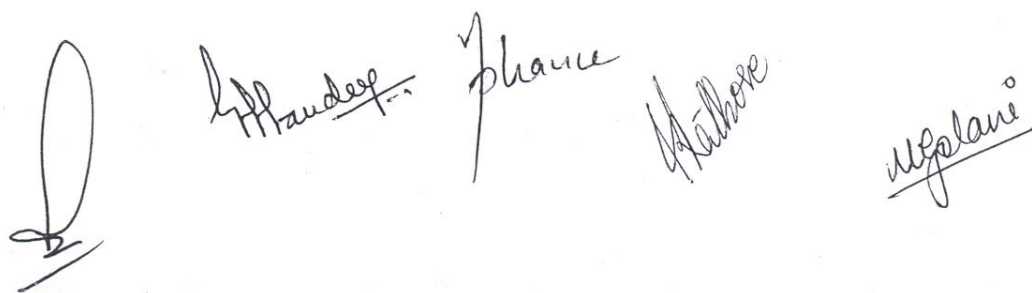


**Devi Ahilya Vishwavidyalaya, Indore**  
**Syllabus for B.Sc. Part-I, II and III (Optional Subject-Microbiology)**

2016-2017 onwards

Semester	Course title	Distribution of marks			
		CCE	Theory Exam	Practical Exam	Total
Sem-I	General Microbiology	15	85	50	150
Sem-II	Microbial Physiology and Biochemistry	15	85	50	150
Sem-III	Bacterial Genetics	15	85	50	150
Sem-IV	Immunology and Clinical Microbiology	15	85	50	150
Sem-V	Industrial Microbiology	15	85	50	150
Sem-VI	Applied and Environmental Microbiology	15	85	50	150
Sem-VI	Project Work				100
Theory-60 lectures/paper (1 lecture = 40 minutes)					

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



Devi Ahilya Vishwavidyalaya, Indore

B.Sc. Part- I (Microbiology) Semester-I

Semester-I	General Microbiology	CCE- 15 Marks End Exam. - 85 Marks
Unit-I	<b>History and Scope of Microbiology</b> Contributions of Pioneers- Anton von Leeuwenhoek, Robert Koch, Edward Jenner, Louis Pasteur, Alexander Fleming and Joseph Lister Discovery of microbial world : Theories of biogenesis and abiogenesis Major branches of Microbiology Beneficial and harmful activities of microbes Difference between prokaryotic and eukaryotic microorganisms	12 lectures
Unit-II	<b>Taxonomy and Morphology of Bacteria</b> Classification systems of prokaryotes- Haeckel's three kingdom concept, Whittaker's five-kingdom classification system, Woese's three-domain system. General principles of bacterial nomenclature. Introduction to Bergey's manual. Size, shape and arrangement of bacterial cells. Structure, chemical composition and functions of components in bacterial cell: Cell wall, cell membrane, capsule, endospore, flagella, pili, chromosomal & extra chromosomal material, cell inclusions	12 lectures
Unit-III	<b>Eucaryotes, Acaryotes and Bacteria with unusual properties</b> General characters and economic importance of eucaryotes-Fungi (Yeast and Molds), Algae and Protozoans. Viruses- Classification and structure of viruses. Introduction to virioids and prions. Bacterial viruses -Structure of bacterial viruses, Multiplication of bacterial viruses- lytic and lysogenic cycles. Bacteria with unusual properties-Rickettsia, Chlamydia, Mycoplasma, Archaeobacteria, Cyanobacteria.	12 lectures
Unit-IV	<b>Microscopy and Staining Techniques</b> Principle, construction, working and applications of: <ul style="list-style-type: none"> <li>• Bright field microscopy</li> <li>• Dark field microscopy</li> <li>• Fluorescence microscopy</li> <li>• Electron microscopy</li> </ul> Stains and Staining Techniques: Definitions of stain, Types of stains Principles of staining techniques for following: <ul style="list-style-type: none"> <li>• Monochrome and Negative staining</li> <li>• Special staining (endospore, cell wall, capsule, flagella, metachromatic granules)</li> <li>• Differential Staining (Gram &amp; Acid Fast)</li> </ul> Wet mount and hanging drop preparations.	12 lectures
Unit-V	<b>Control of Microorganisms</b> Definition of sterilisation, disinfection, antiseptic, sanitation, bactericidal bacteriostatic. Physical methods of control- temperature, radiation, dessication, osmotic pressure, filtration. Chemical methods of control- Phenol, alcohol, halogens, heavy metals, detergents, quaternary ammonium compounds and gaseous chemosterilizers.	12 lectures

