“Education for Knowledge, Science and Culture”

-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha’s

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR

B.Sc.Part-1 CBCS Syllabus with effect from June,2018

Semester: I

Microbiology- Paper -I

MICROBIOLOGY-DSC – 1010 A

INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Theory : 60 Hours (75 Lectures) Credits -4

SYLLABUS FOR MICROBIOLOGY
B.Sc. PART-I

SEMESTER- I

Paper I:	**DSC 10 A : INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY**	**No. of Hours per Unit/Credit**
Section 1		
UnitI/ Credit I	**1.History and mile stones in microbiology:**	**15**
	1.History and mile stones in microbiology: 1. Spontaneous generation *vs*. biogenesis. 2.Contributions of a)Antony von Leeuwenhoek b)Edward Jenner c)Louis Pasteur d)Robert Koch e)Ivanowsky f)Joseph Lister g)Alexander Fleming h)Martinus W. Beijerinck i)Sergei N. Winogradsky j)Hargobindsingh Khorana. 3. Beneficial and harmful activities of microorganisms. 4. Classification of microorganisms –Whittaker's five kingdom and Carl Woese's three kingdom classification systems. 5.Taxonomic ranks **2. Scope of Microbiology:** 1.Introduction to applied branches of Microbiology : a) Air, b) Water, c) Sewage, d) Soil, e) Dairy, f) Food, g) Medical, h)Industrial, i) Biotechnology and j) Geomicrobiology. **2. Bacterial systematics :** i) Common OR vernacular name ii) Scientific name	
UnitI/ Credit I	**1. Types of Microorganisms:** **A.General characteristics of different groups:** a) Acellular microorganisms-Viruses, Viroids, Prions b) Cellular microorganisms- Bacteria, Algae, Fungi and Protozoa; with emphasis on distribution, occurrence and morphology. c) Structure of Prokaryotic and eukaryotic cell. Difference between prokaryotic and eukaryotic microorganisms.	**15**

	2. Control of Microorganisms A. Definitions of - Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Antisepsis, Sanitization. B. Mode of Action and application of- a) Physical agents: i) Temperature – a) Dry heat, b) Moist heat, ii) Desiccation, iii) Ultrasonication iv) Radiations – U.V. Ray, Gamma rays, v) Filtration – Asbestos and Membrane filter b) Chemical Agents: i) Phenol and Phenolic compounds ii) Alcohols (Ethyl alcohol) iii) Halogen compounds (chlorine and iodine) iv) Heavy metals (Cu and Hg) v) Fumigation by Gaseous Agents – Ethylene oxide, Beta-propiolactone and formaldehyde vi) Osmotic Pressure	

Paper I:	**DSC 10 A : INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY**	**No. of Hours per Unit/Credit**
Section 2		
UnitIII/ Credit III		**15**
	1. General Principles of Microscopy : A)Types of microscopes: light and electron microscopes, Light microscopy: Parts, Image formation, Magnification, Numerical aperture, Resolving power and Working distance. B. Ray diagram, special features and applications of : i) Compound Microscope ii) Phase Contrast Microscope iii) Electron Microscope **2. Stains and Staining procedures** A. Definition of dye and stain B. Classification of stains – Acidic, Basic and Neutral C. Principles, Procedure, Mechanism of staining procedures i) Monochrome staining ii) Negative staining	

	iii) Differential staining : Gram's staining and Acid fast staining D. Special staining methods i) Cell wall (Chance's method) ii) Capsule (Maneval's method) iii) Volutin granule (Albert's method)	
UnitIV/ Credit IV	**1. Microbial Nutrition** **A) Nutritional requirements of microorganisms:** i) Water; Micronutrients; Macronutrients; Carbon, Energy source; Oxygen and Hydrogen; Nitrogen, Sulpher and Phosphorous and growth factors. ii) Concept of auxotroph, Prototroph and fastidious organisms based on Growth factors. B) Nutritional types of microorganism based on carbon and energy sources. a. Autotrophs b. Heterotrophs c. Phototrophs d. Chemotrophs e. Photoautotrophs f. Chemoautotrophs g.Photoheterotrophs h. Chemoheterotrophs. **2. Culture media:** a) Components of media, b) Types and use of- Natural and synthetic media, chemically defined medium, complex medium, selective, differential, enriched and enrichment medium. **3. Cultivation of microorganisms:** Use of culture media for cultivation, Conditions required for growth of the microorganisms.	

