F.YB.Sc. Sem I (NEP – Autonomy 2023 Pattern)

Course Title	Amazing World of Microbiology
Course Code: 23SBMB11MM	**No. of Credits: 2** (1 Unit equivalent to 1 Credit)
Course Type: MM (Major Mandatory)	**Total Teaching Hours: 30**

Course Objectives	
1.	To enrich students' knowledge and train them in pure Microbial Sciences
2.	To present to the students the historical developments in microbiology
3.	To inculcate sense of Scientific Responsibilities & Social Awareness
4.	To familiarize students with Microbial Diversity
5.	To introduce the basic concepts of classification and taxonomy of micro-organisms

Course Outcome	
1.	Students will be acquainted with the different areas of Microbiology
2.	Students will become aware about the role of Microbiologist in various fields of science.
3.	Students will understand the Significance of Micro-organisms in Day-to-Day Life

Syllabus		
Unit I	Scope, Applications and Role of Microbiologist in various fields	**21**
	Spontaneous Generation theory and Discovery of Microorganisms	1
	Experiments by Redi, Pasteur and Tyndall Robert Hooke and Cell	3
	Theory 1.Medical Microbiology	1
	i. Louis Pasteur : Germ Theory of disease	3
	ii. Robert Koch and Koch's Postulates, Rivers' postulates	
	iii. Joseph Lister, antisepsis and chemical disinfection	
	2. Chemotherapy –	2
	i. Paul Ehrlich : magic bullets	
	ii. Discovery of Antibiotics: Alexander Fleming, Waksman	
	3. Vaccination	
	i. Edward Jenner :Concept of vaccine	2
	ii. Definition and types of vaccine	

	4. Virology i. Dimitri Iwanowski: Discovery of viruses ii. Discovery of Bacteriophages iii. Applications of Bacteriophages 5. Agricultural Microbiology i. Martinus Beijerinck and Sergei N. Winogradsky ii. Bio-control agents – concept and applications iii. Bio-inoculants- Types and applications 6.Industrial Microbiology i. Louis Pasteur – Fermentation ii. Microbes in Industry iii. Probiotics and fermented foods	3 3 3
Unit II	**Microbial Diversity**	**15**
	1. Algae 2. Protozoa 3. Fungi (Molds and Yeasts) 4. Bacteria 5. Viruses, viroid's and Prions 6. Archaebacteria 7. Principles of Classification of bacteria(Bergey's) and viruses (ICTV)	2 2 2 2 2 2 3

References

1. Sukshmjeevanu in Vedas: The Forgotten Past of Microbiology in Indian Vedic Knowledge

2. Micro-organisms in Vedas R. K. Jakhmola

3. The Medicine of Old India Rachel Hajar, M.D. Heart Views. 2013 Apr-Jun; 14(2): 92.

4. Cakra-samgraha of Cakrapani, Edited with the commentary of Sivadasa Sena by Devendra Nath Sen and Upendra Nath Sen, Calcutta.

5. On the incidence of raktaja krimi (dermatophytes) in chhindwara, madhya pradesh
M K Rai 1, K K Shrivastava

6. Microbiological Properties of Beejamrit, an Ancient Indian Traditional Knowledge, Uncover a Dynamic Plant-Beneficial Microbial Network Shibasis Mukherjee Ramakrishna Mission Vivekananda University and others

7. Vedic Indians were Aware of the Microbial Biodiversity, Demanding 'Kannva' as the Father of Microbiology Sachidananda Padhy

8. Mahdihassan, S.: 1981, ' Parisrut the earliest distilled Liquor of Vedic Times or of about 1500 BC', UHS, 16(2), 223-229.
9. Daniel Lim Microbiology, 2nd EditionMcGraw-Hill Publication
10. Ingraham J. L. and Ingraham C.A. Introduction to Microbiology, 3rd Edition, Thomson Brooks / Cole
11. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata Mac Graw Hill Press.
12. Prescott L.M., Harley J.P., and Klein D.A. Microbiology, 6th Edition MacGraw Hill Companies Inc.
13. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology,
5th Edition.Macmillan Press Ltd
14. D H Bergey; John G HoltBergey's manual of determinative Bacteriology, 9th Edition.
Baltimore: Williams & Wilkins, 1994.