Recommended Books

1. Microbiology-Pelczar MJ, Chan ECS & Kreig NR, 5<sup>th</sup> edition (Tata McGraw-Hill, New Delhi)
2. Fundamentals of Microbiology- Frobisher M, Hinsdill RD, Crabtree KT & Goodheart CR, 9<sup>th</sup> edition (W.B. Saunders Co.)
3. Fundamental Principles of Bacteriology -Salle AJ, 7<sup>th</sup> edition (Tata McGraw-Hill, New Delhi),
4. Microbiology- Prescott LM, Harley JP & Klein DA , 7<sup>th</sup> edition (Wm.C Brown Publishers, USA)
5. Elementary Microbiology -Modi, HA (Vol. I & II), 1<sup>st</sup> edition (Akta Pakashan, Nadiad)
6. A Handbook of Elementary Microbiology -Modi, HA, 1<sup>st</sup> edition (Shanti Pakashan, Rohtak)
7. Textbook of Microbiology -Dubey RC & Maheshwari DK, 2<sup>nd</sup> edition (S Chand & Co. New Delhi)
8. Essentials of Practical Microbiology- Patel B & Phanse N, 1<sup>st</sup> edition (Print Care, Indore)
9. Solutions to Practical Microbiology- Patel B & Phanse N, 2<sup>nd</sup> edition (Print Care, Indore)

*[Signature]*

*[Signature]*

*[Signature]*

*[Signature]*

*[Signature]*

**B.Sc. Part- I (Microbiology) Semester-I**

**General Microbiology**

**List of Practicals**

1. Principles, working knowledge of Instruments like Autoclave, Incubator, Hot air oven, Microscope, Refrigerator, Colony counter, Laminar Air Flow, Colorimeter, Centrifuge
  2. Neutralization, cleaning and sterilization of glassware.
  3. Measurement of microorganisms.
  4. Preparation of stains.
- Staining Techniques-
5. Monochrome staining
  6. Negative staining
  7. Gram Staining
  8. Cell wall staining
  9. Capsule staining
  10. Metachromatic granule staining
  11. Endospore staining.
  12. Identification of some common fungi.

**Scheme of Practical Examination- Semester -I**

**M.M. 50 (4 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).	[10]
Ex.3	Perform wet mount of given fungal culture	[10]
Ex.4	Spotting.	[08]
Ex. 5	Viva-Voce.	[05]
Ex. 6	Practical Record.	[05]



