SHREE H. N. SHUKLACOLLEGE OF SCIENCE

(AFFILIATED TO SAURASHTRA UNIVERSITY)

SYLLABUS NEP-2020

B.Sc. Honours/ Honours with Research in Microbiology (First Year)

Semester I

Course Category	**Major-1**
Title of the Course	**Fundamentals of Microbiology**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**75**

Unit No.	Topics	Hours	Marks
Unit-I	**Scope and History of Microbiology** • Microbiology as a field of Biology • Mile stones of Microbiology • The Place of Microorganisms in the living world; Distribution of Microorganisms in Nature • Applied areas of Microbiology	**9**	**15**
Unit-II	**Major Groups of Microorganisms** • Difference between Eukaryotes, Prokaryotes and Archaea • Major groups of Microorganisms: Structure and types of Prokaryotic microbes • Eukaryotic Microorganisms: Structure and types of Fungi, Algae, Protozoa • Akaryotic microbe: Structure and types of Viruses	**9**	**15**
Unit-III	**Microscopy** • Microscopy: Introduction and Types • Principle, and working of: Bright field Microscopy, Dark field Microscopy • Principle, and working of: Fluorescent Microscopy, Phase Contrast Microscopy • Electron Microscopy – Types, working and Limitations	**9**	**15**
Unit-IV	**Staining** • Stains and staining solutions • Types of Stains: Natural, Acidic & Basic Stains • Chromophore & Auxochrome groups, Leuco compounds • Types of Staining	**9**	**15**
Unit-V	**Morphology of Microorganisms** • Size, Shape, and Arrangement of Bacteria Bacterial Structures – External to Cell Wall: Capsule, Flagella, Pili, Prostheca, Sheath & Stalk • The cell wall of Bacteria – Structure and chemical composition of Gram-negative and Gram-positive Bacterial cell wall • Bacterial Structures – Internal to Cell Wall: Cell Membrane, Cytoplasm, Cytoplasmic inclusions, Endospores, Cyst and Nuclear Material.	**9**	**15**

Reference Books:

- Pelczar, M.J., Chan, E.C.S., Kreig, N.R. (2003). Microbiology 5th Edition, Tata McGraw-Hill Publication Company
- Prescott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology 5th edition, New York: WCB Mc Graw Hill publication
- Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.
- Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
- Modi, H.A. Elementary Microbiology - Vol –I & II, Akta Prakashan, Nadiad.
- Atlas. R.M., Principles of Microbiology- 2nd Edition
- Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications,

Course Category	**Major Practical -1**
Title of the Course	**Fundamentals of Microbiology**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**25**

Sr. No.	Experiments
1	Principles, working, and uses of the following laboratory instruments: a) Microscope b) Incubator c) pH meter d) Refrigerator e) Colorimeter f) Colony counter
2	Principles, working, and uses of the following sterilizers: a) Autoclave b) Hot air oven c) Steam sterilizer d) Inspissator e) Bacteriological filters.
3	Preparation of glassware for sterilization and disposal of laboratory media and cultures.
4	Preparation of Stains and Staining Reagents.
5	Study of Permanent Slides of Bacteria, Fungi, Algae, and Protozoa.
6	Study of bacterial motility by hanging drop method.(Demonstration)

7	Monochrome Staining: a) Negative Staining b) Positive Staining
8	Differential Staining: Gram's Staining
9	Special staining of bacteria: a) Capsule staining – Hiss's method, b) Cell wall staining – Webb's method c) Spore staining – Schaeffer's method d) Metachromatic granule staining – Albert's method e) Spirochete staining – Harrie's method

Reference Books:

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi
4. Konika Sharma, Manual of Microbiology – Tools and Techniques, Ane books, Delhi

Course Category	**Major-2**
Title of the Course	**Introduction to Microbial Chemistry**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**75**

Unit No.	Topics	Hours	Marks
Unit-I	**Basic Biochemistry** • Introduction to Atoms, Elements & Molecules • Major Chemical bonds found in biological system: Ionic Bonds, Covalent Bonds, Hydrogen Bonds, Van der Waals interactions, Hydrophobic interactions • Major Chemical reactions: Acid Base, Redox, Condensation-Hydrolysis Reactions • Water and pH - important properties	**9**	**15**
Unit-II	**Carbohydrates** • Definition and Classification of Carbohydrates • Structure and properties of Monosaccharide • Types and importance of Disaccharides • Types of importance of Polysaccharides	**9**	**15**

Unit-III	**Proteins** • Definition and Functions of Proteins • Amino acids: Classification • Physical & Chemical Properties of Amino acids • Structure of Proteins: Primary, Secondary, Tertiary & Quaternary Levels	**9**	**15**
Unit-IV	**Lipids and Nucleic acids** • Definition, Functions and Classification of Lipids • Introduction and significance of Fatty acids, Triacylglycerol, Phospholipids and Steroid • Introduction to Nitrogen Base, Nucleosides & Nucleotides, Structure of Deoxyribonucleic acid: A-DNA, B-DNA, Z-DNA • Introduction to RNA & its types	**9**	**15**
Unit-V	**Enzymes** • Definition of Enzymes, Apo- enzyme, Core Enzyme, Holo enzyme, Coenzyme, Cofactors, Prosthetic Groups, and Classification • Mechanism of enzyme action – Active Sites, Activation Energy, Lock & Key Model, Induced Fit model • Factors affecting enzyme activity,Enzyme inhibition	**9**	**15**

