.
6. Motility of bacteria by Hanging drop method.
7. Staining procedures I- Simple staining – Monochrome staining and Negative staining.
8. Staining procedures II- Differential staining - Gram Staining and Acid Fast Staining.
9. Staining procedures III- Special / Structural staining - Cell wall staining, Capsule staining, Metachromatic Granule staining, Endospore staining, Spirochete staining.
10. Identification of some common fungi.

Scheme of Practical Examination- Semester- I

M.M. 50 (8 Hrs.)

Ex.1	Perform Gram staining of given bacterial culture	[12]
Ex.2	Perform Structural / Special Staining (Cell wall staining, Capsule staining, Metachromatic Granule staining, Endospore staining, Spirochete staining).	[10]
Ex.3	Perform wet mount of given fungi and stain.	[10]
Ex.4	Spotting.	[8]
Ex. 5	Viva-Voce.	[5]
Ex. 6	Practical Record.	[5]

Recommended Books

Microbiology	- Pelczar, Chan & Kreig
Microbiology	- Prescott, Harley and Klein
General Microbiology	- Stainer RY. Ingharam JL.
Alcamo's Fundamentals of Microbiology	- Pommerville
Elementary Microbiology	- Modi, H.A.
The Microbial World	- Roger Stanier
Fundamentals of Microbiology	- Frobisher Hinsdill
Fundamental Principles of Bacteriology	- Salle, A.J.
Textbook of Microbiology	- Dubey, R.C.
Microbiology- A Human Perspective	- Nester, Roberts
Foundations in Microbiology	- Kathleen Talaro
General Microbiology (Vol I, II, III)	- Powar & Daginawala
General Microbiology	- Hans G. Schlegel
General Microbiology	- Robert Boyd.
Microbiology – A Practical Approach	- Bhavesh Patel and Nandini Phanse
Solutions to Practical Microbiology	- Bhavesh Patel and Nandini Phanse

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B.Sc. Part- I (Industrial microbiology) Semester-II

Semester-II	Microbial physiology and Biochemistry	CCE- 15 Marks End Exam. - 85 Marks
Unit-I	**Cultivation and preservation of bacteria** Nutrition and nutritional types of bacteria. Bacteriological media and its types. Cultivation of aerobic and anaerobic microbes. Pure culture and cultural characteristics. Maintenance and preservation of cultures.	
Unit-II	**Bacterial growth** Mathematical expression of bacterial growth. Growth curve of bacteria. Batch, continuous, synchronous and diauxic growth. Factors affecting microbial growth. Quantitative measurement of bacterial growth by cell mass, cell number and cell activity.	
Unit-III	**Enzymes** General characters, classification and nomenclature of enzymes. Factors affecting enzyme activity. Mechanism of enzyme action. Regulation of enzyme activity. Applications of enzymes.	
Unit-IV	**Basic Biochemistry** Bonds of life- covalent, ionic and hydrogen bonds General properties, classification and functions of – Carbohydrates, Lipids, Amino acids, Proteins, Nucleic acids.	
Unit-V	**Bioenergetics and Metabolism** Principles of Bioenergetics. Modes of energy production- Photophosphorylation, Substrate level phosphorylation, Oxidative phosphorylation Catabolism- Carbohydrates-(Aerobic and Anaerobic); Proteins- (Proteolysis, Transamination, Deamination) and Fats/Lipids- (Beta oxidation) Bacterial photosynthesis	

List of Practicals

1. Isolation of microorganisms by streak plate method.
2. Isolation of microorganisms by pour plate method.
3. Growth of microorganisms on agar slants and agar stabs
4. Growth of microorganisms in broth.
5. Qualitative detection of carbohydrates, proteins and lipids
6. Effect of environment on bacterial growth : a. Temperature b. Osmotic pressure c. pH
7. The lethal action of Ultraviolet light on growth.
8. The oligodynamic action of heavy metals on bacterial growth
9. Comparative evaluation of antimicrobial agents.

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Scheme of Practical Examination- Semester- II

M.M. 50 (3+3 Hrs.) (2days)

Ex.1	Perform isolation of microorganisms by streak plate / pour plate method.	[12]
Ex.2	Study the effect of:-	[10]
a.	Environmental condition on bacterial growth – Temperature / pH.	
b.	Lethal action of Ultra-Violet light on bacterial growth.	
c.	Oligodynamic action of heavy metals on bacterial growth.	
Ex.3	Qualitative analysis of biomolecules – Carbohydrates/ Proteins / Lipids.	[10]
Ex.4	Spotting.	[8]
Ex. 5	Viva-Voce.	[5]
Ex. 6	Practical Record.	[5]

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Microbiology	-	Prescott, Harley and Klein
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Elementary Microbiology	-	Modi, H.A.
The Microbial World	-	Roger Stanier
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Textbook of Microbiology	-	Dubey, R.C.
Microbiology- A Human Perspective	-	Nester, Roberts
Foundations in Microbiology	-	Kathleen Talaro
General Microbiology (Vol I, II, III)	-	Powar & Daginawala
Principles of Biochemistry	-	Lehniger, A.L.
Microbial Physiology	-	Moat & Foster
Fundamentals of Biochemistry	-	Jain, J.L.
General Microbiology	-	Hans G. Schlegel

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