*Handwritten signature: P.P. Maurya*

*Handwritten signature: Phane*

*Handwritten signature: Kabore*

*Handwritten signature: Meplani*

**Devi Ahilya Vishwavidyalaya, Indore**  
**B.Sc. Part- I (Microbiology) Semester-II**

Semester-II	Microbial Physiology and Biochemistry	CCE- 15 Marks End Exam. - 85 Marks
<b>Unit-I</b>	<b>Cultivation and preservation of bacteria</b> 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.	<b>12 lectures</b>
<b>Unit-II</b>	<b>Bacterial growth</b> Growth curve of bacteria. Batch, continuous, synchronous and diauxic growth. Factors affecting microbial growth. Growth of microbes in extreme environments Quantitative measurement of bacterial growth by cell mass, cell number and cell activity.	<b>12 lectures</b>
<b>Unit-III</b>	<b>Enzymes</b> General characters, classification and nomenclature of enzymes. Factors affecting enzyme activity. Mechanism of enzyme action. Regulation of enzyme activity-Feedback inhibition, Precursor activation, Energy- link control Applications of enzymes.	<b>12 lectures</b>
<b>Unit-IV</b>	<b>Chemistry of Biomolecules</b> General properties, classification and functions of – • Carbohydrates • Lipids • Proteins • Amino acids	<b>12 lectures</b>
<b>Unit-V</b>	<b>Microbial Metabolism</b> Metabolism of carbohydrates- energy production by aerobic processes, anaerobic processes; bacterial photosynthesis Metabolism of proteins-proteolysis, transamination, deamination Metabolism of lipids- Beta oxidation of fatty acids	<b>12 lectures</b>
<b>Recommended Books</b>		
<ol style="list-style-type: none"> <li>1. Microbiology- Pelczar MJ, Chan ECS &amp; Kreig NR, 5<sup>th</sup> edition (Tata McGraw-Hill, New Delhi)</li> <li>2. Fundamentals of Microbiology- Frobisher M, Hinsdill RD, Crabtree KT &amp; Goodheart CR, 9<sup>th</sup> edition (W.B. Saunders Co.)</li> <li>3. Fundamental Principles of Bacteriology-Salle AJ, 7<sup>th</sup> edition (Tata McGraw-Hill, New Delhi),</li> <li>4. Microbiology- Prescott LM, Harley JP &amp; Klein DA , 7<sup>th</sup> edition (Wm. C. Brown Publishers, USA)</li> <li>5. Elementary Microbiology -Modi, HA (Vol.I), 1<sup>st</sup> edition (Ekta Pakashan, Nadiad)</li> <li>6. A Handbook of Elementary Microbiology-Modi, HA, 1<sup>st</sup> edition (Shanti Pakashan, Rohtak)</li> <li>7. A Textbook of Microbiology- Dubey RC &amp; Maheshwari DK, 2<sup>nd</sup> edition (S Chand &amp; Co. New Delhi)</li> <li>8. Lehniger-Principles of Biochemistry-Nelson DL &amp; Cox MM, 4<sup>th</sup> edition (CBS Publishers)</li> <li>9. Microbial Physiology- Moat AG, Foster JW &amp; Spector MP, 4<sup>th</sup> edition (John Wiley &amp; Sons)</li> <li>10. Fundamentals of Biochemistry- Jain JL, Jain S &amp; Jain N, 8<sup>th</sup> edition (S Chand &amp; Co. New Delhi)</li> <li>11. Biochemistry- Satyanarayana U, 4<sup>th</sup> edition ( Elsevier, India)</li> <li>12. Essentials of Practical Microbiology-Patel B &amp; Phanse N, 1<sup>st</sup> edition (Print Care, Indore)</li> <li>13. Experiments in Biotechnology- Nighojkar S &amp; Nighojkar A, 1<sup>st</sup> edition (Satprachar Press, Indore)</li> </ol>		

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

**B.Sc. Part- I (Microbiology) - Semester-II**  
**Microbial Physiology and Biochemistry**  
**List of Practicals**

1. Preparation of culture media like nutrient agar and its uses.
2. Growth of microorganisms on agar slants, stab and in broth.
3. Isolation of microorganisms by streak plate method.
4. Isolation of microorganisms by pour plate method.
5. Qualitative detection of carbohydrates.
6. Qualitative detection of proteins.
7. Qualitative detection of lipids.
8. Effect of environment on bacterial growth : Temperature.
9. Effect of environment on bacterial growth : Osmotic pressure.
10. Effect of environment on bacterial growth : pH
11. The oligodynamic action of heavy metals on bacterial growth.
12. Demonstration of extracellular enzyme production by microbes
13. Effect of pH on enzyme activity
14. Effect of temperature on enzyme activity