Reference Books:

- Atlas, R.M., Bartha, R. (1997). Microbial Ecology, 4th Edition: Benjamin Cummings publication
- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
- Powar, C.B., Daginawala, J.F. (2010). General Microbiology Vol-I. Mumbai: Himalaya Publishing House.
- Conn E.E., Stumpf P.K. (1989). Outlines of Biochemistry, Wiley publication.
- Stanier, R.Y. (1987). General Microbiology, 5th Edition: Macmillan publication.
- Nelson, D.L., Cox, M.M. (2013). Lehninger: Principles of Biochemistry. W.H. Freeman publication.
- Satyanarayan, U. (2008). Biotechnology. Kolkata, West Bengal: Books and allied (P) Ltd

Course Category	**Major Practical -2**
Title of the Course	**Introduction to Microbial Chemistry**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**25**

Sr. No.	Experiment
1	Measurement and adjustment of pH of various solutions
2	Estimation of Protein by Foiln-Lowry's Method.
3	Estimation of Sugar by Cole's Method.
4	Estimation of Reducing sugar by DNSA method
5	Estimation of DNA by DPA Method.
6	Qualitative Analysis of Carbohydrates.
7	Qualitative Analysis of Proteins & Amino acids.
8	Determination of alpha amylase activity by iodometric method.

Reference Books:

1. Jayaraman, J. (2011). Laboratory Manual in Biochemistry: New Age International Private Limited. India
2. Sawhney S.K., Singh, R. (2005). Introductory Practical Biochemistry: Alpha Science International.
3. Cappuccino, J.G., Sherman, N. (2004). International student edition: Microbiology- A laboratory Manual 4th edition: Benjamin Cummings publications

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Course Category	**Skill Enhancement course-1 (SEC-1)**
Title of the Course	**Basics of Clinical Laboratory**
Course Credit	**02**
Teaching Hours per Semester	**60**
Total Marks	**50**

Course Content	**Hours**
UNIT – 1: Laboratory Set-up	**10hrs**
• Laboratory – types, departments of laboratory and Laboratory set-up • Laboratory safety – universal safety precaution (hand hygiene, PPE, biomedical waste management, sterilization, disinfection.) • Biohazard, chemical hazard, blood spillage management. • Communication between physician, patients, and the medical laboratory professional	
UNIT – 2: Instrumentation	**12hrs**
• Different type of equipments /instruments/Glassware and their Principle, procedure, and operation/use. • Sterilization and Disinfection: Physical agents- Sunlight, Temperature, steam at atmospheric pressure and steam under pressure, irradiation, filtration. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide • Automation – Hematology, biochemistry, microbiology & serology • Installation, operation, maintenance of equipments	
UNIT –3: Pre-Analytical procedures	**14hrs**
• Various types of specimens, their collection, transportation, preservation, and important instructions. • Turn Around Time • Registration process • To understand importance of proper and safe disposal of bio-medical waste & treatment and to understand categories of biomedical waste	
UNIT –4: Analytical & Post Analytical procedures	**10hrs**
• Diagnostic methods – principle, procedures and reagents • Different types of Laboratory tests • Laboratory Information System • Interpretation of laboratory findings, biological reference value and Reporting of results	
UNIT –5: Quality control & Documentation	**14hrs**
• Quality control (internal & external), LJ Chart, Westgard rules. • Standard Operating Procedures, work desk instructions, formats, registers and Data maintenance. • Accreditation / Certification • Visit to a laboratory and 5-days training.	

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B.Sc. Honours/ Honours with Research in Microbiology (First Year)

Course Category	**Minor Course-1** (In addition to courses mentioned in SOP basket)
Title of the Course	**Fundamentals of Microbiology**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**75**

Unit No.	Topics	Hours	Marks
Unit-I	**Scope and History of Microbiology** • Microbiology as a field of Biology • Mile stones of Microbiology • The Place of Microorganisms in the living world; Distribution of Microorganisms in Nature • Applied areas of Microbiology	**9**	**15**
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	Membrane, Cytoplasm, Cytoplasmic inclusions, Endospores, Cyst and Nuclear material		

Course Category	**Minor Course-1 Practical** (In addition to courses mentioned in SOP basket)
Title of the Course	**Fundamentals of Microbiology**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**25**
Sr. No.	**Experiments**
1	**Principles, working, and uses of the following laboratory instruments:** **Microscope Incubator** **pH meter Refrigerator** **Colorimeter Colony counter**
2	**Principles, working, and uses of the following sterilizers:** **Autoclave Hot air oven** **Steam sterilizer Inspissator** **Bacteriological filters.**
3	**Preparation of glassware for sterilization and disposal of laboratory media and cultures.**
4	**Preparation of Stains and Staining Reagents.**
5	**Study of Permanent Slides of Bacteria, Fungi, Algae, and Protozoa.**
6	**Study of bacterial motility by hanging drop method.(Demonstration)**
7	**Monochrome Staining:** a) **Negative Staining** b) **Positive Staining**
8	**Differential Staining: Gram's Staining**
9	**Special staining of bacteria:** a) **Capsule staining – Hiss's method,** b) **Cell wall staining – Webb's method** c) **Spore staining – Schaeffer's method** d) **Metachromatic granule staining – Albert's method** e) **Spirochete staining – Harrie's method**

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