F.YB.Sc. Sem I (NEP – Autonomy 2023 Pattern)

Course Title	Techniques in Microbiology
Course Code: 23SBMB12MM	**No. of Credits: 2**
Course Type: MM (Major Mandatory)	**Total Teaching Hours: 30**

Course Objectives	
1.	To enrich students' knowledge and train them in microbial techniques
2.	To make them learn different types of microscopy
3.	To introduce the concept of sterilization and disinfectant

Course Outcome	
1.	Students will be acquainted with the different types of microscopes
2.	Students will learn techniques to observe micro-organisms and their organelles
3.	Students will understand the importance of sterility in Microbiology

Syllabus		
Credit I	**Microscopy**	15
	1.Discovery Of Microscope : Micrographia of Anton von Leeuwenhoek and Robert Hooke	1
	2.Microscopy: **A.Bright field microscopy:** i. Structure, working of and ray diagram of a compound light microscope; concepts of magnification, numerical aperture and resolving power. ii. Types, ray diagram and functions of – condensers, eyepieces and objectives iii. Concept of aberrations in lenses - spherical, chromatic, comma and astigmatism **B.Principle, working and ray diagram of** i. Dark field Microscope ii. Fluorescence Microscope	4 1 2 2

	iii.Electron Microscopy – TEM,SEM	
	3.Staining Techniques: i. Definition of Stain; Types of stains (Basic and Acidic), ii. Properties and role of Fixative, Mordant, Decolouriser and Accentuator iii. Monochrome staining and Negative (Relief)staining iv. Differential staining - Gram staining and Acid-fast staining v. Special Staining- Flagella Staining, Spore Staining	5
Credit II	**Sterilization and Disinfection**	15
	1. Sterilization **i.** Physical Agents - Heat, Radiation, Filtration ii. Checking of efficiency of sterilization (Dry and Moist) – Biological and Chemical Indicators 2.**Disinfection:** i.Chemicalagentsandtheirmodeofaction-Aldehydes,Halogens,Quaternary ammonium compounds, Phenol and phenolic compounds, ii.Heavy metals, Alcohol, Dyes, Detergents and Ethyleneoxide. iii.Characteristics of an ideal disinfectant iv.Checking of efficiency of disinfectant - Phenol Coefficient (Rideal–Walker method)	7 8

References

1. Salle A.J. (1971) Fundamental Principles of Bacteriology 7th Edition. Tata MacGraw Hill Publishing Co.

2. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: An Introduction. 8th Edition. Pearson Education Inc.

3. Wilson K. and Walker J.M. (2005) Principles and Techniques of Biochemistry and Molecular Biology. 6th Edition Cambridge University Press.

4. Hans G. Schlegel (1993) General Microbiology, 8th Edition, Cambridge University Press

5. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata Mac Graw Hill Press.

F.YB.Sc. Sem I (NEP – Autonomy 2023 Pattern)

Course Title	General Microbiology-I
Course Code: 23SBMB13MM	**No. of Credits: 2**
Course Type: MM (Major Mandatory)	**Total Teaching Hours: 60**

Course Objectives	
1.	To make students aware about the conduct in Microbiology laboratory
2.	To make them familiar with glassware, equipment and instruments (including microscope) in Microbiology laboratory
3.	To teach them basic techniques required to isolate, cultivate and observe the micro-organisms

Course Outcome	
1.	Students will learn the handling and maintenance of various instruments and equipment
2.	Students will learn to isolate and cultivate the micro-organisms
3.	Students will be acquainted with the methods used for observation of the micro-organisms using various staining techniques and their motility patterns