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B.Sc.Part-1 CBCS Syllabus with effect from June,2018

Semester: II

Microbiology- Paper -II

MICROBIOLOGY-DSC – 1010 B

BACTERIOLOGY & APPLIED MICROBIOLOGY

Theory: 60 Hours (75 Lectures) Credits -4

SYLLABUS FOR MICROBIOLOGY
B.Sc. PART-I

SEMESTER- II

Paper II:	**DSC 10 B : BACTERIOLOGY & APPLIED MICROBIOLOGY**	**No. of Hours per Unit/Credit**
Section 1		
UnitI/ Credit I	**Bacterial Cell organization**	**15**
	Bacterial Cell organization A . Cell size, shape and arrangement, B. Cytology of Bacteria : Structure and Function of- i)Cell-wall: ii) Cell membrane. ii) Cell Membrane: iii) Capsule and slime layer. iv) Flagella and Pili. v) Ribosomes, vi . Mesosomes, vii). inclusion bodies, viii).nucleoid, chromosome and plasmids vi) Endospore C) Reserve food materials – Nitrogenous and non nitrogenous	
UnitII/ Credit II	**Biochemistry:**	**15**
	A. Proteins : i) Introduction to amino acids , peptide bond. ii) Types of amino acids based on R group – a) Nonpolar, aliphatic amino acids. b) Aromatic amino acids. c) Polar, Uncharged amino acids. d)Positively charged (basic) amino acids e) Negatively charged (acidic) amino acids. iii) Structural levels of proteins: primary, secondary, tertiary and quaternary. **B. Carbohydrates:** i) Monosaccharides : Classification based on aldehyde and ketone groups; structure of Ribose, Deoxyribose, Glucose, and Fructose. ii) Disaccharides : Glycosidic bond, structure of lactose and sucrose. ii) Polysaccharides : Structure of starch, glycogen and cellulose.	

	C. Lipids : i) Simple lipids – Fats, oils and waxes. ii). Compound lipids – Phospholipid, Glycolipids iii) Derived lipids – Cholesterol **D. Enzymes:** i)Definition and types of enzymes ii) Concept of apoenzyme, coenzyme, cofactor and active site iii) Mechanism of Enzyme Action- Lock and key hypothesis, Induced fit hypothesis **E. Nucleic Acids :** i) DNA – Structure (Watson and Crick Model) and function. ii) RNA – Types (m-RNA, t-RNA, r-RNA), structure and functions.	

Paper II:	**DSC 10 B : BACTERIOLOGY & APPLIED MICROBIOLOGY**	**No. of Hours per Unit/Credit**
	Section II	
UnitIII/ Credit III		**15**
	1) Water Microbiology: a) Sources of microorganisms in water. b) Fecal pollution of water. c) Indicators of fecal pollution d) Routine Bacteriological analysis of water. 1) SPC 2) Tests for Coliforms i) Qualitative a. **Detection of coliforms** - Presumptive test, Confirmed Test, Completed test. b. **Differentiation between coliforms** - IMViC test, Eijkman test. ii) Quantitative – MPN, Membrane filter technique e) Municipal water purification process and it's significance. **2) Milk Microbiology** a) General composition of Milk. b) Sources of contamination in milk.	