**Scheme of Practical Examination- Semester-II**

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

Ex.1	a) Effect of temperature on bacterial growth b) Effect of pH on bacterial growth c) Effect of temperature on enzyme activity d) Effect of pH on enzyme activity	[12]
Ex.2	Perform isolation of microorganisms by streak plate / pour plate method.	[10]
Ex.3	Qualitative analysis of biomolecules – Carbohydrates/ Proteins / Lipids	[10]
Ex.4	Spotting	[08]
Ex. 5	Viva-Voce	[05]
Ex. 6	Practical Record	[05]



*Deep*

*Shane*

*Mathore*

*Ugolau*

**Devi Ahilya Vishwavidyalaya, Indore**  
**B.Sc. Part- II (Microbiology) Semester-III**

Semester-III	Bacterial Genetics	CCE- 15 Marks End Exam. - 85 Marks
<b>Unit-I</b>	<b>Fundamentals of Genetics</b> Genotype and Phenotype Evidence for DNA as genetic material Structure and types of DNA and RNA. Genetic code. DNA Replication.	12 lectures
<b>Unit-II</b>	<b>Mutation</b> Spontaneous and induced mutations Molecular basis of mutation – types of mutations. Types of bacterial mutants and their isolation. Mutagenic agents – Physical: mechanism of mutagenesis by UV and ionizing radiations. Chemical mutagenesis: Base analogues (5BU, 2AP), nitrous acid, hydroxyl amine, alkylating agents	12 lectures
<b>Unit-III</b>	<b>Genetic Recombination</b> Transformation – Competence, process of transformation Conjugation – F factor, characters of donar and recipient. steps in conjugation, formation of Hfr and F prime cells, sexduction Transduction – Generalized and specialized transduction, abortive transduction. Types and functions of transposons and plasmids	12 lectures
<b>Unit-IV</b>	<b>Expression and Regulation of Gene Activity</b> Central Dogma of Molecular biology: Transcription, Translation Operon Concept Inducible Operon – Lac Operon. Repressible Operon – Trp Operon.	12 lectures
<b>Unit-V</b>	<b>Genetic Engineering - Tools and Techniques</b> Restriction Endonucleases - Types and uses. Isolation of DNA. Vectors- Plasmid, Phage, Cosmid and Yeast Vectors. Cloning technique and identification of clones. Achievements, biohazards and ethical issue of genetic engineering.	12 lectures
<b>Recommended Books</b>		
<ol style="list-style-type: none"> <li>1. Genetics- Russel JP, 2<sup>nd</sup> edition (Scott, Foresman &amp; Company, USA)</li> <li>2. Principles of Genetics- Gardner JE, Simmons JM &amp; Snustad PD, 8<sup>th</sup> edition (John Wiley &amp; Sons, Canada)</li> <li>3. Concepts of Genetics- Klug WS &amp; Cummings MR, 10<sup>th</sup> edition (Bejamin Cummings, USA)</li> <li>4. Microbial Genetics- Freifelder D, 2<sup>nd</sup> edition (Jones &amp; Bartlett, Boston)</li> <li>5. Molecular Biology &amp; Genetic Engineering- Singh BD, 1<sup>st</sup> edition (Kalyani Publishers)</li> <li>6. Microbiology -A Practical Approach- Patel B &amp; Phanse N, 2<sup>nd</sup> edition (Print Care, Indore)</li> <li>7. Experiments in Biotechnology- Nighojkar S &amp; Nighojkar A, 1<sup>st</sup> edition (Satprachar Press, Indore)</li> </ol>		