Expt. No.	**Topics**	**No. of Practicals**
1	Safety measures(BSL1, BSL2, BSL3 and BSL4) and Good Laboratory Practices in microbiology laboratory, Concept of virulence, pathogenicity and transmission of microorganisms	2
2	To study the principle, operation, precautions and application of common microbiology laboratory instruments: i. Incubator ii. Hot air oven iii. Autoclave iv. Colorimeter	3

	v. Laminar air flow hood vi. Clinical centrifuge Concept of cleaning, calibration and validation of instruments	
3	Construction (mechanical and optical), working and care of bright field microscope	1
4	Media preparation: Preparation of simple laboratory nutrient media: a. Nutrient broth b. Nutrient agar c. MacConkey's agar	1
5	Checking sterilization efficiency of autoclave using a biological indicator (*B. stearothermophilus*)	1
8	Basic staining techniques: **i.** Monochrome staining **ii.** Negative staining	2
9	Differential Staining **i.** Gram Staining	1
10	Observation of motility in bacteria using: i. Microscopic technique: Hanging drop method ii. Culture techniques: Swarming growth and Cragie's tube method	3
11	Method of Isolation of bacteria : Streak plate technique	1
	TOTAL	**15**

References

1. Microbiology: A Laboratory Manual - Book by James G. Cappuccino and Natalie Sherman.

2. Practical microbiology: Professor Dr. R. C. Dubey and Dr. D. K. Maheshwari, S. Chand Publishing, 2002

3. Practical Handbook of Microbiology: 2nd Edition, Edited by Emanuel Goldman and Lorrence H. Green, CRC Press

F.YB.Sc. Sem II (NEP – Autonomy 2023 Pattern)

Course Title	Bacteriology
Course Code: 23SBMB21MM	**No. of Credits: 2**
Course Type: MM (Major Mandatory)	**Total Teaching Hours: 30**

Course Outcome	
1.	To enlighten the students with the basic concepts of Bacteriology.
2.	To familiarize students with the ultra-structure of bacterial cell.
3.	To introduce the concepts of bio-molecules.
4.	To comprehend the organization of a bacterial cell.
5.	To relate structure and functions of bio-molecules in a bacterial cell.

Course Outcome	
1.	Students will be conversant with the structure of bacterial cell.
2.	Students will acquire basic knowledge of bio-chemistry.
3.	The students will Develop understanding about structure-function relationship in bio-molecules.

Syllabus		
Unit I	**Bacterial Cytology**	15
	1. Microbial cell size, shape and arrangements	1
	2. Studies on structure, chemical composition and functions of the following components in bacterial cell:	
	i. Cellwall- Protoplast, Spheroplast, structure of Peptidoglycan	2
	ii. Cellmembrane- Structure of phospholipids	
	iii. Endospore	1
	iv. Capsule	2
	v. Flagella, Fimbriae and Pili	1

	vi. Ribosomes vii. Nucleic acids : DNA and RNA, types of RNA viii. Plasmids ix. Cell inclusions (Gas vesicles, carboxysomes, PHB granules, metachromatic granules, glycogen bodies starch granules, magnetosomes, sulfur granules and chlorosomes)	2 1 2 1 2
Unit II	**Biomolecules: Structure, organization and functions**	15
	1. **Types of bonds in biomolecules** -Covalent, co-ordinate bond, non-covalent and linkages (ester, phospho-diester, peptide, glycosidic) 2. **Carbohydrates: Definition, classification** i. Structure of Ribose, Deoxyribose, ii. Disaccharides: Glycosidic bond, structure of lactose iii. Polysaccharides: Peptidoglycan **3. Lipids: Definition, classification** i. Simple lipids – Triglycerides, Fats and oils, waxes. ii. Compound lipids – Phospholipid,Glycolipids Derived lipids – Steroids, Cholesterol **4.Proteins: Definition, classification** i. General structure of amino acids, peptidebond. ii. Types of amino acids based on Rgroup iii. Structural levels of proteins: primary, secondary, tertiary and quaternary iv. Study of Hemoglobin, flagellin and cytoskeletalproteins	2 4 4 5

References

1. Daniel Lim Microbiology, 2nd Edition McGraw-Hill Publication

2. Ingraham J. L. and Ingraham C.A. Introduction to Microbiology, 3rd Edition, Thomson Brooks / Cole

3. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata Mac Graw Hill Press.