	c) Microbiological examination of Milk – SPC and dye reduction tests : i) MBRT test, ii) Resazurin test d) Spoilage of milk – Change in Colour and flavor, curdling and ropiness e) Pasteurization (definition, types of methods used) – vii) LTH (Low Temperature Holding) viii) HTST (High Temperature Short Time) ix) UHT (Ultra High Temperature) Efficiency of Pasteurisation – Phosphatase test (Qualitative)	
UnitIV/ Credit IV	**1. Enrichement and Isolation of Microorganisms from natural environment.** A. Pure culture techniques – Streak plate, Spread plate, Pour Plate. B. Isolation and cultivation of anaerobic organisms by using media components and by exclusion of air. **2. Preservation of microbial cultures –** Subculturing, overlaying cultures with mineral oils, storage at low temperature, lyophilization. **3. Systematic study of pure cultures:** A. Morphological characteristics. B. Cultural characteristics - Colony characteristics on solid media, growth in liquid media. C. Biochemical Characteristics - i) Sugar fermentation ii) H2S gas production iii) Detection of enzymes - Amylase, Caseinase and Catalase. **4. Concept Culture collection centres.**	**15**

B.Sc.Part-1 CBCS Syllabus with effect from June,2018

MICROBIOLOGY MBP- 101

INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Theory : 60 Hours (75 Lectures) Credits -2

MICROBIOLOGY MBP-102
BACTERIOLOGY

Theory : 60 Hours (75 Lectures) Credits -2

B.Sc. I Microbiology
Practical Course

Paper I	PRACTICAL COURSE-I: MBP- 101 INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY	No. of Hours per Unit/Credit
	1. Preparations of- stains (0.5% basic fuchsin, 0.5% crystal violet), Reagents (phosphate buffer of pH 7, 1 N and 1M solutions of HCL and NaOH), physiological saline. 2. Biosafety- Table disinfection, hand wash, use of aprons, proper disposal of used material, Aseptic techniques, Cleaning and sterilization of glasswares. 3. Study of Laboratory instruments used in the microbiology laboratory: Laminar air flow, autoclave, incubator, hot air oven, colorimeter, colony counter and bacteriological filter assembly 4. Study of compound microscope. 5. Microscopic observation of bacteria: Monochrome staining, negative staining, Gram's staining, motility by Hanging-drop method. Cell wall staining (Chance's method), capsule staining (Manuval's method), Volutine granule staining (Albert' s method) 6. Preparation of liquid and solid culture media-. agar plates, buts and slants; Peptone water, nutrient broth, nutrient agar; Sabourauds agar and Potato Dextrose agar, Glucose yeast extract agar; MacConkey's agar. 7. Preparation of solid and liquid medium and assuring its sterility by autoclave and hot air oven. 8. Sterilization of glassware using Hot Air Oven and assessment for sterility 9. Fungal Mounting- *Penicillium and Aspergillus* 10. Demonstration of presence of microflora in air by exposure of nutrient agar plates to the air.	**60**

Paper II	PRACTICAL COURSE-II: MBP-102 - BACTERIOLOGY	No. of Hours per Unit/Credit
	1. Enrichment of coliform from water by MacConkeys broth. 2. Personal hygiene- Demonstration of presence of bacterias from hands, Teeth and skin (swabbing) by cultivation methods. 3. Isolation of pure cultures of bacteria by four quadrant streaking method**,** and studies of Colony characteristics, Gram staining and motility of – i) *Escherichia coli* ii) *Bacillus species* iii) *Staphylococcus aureus* 4. Biochemical tests : i)Detection of production of indole, excess acid, acetoin and utilization of citrate as a carbon source by IMViC test ii) Detection of glucose and lactose fermentation ability of bacteria iii) Detection of H_2S production ability of bacteria 5. Detection of enzyme production ability of bacteria - i) Amylase ii) Catalase iii) Caseinase ii) 6. Determination of bacteriological quality of milk by MBRT test. 7. Preparation of serial dilutions of water and soil for isolation of bacteria. 8. Isolation of bacteria from water (spread plate technique) and soil (pour plate technique) by preparation of serial dilutions. 9. Enumeration of bacteria from water and milk by SPC method.	**60**