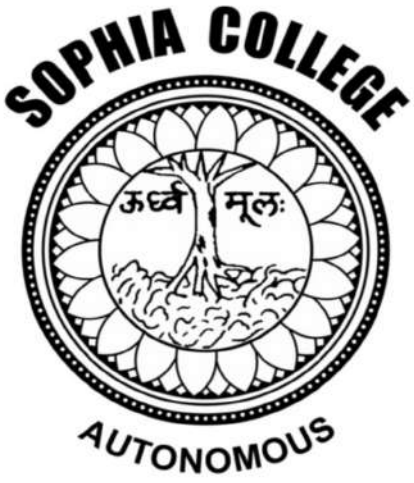

SOPHIA COLLEGE (Autonomous)

Affiliated to the University of Mumbai

Programme: Science

Microbiology (Major)

Syllabus for the Academic Year 2023-2024

based on the National Education Policy 2020

SOPHIA COLLEGE (Autonomous)

PROGRAMME SPECIFIC OUTCOMES	
1	The program will enable a beginner to learn and assimilate the principles of Microbiology in a clear and engaging fashion.
2	The program places Microbiology in a historical perspective, which will also help a learner to see the effects that the microorganisms have on our daily lives.
3	At the end of this program, the learners would have acquired essential practical skills often needed in Microbiology laboratories for probing into the microbial world.

DEPARTMENT OF MICROBIOLOGY

COURSE DETAILS FOR MAJOR:

	SEMESTER I
TITLE	Fundamentals of Microbiology
TYPE OF COURSE	DSC
CREDITS	4

SOPHIA COLLEGE (Autonomous)

Programme: SCIENCES Microbiology Major	**Semester – 1**
Course Title: Fundamentals of Microbiology	**Course Code:**

COURSE OBJECTIVES:

It aims to

1. Provide a glimpse of the microbial world and pioneers in the field of Microbiology.
2. Promote an understanding of fundamental aspects of microbial cell structure and function as well as the differences between Prokaryotic and Eukaryotic cells
3. Give realization of the crucial role of a light microscope in the study of microorganisms.
4. Revise the concept of magnification, resolving power and numerical aperture.
5. Train the students in using oil immersion objective for observing microorganisms.
6. Understand the principle of use of various staining procedures for studying bacterial cell structure.

COURSE OUTCOMES:

At the end of the course, learner will be able to

1. Review the basic characteristics of prokaryotic and eukaryotic cells.
2. Describe the cellular makeup of bacteria.
3. Enlist the major events in the history of Microbiology, including the major contributors to the early development of microscopy, the germ theory of disease, aseptic techniques and medical advances.
4. Outline new system of classification of organisms in domains and cite representatives of each domain.
5. Explain how the magnified images are formed, and how properties of light / resolution affects image visibility.
6. Perform simple, differential, and special stainings
7. Describe the process of Gram staining and acid fast staining and how the results can aid the identification of pathogens.

Lectures per week (1 Lecture is 60 minutes)		**3**	
Total number of Hours in a Semester		**45**	
Credits		**3**	
Evaluation System	**Semester End Examination**		
	Internal Assessment		

UNIT 1 History of Microbiology and Prokaryotic Cell Structure	1.1	Milestones in Microbiology a. History Of Microbiology b. Discovery of microorganisms c. Conflict over spontaneous generation d. Golden Age of Microbiology-Koch Postulates e. Classification of organisms	15 hours
	1.2	Bacterial cell structure a. Morphology and Arrangement b. Cell wall c. Plasma membrane d. Chromosome and plasmid e. Ribosomes. f. Structures external to the cell wall:Capsule, Slime layer, Flagella, Pili, and Fimbriae. g. Endospores h. Organic and inorganic inclusion bodies	
UNIT 2 Eukaryotic Cell Structure And Function	2.1	Overview of eukaryotic cell structure: a. Plasma membrane Cytoplasmic matrix, Cytoskeletal elements b. Endoplasmic reticulum c. Ribosomes d. Golgi apparatus e. Mitochondria f. Chloroplasts g. Nucleus h. Cilia and Flagella.	15 hours
	2.2	Morphological characteristics, Life Cycle and Significance of: a. Yeast and Molds (*Saccharomyces cerevisiae* and *Rhizopus*) b. Algae (*Chlamydomonas*) c. Slime Molds and Myxomycetes d. Protozoa (*Entamoeba histolytica*)	

UNIT 3 Microscopy & Staining procedures	3.1	Microscopy: a. History of microscopy b. Structure and functions of different parts of a microscope c. Simple and compound light microscopes.	15 hours
	3.2	Staining procedures a. Stains: Types of stains (Acidic, Basic, Compound) b. Fixatives, Mordants and Decolorizers. c. Simple and Differential staining (Gram and Acid Fast) d. Special staining (Cell wall, Capsule, Lipid granules, Spores, Metachromatic granules & Flagella)	
		Practicals based on units 1, 2 and 3	30 hours

1. Use and care of a microscope
2. Monochrome staining
3. Negative Staining.
4. Differential staining: Gram staining
5. Cell wall staining
6. Demonstration of capsule.
7. Endospore staining
8. Lipid staining
9. Metachromatic granules staining
10. Flagella staining (Demonstration)
11. Preparation of Wet mount of pond water / hay infusion / flavoured curd: Observations to be recorded as a Video.
12. Preparation of Wet mount of molds: Observations to be presented using a Powerpoint Point.
13. Assignment: Tabulation of names, morphology, arrangement and Gram nature with diagrams of 10 common microorganisms including Gram variable microorganisms.