4. Prescott L.M., Harley J.P., and Klein D.A. Microbiology, 6th Edition MacGraw Hill Companies Inc.

5. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology,

5th Edition. Macmillan Press Ltd

6. D H Bergey; John G Holt Bergey's manual of determinative Bacteriology, 9th Edition. Baltimore: Williams & Wilkins, 1994

F.YB.Sc. Sem II (NEP – Autonomy 2023 Pattern)

Course Title	Cultivation and Growth of Microorganisms
Course Code: 23SBMB22MM	**No. of Credits: 2**
Course Type: MM (Major Mandatory)	**Total Teaching Hours: 30**

Course Objectives	
1.	To enrich students' knowledge and train them in understanding requirements of microorganisms
2.	To make them learn different techniques to cultivate microorganisms
3.	To introduce the concept of bacterial growth and measurement of growth

Course Outcome	
1.	Students will be acquainted with the microbial nutritional requirements
2.	Students will learn different techniques to cultivate micro-organisms
3.	Students will understand different phases of bacterial growth and it's measurement

Syllabus		
Unit I	**Nourishing Microorganisms:**	15
	1.Nourishing Microorganisms	1
	i.Nutritional requirements	
	ii.Nutritional classification	1
	iii.Design and preparation of media: Common ingredients of media	2
	iv.Types of media	2
	v.Factors affecting bacterial growth {pH, Temperature, Solute Concentration (Salt and Sugar)} and Heavy metals	3
	vi.Concept of Enrichment, Pure Culture, Isolation of culture by streak plate, pour plate, spread plate	3
	vii.Maintenance of bacterial and fungal cultures using different techniques	2
	viii.Culture collection centres and their role	

		1
Unit II	**Bacterial growth**	15
	1.Bacterial growth i.Kinetics of bacterial growth (Exponential growth model) ii.Growth curve and Generation time iii.Diauxic growth iv.Measurement of bacterial growth- Methods of enumeration: a.Microscopic methods (Direct microscopic count, counting cells using improved Neubauer, Petroff-Hausser'schamber) b.Plate counts (Total viable count) c.Turbidometric methods d.Estimation of biomass (Dry mass, Packed cellvolume) e.Chemical methods (Cell carbon and nitrogen estimation) v.Methods for cultivating photosynthetic, extremophilic and chemo-lithotrophic bacteria, anaerobic bacteria, algae, fungi, actinomycetes and viruses	2 2 2 1 5 5

References

1. Salle A.J. (1971) Fundamental Principles of Bacteriology 7th Edition. Tata MacGraw Hill Publishing Co.

2. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: An Introduction. 38th Edition. Pearson Education Inc.

3. Wilson K. and Walker J.M. (2005) Principles and Techniques of Biochemistry and Molecular Biology. 6th Edition Cambridge University Press.

4. Hans G. Schlegel (1993) General Microbiology, 8th Edition, Cambridge University Press

5. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata Mac Graw Hill Press.

F.Y.B.Sc. Sem II (NEP – Autonomy 2023 Pattern)

Course Title	General Microbiology-II
Course Code: 23SBMB23MM	**No. of Credits: 2**
Course Type: MM (Major Mandatory)	**Total Teaching Hours: 60**

Course Objectives	
1.	To make students learn the techniques for isolation and observation of fungi and various types of bacteria
2.	To make them aware about the techniques used to enumerate the bacteria present in different samples
3.	To teach them the effect of various parameters on the growth of bacteria

Course Outcome	
1.	Students will learn the cultivation of various types of organisms including skin microflora
2.	Students will understand the methods of bacterial enumeration from food, water or soil samples
3.	Students will be acquainted with the effects of various parameters including pH, salt concentration, temperature and heavy metal on bacterial growth