**B.Sc. Part- II (Microbiology) Semester-III**

**Bacterial Genetics**

**List of Practicals**

1. Staining and microscopic observation of nuclear material of bacteria and yeasts
2. Isolation of bacterial genomic DNA.
3. Isolation of Plasmid DNA.
4. Electrophoretic analysis of DNA.
5. UV as a mutagenic agent.
6. Replica plating technique.
7. Isolation of antibiotic resistant mutants by gradient plate technique.
8. Quantitative estimation of DNA by DPA method.
9. Quantitative estimation of RNA by orcinol method.
10. Spectrophotometric analysis of DNA (Demonstration)

**Scheme of Practical Examination- Semester- III      M.M. 50 (3+3 Hrs.) (2days)**

Ex.1- Isolation of bacterial genomic /plasmid DNA.	[12]
Ex.2 - Quantitative estimation of RNA by orcinol method/DNA by DPA method.	[10]
Ex.3 - Replica plate technique/Gradient plate technique/UV as mutagenic agent.	[10]
Ex.4 - Spotting	[08]
Ex.5 - Viva Voce	[05]
Ex.6 - Practical Record	[05]

*Handwritten signature*

*Handwritten signature*

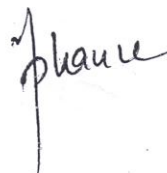
*Handwritten signature*

*Handwritten signature*

**Devi Ahilya Vishwavidyalaya, Indore**  
**B.Sc. Part- II (Microbiology) Semester-IV**

Semester-IV	Immunology and Clinical Microbiology	CCE- 15 Marks End Exam. - 85 Marks
<b>Unit-I</b>	<b>Infection and Immunity</b> Normal flora of human body. Infection and its types. Mechanism of pathogenesis. Immunity – Natural and acquired. Defense mechanisms – First line, second line and third line of host defense. Vaccines – types of vaccines, modern vaccination schedule for children in India.	<b>12 lectures</b>
<b>Unit-II</b>	<b>Epidemiology of infectious diseases</b> Transmission of diseases. Types of diseases – Epidemic, Endemic, Pandemic, Sporadic. Epidemiological Methods – Descriptive, Analytical and Experimental Epidemiology. Antibiotics – Mode of action and development of resistance. Antiviral and Antifungal drugs.	<b>12 lectures</b>
<b>Unit-III</b>	<b>Components of Immune System</b> Organs and cells involved in immune response. Antigens – properties and types, Adjuvants. Immunoglobulins – structure and types. Primary and secondary response. Complement – components and biological activities.	<b>12 lectures</b>
<b>Unit-IV</b>	<b>Antigen – Antibody Interactions</b> Antigen and antibody reactions – agglutination, precipitation. immunofluorescence, ELISA, RIA. Hypersensitivity – Immediate and delayed type. Autoimmune diseases.	<b>12 lectures</b>
<b>Unit-V</b>	<b>Microorganisms and Diseases</b> Gram positive cocci – <i>Staphylococcus aureus</i> . Gram negative bacilli – <i>Salmonella typhi</i> . Acid fast bacteria – <i>Mycobacterium tuberculosis</i> . Anaerobic, Gram positive bacilli – <i>Clostridium tetani</i> . Spirochaete – <i>Treponema pallidum</i> . Virus – Hepatitis and HIV.	<b>12 lectures</b>
<b>Recommended Books</b>		
<ol style="list-style-type: none"> <li>1. Kuby Immunology- Kindt TJ, Goldsby RA, Osborne BA, 6<sup>th</sup> edition (WH Freeman &amp; Co. New York)</li> <li>2. Text book of Microbiology-Ananthnarayan R and Panikar CKJ, 8<sup>th</sup> edition, (Univ Press Pvt Ltd, Hyderabad )</li> <li>3. Text book of Microbiology-Chakraborty P, 1<sup>st</sup> edition (New Central book agency Pvt Ltd.)</li> <li>4. Fundamental Immunology- Paul WE, 7<sup>th</sup> edition (Lippincott Williams &amp; Wilkins, USA)</li> <li>5. Fundamentals of Immunology-Coleman RM, Lombord MF and Sicard RE, 2<sup>nd</sup> edition (WMC Brown, USA)</li> <li>6. Immunology-Weir DM and Steward J, 8<sup>th</sup> edition (Topley &amp; Wilson, UK)</li> <li>7. Immunology-Rao CV, 2<sup>nd</sup> edition (Narosa Publishing House, New Delhi)</li> <li>8. Essentials of Immunology-Roitt IM, 11<sup>th</sup> edition, (Blackwell Pub, USA)</li> <li>9. Immunology- Elgert KD, 2<sup>nd</sup> edition (Wiley Blackwell)</li> <li>10. Microbiology-A Practical Approach-Patel B and Phanse N, 2<sup>nd</sup> edition (Print Care, Indore)</li> </ol>		