SOPHIA COLLEGE (Autonomous)

Programme: SCIENCES **VSC 1**	**Semester – 1**
Course Title: Cultivation of Microorganisms	**Course Code:**

COURSE OBJECTIVES:

It aims to

1. List differences in nutritional modes of microorganisms
2. Introduce the concept of pure culture
3. Train students to use various techniques of inoculation for growing microorganisms from samples.
4. Outline the processes and purposes of the procedures that are used in handling, maintaining, and studying microorganisms.
5. Explain the importance of media for culturing microbes in the laboratory.

COURSE OUTCOMES:

At the end of the course, learner will be able to

1. Prepare microbiological media using basic ingredients.
2. Identify the purpose of use of enriched, selective, and differential media
3. Select appropriate growth medium or method for experimental work.
4. Apply the knowledge of inoculation methods for isolating a variety of bacteria
5. Study and identify isolates based on features of their colonies formed on solid media.
6. Preserve different types of microbial cultures for the desired duration.

Lectures per week (1 Lecture is 60 minutes)		**3**	
Total number of Hours in a Semester		**45**	
Credits		**2**	
Evaluation System	**Semester End Examination**		
	Internal Assessment		

VSC 1 Cultivation of Microorganisms		a. World of microorganisms b. Nutritional requirements – Macro and Micronutrients, growth factors. c. Nutritional types of microorganisms d. Culture media: Types with examples e. Methods of Inoculation f. Pure culture techniques g. Cultivation of anaerobes h. Preservation of microbial cultures i. List of Microbial Culture Collection Centres	15 hours
		VSC 1 Practicals	
		1. Preparation of Culture Media: a. Liquid medium (Nutrient Broth) b. Solid Media (Nutrient agar & Sabouraud's agar) 2. Preparation of slant, butts & plates 3. Methods of Inoculation and Study of growth Characteristics : a. Liquid Medium b. Solid Media (Slants, Butts and Plates) 4. Isolation of pure cultures and study of colony characteristics.	30 hours

Programme: SCIENCES **VSC 2**	**Semester – 1**
Course Title: Control of Microorganisms	**Course Code:**

COURSE OBJECTIVES:

It aims to

1. Provide understanding of the key concepts related to microbial control
2. Compare the effectiveness of physical methods of microbial control such as high temperature, low temperature, radiation and filtration.
3. Give an overview of mode of action, uses, limitations of the common chemical disinfectants and

sterilizing gases.

4. Train the students to choose appropriate method for killing or inhibiting microorganisms

COURSE OUTCOMES:

At the end of the course, learner will be able to

1. Define and differentiate among the major terms for microbial control, citing examples of each.
2. Describe dry heat and moist heat methods and their chief applications for sterilization and disinfection.
3. Apply the concept of sterilization by filtration for practical use.
4. Differentiate between ionizing and nonionizing radiations used for the purpose of destroying microbial contaminants
5. Summarize the modes of action and primary uses of chemical antimicrobial agents.
6. Identify preferred physical methods / uses of chemical disinfectants in various scenarios.

Lectures per week (1 Lecture is 60 minutes)		**3**	
Total number of Hours in a Semester		**45**	
Credits		**2**	
Evaluation System	**Semester End Examination**		
	Internal Assessment		

VSC 2 **Control of Microorganisms**		a. Concept of sterility,Need for control of microorganisms, Definition of Antimicrobial agents b. Methods of microbial control: 1. Physical: a. Moist heat, Dry heat b. Radiation c. Filtration d. Low temperature e. Desiccation and Osmotic pressure 2. Chemical : a. Phenolics b. Alcohols c. Heavy metals d. Halogens e. Quaternary ammonium compounds f. Chlorhexidine	15 hours

		g. Sterilizing gases- ETO, Formaldehyde	
		VSC 2 Practicals	
		1. Introduction to Laboratory equipments, 2. Disinfection & Safe Disposal of waste 3. Sterilization of glassware and microbiological media 4. Aseptic transfer of media 5. Demonstration of use of membrane filter and efficiency of sterilization 6. Effect of UV light on microorganisms. (Demonstration) 7. Effect of Osmotic pressure on microorganisms 8. Oligodynamic action of heavy metals 9. Testing antimicrobial activity of a disinfectant by disc diffusion method.	30 hours

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VSC1 : Cultivation of Microorganisms

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VSC2 : Control of Microorganisms

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