Expt. No.	**Topics**	**No. of Practicals**
1	Cultivation of photosynthetic, aerobic, anaerobic & chemolithotrophic organisms using Winogradsky's column, monitoring and observation of microorganisms after growth	2
2	Isolation of fungi from natural samples and observation by lactophenol cotton blue staining *(Rhizopus/Penicillium/Aspergillus)*	2
3	**S**taining techniques: i. Endospore staining	3
	ii. Capsule staining iii.Metachromatic Granules	

4	Enumeration of yeast cells by microscopic technique: *Neubauer chamber* (Hemocytometer) method	1
5	Measuring the yeast cell size by micrometry	1
6	Enumeration of bacteria from fermented food / soil / water by culture techniques: i. Spread plate method ii. Pour plate method	2
7	Study of normal flora of skin: i. Cultivating and observing different morphoforms of bacteria from skin ii.Study of effect of washing on skin with soap and disinfectant on its microflora	
8	To study the effect of different parameters on growth of bacteria: i. pH ii. Temperature iii. Sodium chloride concentration	3
9	Study of oligodynamic action of heavy metal	1
	TOTAL	**15**

References

1. Microbiology: A Laboratory Manual - Book by James G. Cappuccino and Natalie Sherman.

2. Practical microbiology: Professor Dr. R. C. Dubey and Dr. D. K. Maheshwari, S. Chand Publishing, 2002

3. Practical Handbook of Microbiology: 2nd Edition, Edited by Emanuel Goldman and Lorrence H. Green, CRC Press.

F.YB.Sc. Sem I (NEP – Autonomy 2023 Pattern)

Course Title	Introduction to Microbiology		
Course Code: 23SBMB21MN			**No. of Credits: 2**
Course Type: Minor			**Total Teaching Hours: 30**

Course Objectives	
1.	To enrich students' knowledge and train them in pure Microbial Sciences
2.	To present to the students the historical developments in microbiology from Vedas till date
3.	To inculcate sense of Scientific Responsibilities & Social Awareness
4.	To familiarize students with Microbial Diversity
5.	To introduce the structure of bacterial cell organelles.

Course Outcome	
1.	Students will be acquainted with the different areas of Microbiology.
2.	Students will become aware about the role of Microbiologist in various fields of Science.
3.	Students will understand the Significance of Micro-organisms in Day to Day Life

Syllabus		
Credit I	Scope and History of Microbiology	**15**
	I) Basic and applied aspects: a. Industrial Microbiology b. Immunology c. Soil and Agricultural Microbiology d. Food and Dairy Microbiology e. Geomicrobiology f. Virology	6
	II) History of Microbiology A) Controversy over Abiogenesis • Aristotle's notion about spontaneous generation • Redi's experiment	3

	• Louis Pasteur's & Tyndall's experiment B) Development of Microbiology in 19th and 20th century • Germ theory of fermentation- Discovery of anaerobic life & physiological significance of fermentation • Germ theory of disease- Discovery of microbial role in causation of disease- Koch's postulates & River's postulates and Surgical antisepsis, chemotherapy and vaccination.	6
Credit II	**Microbial Diversity and bacterial cytology**	**15**
	I) Morphological and other characteristic features of • Algae • Protozoa • Fungi (Molds and Yeasts) • Bacteria • Viruses, viroid's and Prions II) Studies on chemical composition and structure –function relationship in bacteria; • Cell wall • Cell membrane • Endospore • Capsule • Flagella • Fimbriae and pili • Ribosomes • Chromosomal & extra-chromosomal material • Cell inclusions	1 1 1 2 1 9

References:

1. Daniel Lim Microbiology, 2nd EditionMcGraw-Hill Publication
2. Ingraham J. L. and Ingraham C.A. Introduction to Microbiology, 3rd Edition, Thomson Brooks / Cole
3. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata Mac Graw Hill Press.
4. Prescott L.M., Harley J.P., and Klein D.A. Microbiology, 6th Edition MacGraw Hill Companies Inc.
5. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology, 5th Edition.Macmillan Press Ltd
6. D H Bergey; John G HoltBergey's manual of determinative Bacteriology, 9th Edition. Baltimore: Williams & Wilkins, 1994.