**B.Sc. Part- II (Microbiology) Semester-IV**  
**Immunology and Clinical Microbiology**  
**List of Practicals**

1. Determination of Blood Groups.
2. Estimation of hemoglobin by Sahli's method.
3. Estimation of hemoglobin by Cyanmethaemoglobin method.
4. Total count of W.B.C.
5. Total count of R.B.C.
6. Differential W.B.C. count.
7. Flocculation reaction- VDRL.
8. Agglutination reaction- Widal test.
9. Examination of urine- chemical, physical, microscopic and bacteriological.  
Isolation and identification of medically important bacteria-
10. *Staphylococcus aureus*.
11. *E. coli*.
12. *Proteus* sp.
13. *Salmonella typhi*.

**Scheme of Practical Examination- Semester- IV M.M. 50 (3+3 Hrs.) (2days)**

Ex.1 – Identification of medically important microorganisms <i>Staphylococcus aureus</i> / <i>E.coli</i> / <i>Proteus</i> / <i>Salmonella typhi</i>	[12]
Ex.2 - Total count :RBC/WBC/Differential count of WBC/Hemoglobin estimation/ Urine Analysis.	[10]
Ex.3 – Antigen-Antibody reactions – Widal /VDRL Test.	[10]
Ex.4 – Spotting	[08]
Ex.5 – Viva Voce	[05]
Ex.6 – Practical Record	[05]