Microbiology Minor

F.YB.Sc. Sem II (NEP – Autonomy 2023 Pattern)

Course Title	Handling Microorganisms		
Course Code:23SBMB22MN			**No. of Credits: 2**
Course Type: Minor			**Total Teaching Hours: 30**

Course Objectives	
1.	To make them learn different types of microscopy
2.	To introduce the concept of sterilization and disinfection
3.	To enrich students' knowledge about growth and cultivation of microorganisms

Course Outcome	
1.	Students will be acquainted with the different types of microscopes
2.	Students will understand the importance of sterility in Microbiology
3.	Students will learn techniques to observe and cultivation of micro-organisms

Syllabus		
Credit I	**Microscopy, Sterilization and Disinfection**	15
	1. Discovery Of Microscope : Micrographia of Anton von Leeuwenhoek and Robert Hooke **2. Microscopy:** **A. Bright field microscopy:** Structure, working and ray diagram of a compound light microscope; concepts of magnification **B. Fluorescence Microscopy** Structure, working and ray diagram of a compound light microscope; concepts of magnification	5
	3. Staining Techniques: i. Definition of Stain; Types of stains (Basic and Acidic), ii. Properties and role of Fixative, Mordant, Decolouriser and Accentuator iii.Monochrome staining and Negative (Relief)staining iv.Differential staining - Gram staining **4.Sterilization and Disinfection** **a. Sterilization** **i.** Physical Agents - Heat, Radiation, Filtration ii. Checking of efficiency of sterilization (Dry and Moist) – Biological and Chemical Indicators b.**Disinfection:** i.Chemical agents and their mode of action- Alcohol, Ethylene oxide.	5 5
Credit II	**Cultivation and Growth of Microorganisms**	15
	1.Nourishing Microorganisms i.Nutritional requirements ii.Nutritional classification iii.Design and preparation of media: Common ingredients of	12

	media iv. Types of media v. Methods for cultivating photosynthetic, extremophilic and chemo- lithotrophic bacteria, anaerobic bacteria, algae, fungi, actinomycetes and viruses **2.Growth of Microorganisms** ii.Growth curve and Generation time iii.Diauxic growth	3

References:

1. Salle A.J. (1971) Fundamental Principles of Bacteriology 7th Edition. Tata MacGraw Hill Publishing Co.

2. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: An Introduction. 8th Edition. Pearson Education Inc

3. Wilson K. and Walker J.M. (2005) Principles and Techniques of Biochemistry and Molecular Biology. 6th Edition Cambridge University Press.

4. Hans G. Schlegel (1993) General Microbiology, 8th Edition, Cambridge University Press

5. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. (1993) Microbiology, 5th Edition, Tata Mac Graw Hill Press.

F.YB.Sc. Sem I (NEP – Autonomy 2023 Pattern)

Course Title	**Basic techniques in Microbiology**	
Course Code: 23SBMB11VS		**No. of Credits:2**
Course Type: VSC		**Total Teaching Hours:60**

Course Objectives	
1.	To provide adequate knowledge to the students on basic techniques in Microbiology
2.	To acquaint students with the instruments used in Microbiology laboratory
3.	To make the students understand different methods of preservation of microorganisms
4.	To make students learn aseptic techniques

Course Outcome	
1.	Students will learn techniques in Microbiology
2.	Students will understand the use of instruments in Microbiology Laboratory
3.	Students will get acquainted with aseptic transfer techniques
4.	Students will learn to preserve and revive microbes