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

*Handwritten signature*

**Devi Ahilya Vishwavidyalaya, Indore**  
**B.Sc. Part- III (Microbiology) Semester-V**

Semester-V	Industrial Microbiology	CCE- 15 Marks End Exam. - 85 Marks
<b>Unit-I</b>	<b>Fundamentals of Industrial Fermentations</b> Primary and secondary screening of industrially important organisms. Strain development strategies. Scale up of fermentation process. Raw materials for media preparation. Inoculum development. Harvesting and product recovery.	<b>12 lectures</b>
<b>Unit-II</b>	<b>Fermentor Design</b> Design of typical batch fermentor. Factors affecting fermentor design. Types of fermentations – Batch and continuous fermentations. Surface, solid state and submerged fermentation Monitoring and control of-agitation, aeration, pH, temperature and dissolved oxygen. Industrial sterilization of media and air.	<b>12 lectures</b>
<b>Unit-III</b>	<b>Analytical Microbiology</b> Bioassay of growth supporting substances – vitamins. Bioassay of growth inhibiting substances – antibiotics. Phenol coefficient of antimicrobial substances Quality control tests – Sterility testing, Microbial limit test (MLT), pyrogen testing (LAL test), Minimum inhibitory concentration (MIC).	<b>12 lectures</b>
<b>Unit-IV</b>	<b>Industrial Production</b> Enzyme– Protease Amino acids– Lysine Antibiotics – Penicillin Vitamins – Cyanocobalamin Organic acids – Citric acid Solvent – Ethyl alcohol.	<b>12 lectures</b>
<b>Unit-V</b>	<b>Microbial biotechnology</b> Applications of microbes in pest control- Bacterial, fungal and viral biocontrol agents Biofertilizers- symbiotic and non-symbiotic nitrogen fixing microorganisms, phosphate solubilizers, mycorrhiza Fuel from microorganisms – digester design and biogas production technology. Immobilized enzymes – Methods of immobilization and their applications.	<b>12 lectures</b>
<b>Recommended Books</b>		
<ol style="list-style-type: none"> <li>1. Textbook of Industrial Microbiology-Patel AH, 1<sup>st</sup> edition (Macmillan India Ltd, Madras)</li> <li>2. Industrial Microbiology-Cassida LE, 4<sup>th</sup> edition (Wiley Eastern Ltd, New Delhi)</li> <li>3.Principles of Fermentation Technology-Stanbary FP, Whitaker A and Hall JS, 2<sup>nd</sup> edition, (Elsevier, Delhi)</li> <li>4.Fermentation Technology- Modi HA, 1<sup>st</sup> edition (Pointer Publisher, Jaipur)</li> <li>5.Biotechnology -Industrial Microbiology- Crueger W &amp; Crueger A, 2<sup>nd</sup> edition (Panima Publisher, Delhi)</li> <li>6.ndustrial Microbiology- Prescott SC &amp; Dunn CG, 4<sup>th</sup> edition (Agrobios India, Jodhpur)</li> <li>7.Industrial Microbiology: Fundamentals and Applications- Agarwal AK &amp; Parihar P, 1<sup>st</sup>edition (Agrobios India, Jodhpur)</li> <li>8.Microbiology – A Practical Approach- Patel B &amp; Phanse N, 2<sup>nd</sup> edition (Print Care, Indore)</li> </ol>		

Patel AH

Phanse

Kalboxe

Meghane

**B.Sc. Part- III (Microbiology) Semester-V**  
**Industrial Microbiology**

**List of Practicals**

1. Screening of antibiotic producing microorganisms.
2. Primary screening of amylase producing microorganisms.
3. Primary screening of protease producing microorganisms.
4. Primary screening of cellulase producing microorganisms.
5. Primary screening of lipase producing microorganisms.
6. Microbial assay of antibiotics.
7. Microbial assay of vitamins.
8. Estimation of MIC for antibiotics.
9. Sterility testing of pharmaceutical products- injectibles, eye drops and ear drops.
10. Microbial Limit Test- tablets and syrups.
11. Area monitoring.

**Scheme of Practical Examination- Semester- V**

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

Ex.1 – Microbial assay of antibiotics / MIC	[12]
Ex.2 – Sterility testing/MLT- Total aerobic bacterial count/ MLT-For specific pathogens/ Area Monitoring	[10]
Ex.3 – Primary screening of antibiotic producers/amylase/ protease/cellulase /lipase producers.	[10]
Ex.4 – Spotting	[08]
Ex.5 – Viva Voce	[05]
Ex.6 – Practical Record	[05]

  
A. S. Hande

Phane

Kathore

M. Golani

**Devi Ahilya Vishwavidyalaya, Indore**  
**B.Sc. Part- III (Microbiology) Semester-VI**

Semester-VI	Applied and Environmental Microbiology	CCE- 15 Marks End Exam. - 85 Marks
<b>Unit-I</b>	<b>Microbiology of soil</b> Composition of soil. Estimation of soil microflora. Interactions among soil microflora. Biogeochemical cycles – Nitrogen, Carbon and Sulfur cycles.	<b>12 lectures</b>
<b>Unit-II</b>	<b>Microbiology of food</b> Microbiological examination of food and milk. Food and milk-borne diseases. Food intoxications. Spoilage of food – fresh food, canned food, vegetables and milk products. Grading of milk – MBRT, resazurin and phosphatase tests. Preservation of food. Dairy products – Cheese, Butter and Yogurt. Microorganisms as food – Single Cell Protein.	<b>12 lectures</b>
<b>Unit-III</b>	<b>Microbiology of water and waste-water</b> Microbiological examination of water and waste-water. Water borne diseases. Water purification. Treatment of waste-water- primary, secondary, advanced and final treatments, solid processing. Eutrophication.	<b>12 lectures</b>
<b>Unit-IV</b>	<b>Microbiology of air</b> Air borne diseases. Microbiological analysis of air. Aeromicroflora of different habitats. Aeroallergens. Control of microorganisms in air.	<b>12 lectures</b>
<b>Unit-V</b>	<b>Applications of microorganisms</b> Microbial leaching of copper and uranium. MEOR-biorecovery of petroleum. Bioremediation, Biodeterioration – petroleum products, leather, textile and paper. Applications of biosensors and biopolymers.	<b>12 lectures</b>
<b>Recommended Books</b>		
<ol style="list-style-type: none"> <li>1. Introduction to soil microbiology-Alexander M, 2<sup>nd</sup> edition (John Wiley and Sons NewYork)</li> <li>2. Soil Microbiology- Subba Rao NS, 4<sup>th</sup> edition (Oxford and IBH, Publishing Co. New Delhi)</li> <li>3. Fundamental Principles of Bacteriology -Salle AJ, 7<sup>th</sup> edition (Tata McGrawhill,NewDelhi)</li> <li>4. Microbiology-Pelczar MJ, Chan ECS &amp; Kreig NR, 5<sup>th</sup> edition (Tata McGraw-Hill, New Delhi)</li> <li>5. A Textbook of Microbiology- Dubey RC &amp; Maheshwari DK, 2<sup>nd</sup> edition (S Chand &amp; Co. New Delhi)</li> <li>5. Food Microbiology- Frazier CW and Westhoff CD, 4<sup>th</sup> edition (Tata McGrawhill,NewDelhi)</li> <li>6. Food Microbiology- Adams RM and Moss OM, 3<sup>rd</sup> edition (RSC publisher)</li> <li>7. Introductory Food Microbiology-Modi HA, 1<sup>st</sup> edition, (Aavishkar Publishers, Jaipur)</li> <li>8. Modern Food Microbiology- Jay JM, 5<sup>th</sup> edition (Aspen Publishers, Maryland)</li> <li>9. Introduction to Environmental Microbiology-Michael R, 1<sup>st</sup> edition (Prentice Hall)</li> <li>10. Bioremediation-Baker KH and Herson DS (Mc Graw Hill, New York)</li> <li>11. Microbiology – A Practical Approach- Patel B &amp; Phanse N, 2<sup>nd</sup> edition (Print Care, Indore)</li> </ol>		

App. Phanse

Phanse

Mahore

Ugalaw

**B.Sc. Part- III (Microbiology) Semester-VI**  
**Applied and Environmental Microbiology**  
**List of Practicals**

1. Qualitative and quantitative examination of food.
2. Qualitative and quantitative examination of milk.
3. Qualitative and quantitative examination of water.
4. Qualitative and quantitative examination of sewage.
5. Estimation of soil microflora (bacteria, yeast and mold).
6. Isolation of *Azotobacter*.
7. Isolation of *Rhizobium* from root nodules.
8. Isolation of phosphate solubilizing microorganisms.
9. Estimation of air micro-flora.
10. Isolation of *Lactobacillus*.
11. Isolation of Yeast.

**Scheme of Practical Examination- Semester- VI**

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

Ex.1 – Qualitative and quantitative analysis of water/food/milk/sewage.	[12]
Ex.2 – Isolation of <i>Azotobacter</i> / <i>Rhizobium</i> /phosphate solubilizing microorganisms	[10]
Ex.3 – Isolation of <i>Lactobacillus</i> /Yeast	[10]
Ex.4 – Spotting	[08]
Ex.5 – Viva Voce	[05]
Ex.6 – Practical Record	[05]