Syllabus		
1	To study the principle, operation, precautions and application of common Microbiology laboratory instruments: i. pH Meter ii. Analytical balance iii. Distillation unit iv. Spectrophotometer v. Water bath vi. CO_2 Incubator	3
2	Introduction and use of common laboratory glassware: i. Test tubes ii. Culture tubes iii. Suspension tubes iv. Screw capped tubes	2

	v. Petri plates vi. Pipettes: Mohr, Serological & Micropipettes vii. Pasteur pipettes viii. Erlenmeyer flask ix. Volumetric flask x. Glass spreader xi. Durham's tube xii. Cragie's tube xiii. Inoculating needles: Wire loop, stab needles	
3	Learning basic techniques in Microbiology: i. Wrapping of glassware ii. Cotton plugging iii. Cleaning and washing of glassware iv. Biological waste disposal	1
4	Aseptic transfer techniques	1
5	Wet mount slide preparation and its observation for: Algae, Fungi and Protozoa	1
6	Special staining i) Flagella staining	1
7	Different types of Streak plate technique: a. T-streaking b. Continuous Streaking c. Radiant Streaking d. Semi-quantitative Streaking	2
8	Checking of efficacy of chemical disinfectant: Phenol Coefficient (Rideal Walker method)	2
9	Methods of preservation and revival of cultures (Any three)	2

References:

1. Microbiology: A Laboratory Manual - Book by James G. Cappuccino and Natalie Sherman.
2. Practical microbiology: Professor Dr. R. C. Dubey and Dr. D. K. Maheshwari, S. Chand Publishing, 2002
3. Practical Handbook of Microbiology: 2nd Edition, Edited by Emanuel Goldman and Lorrence H. Green, CRC Press

F.YB.Sc. Sem I (NEP – Autonomy 2023 Pattern)

Course Title	**Experimental Microbiology**	
Course Code: 23SBMB11VS (Minor)		**No. of Credits:2**
Course Type: VSC		**Total Teaching Hours:60**

Course Objectives	
1.	To provide adequate knowledge to the students on basic techniques in Microbiology
2.	To acquaint students with the instruments used in Microbiology laboratory
3.	To make the students understand different methods of preservation of microorganisms
4.	To make students learn aseptic techniques

Course Outcome	
1.	Students will learn techniques in Microbiology
2.	Students will understand the use of instruments in Microbiology Laboratory
3.	Students will get acquainted with aseptic transfer techniques
4.	Students will learn to preserve and revive microbes

Syllabus		
1	To study the principle, operation, precautions and application of common Microbiology laboratory instruments: i. Incubator ii. Hot air oven iii. Autoclave iv. Colorimeter v. Laminar air flow hood vi. Clinical centrifuge vii. Analytical balance viii. Distillation unit	4
2	Construction (mechanical and optical), working and care of bright field microscope	1

3	Introduction and use of common laboratory glassware: i. Test tubes ii. Culture tubes iii. Suspension tubes iv. Screw capped tubes v. Petri plates vi. Pipettes: Mohr, Serological & Micropipettes vii. Pasteur pipettes viii. Erlenmeyer flask ix. Volumetric flask x. Glass spreader xi. Durham's tube xii. Cragie's tube xiii. Inoculating needles: Wire loop, stab needles	2
4	Learning basic techniques in Microbiology: i. Wrapping of glassware ii. Cotton plugging iii. Cleaning and washing of glassware iv. Biological waste disposal	1
5	Aseptic transfer techniques	1
6	Media preparation: Preparation of simple laboratory nutrient media: a. Nutrient broth b. Nutrient agar c. MacConkey's agar	1
7	Checking sterilization efficiency of autoclave using a biological indicator(*B. stearothermophilus*)	1
8	Basic staining techniques: **i.** Monochrome staining **ii.** Negative staining	2
9	Differential Staining **i.** Gram Staining	1
10.	Method of Isolation of bacteria : Streak plate technique	1

References:

1. Microbiology: A Laboratory Manual - Book by James G. Cappuccino and Natalie Sherman.
2. Practical microbiology: Professor Dr. R. C. Dubey and Dr. D. K. Maheshwari, S. Chand Publishing, 2002
3. Practical Handbook of Microbiology: 2nd Edition, Edited by Emanuel Goldman and Lorrence H. Green, CRC Press

F.YB.Sc.Sem I (NEP – Autonomy 2023 Pattern)

Course Title	**SOPs for instrumentation in Life Sciences**		
Course Code: 23SBMB11SE			**No. of Credits:02**
Course Type: SEC			**Total Teaching Hours:60**

Course Objectives	
1.	This course will enable the students to understand Good Laboratory Practices to be followed in microbiology laboratory.
2.	To acquaint students with the principle and working of a Bright field microscope.
3.	To make the students understand the SOPs of various instruments.

Course Outcome	
1.	Student will acquire adequate knowledge to follow Good Laboratory Practices in the microbiology laboratory.
2.	Students will gain confidence in Microscope handling and focussing techniques.
3.	Hands on training of various Instruments used in the Microbiology laboratory.

Syllabus		
1.	**Good Laboratory Practices**	**01**
	Safety measures and Good Laboratory Practices in microbiology laboratory.	
2.	**Microscopy**	**02**
	Study of parts and functions of bright field microscope.	
3.	**SOPs of Microbiology laboratory instruments**	**12**

	a.pH meter b.Incubator (Static and Rotary Shaker) c.Autoclave d. Hot air oven e. Colorimeter f. Spectrophotometer g. Laminar air flow hood h. Centrifuge (Clinical and Cooling) i. Analytical balance j. Distillation unit. k. Serological Water bath	

References

1. Fundamental principles of Bacteriology By A J Saale

2. Experimental Microbiology and Instrumentation 7 July 2011 by Dr Bhanu Shrivastava (Author)

3. Principles and Techniques of Biochemistry and Molecular Biology Seventh edition Wilson and Walker.

4. Biophysical chemistry - principles and techniques By Avinash Upadhyay .

5. Biochemistry-Modern theory and techniques By Rodney Boyer

2023 Pattern)

Course Title	Adrishta Krimi Shastra		
Course Code: 23SBMB111MJ			**No. of Credits: 2** (1 Unit equivalent to 1 Credit)
Course Type: MM (Major Mandatory)			**Total Teaching Hours: 30**

Course Objectives	
1.	To enrich students‟ knowledge and train them in pure Microbial Sciences
2.	To present to the students the historical developments in microbiology from Vedas till date
3.	To inculcate sense of Scientific Responsibilities & Social Awareness
4.	To familiarize students with Microbial Diversity
5.	To introduce the basic concepts of classification and taxonomy of micro-organisms.

Course Outcome	
1.	Students will be acquainted with the different areas of Microbiology from ancient India.
2.	Students will become aware about the role of Microbiologist in various fields of Science.
3.	Students will understand the Significance of Micro-organisms in Day to Day Life

Syllabus		
Credit I	**Knowledge of Microbiology in Ancient Indian Literature**	**15**
	1. History i. „Sage scientist Kannva‟ as the Father of Microbiology ii. Sukshmjeevanu in Vedas iii. Abiogenesis **2. Medical Microbiology** i. Incidence of raktaja krimi (dermatophytes) ii. Indian Medicinal Plants: Preventive and therapeutic iii. Modern medicine	5 5

	3. Agricultural Microbiology- i. Microbiological Properties of Beejamrit ii. Dynamic Plant-Beneficial Microbial Network	5
Unit II	**Ethno-microbiology**	**15**
	1. **Indian fermented foods and beverages** i. Local fermented products and their Microbial flora ii. Health benefits of traditional fermented foods 2. **Promoting gut bacterial diversity using Thali diet approach** i. Nutritional value of thali diet ii. Ancient Thali Diet- Gut Microbiota, Immunity, and Health 3. **Spoilage of food and methods of food preservation** i. Food spoilage- causes and role of bacteria ii. Traditional and modern techniques of food preservation	5 5 5

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5. On the incidence of raktaja krimi (dermatophytes) in chhindwara, madhya pradesh
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6. Microbiological Properties of Beejamrit, an Ancient Indian Traditional Knowledge, Uncover a Dynamic Plant-Beneficial Microbial Network Shibasis Mukherjee Ramakrishna Mission Vivekananda University and others

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