SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Science

Microbiology

T.Y.B.Sc. MICROBIOLOGY (DSE)

Syllabus for the Academic Year 2025-2026 based on the National Education Policy 2020

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

DEPARTMENT OF MICROBIOLOGY

COURSE DETAILS:

	SEMESTER 5			SEMESTER 6	
TITLE	**Medical Microbiology**	**Instrumentation**		**Immunology**	**Microbial Biodiversity**
TYPE OF COURSE	**DSE**	**DSE**		**DSE**	**DSE**
CREDITS	**4 (2 theory + 2 practical)**	**4 (2 theory + 2 practical)**		**4 (2 theory + 2 practical)**	**4 (2 theory + 2 practical)**

Preamble:

The department of Microbiology at Sophia College was founded in 1966. Microbiology is the study of life and tentative life forms that cannot be viewed by the unaided eye. The microscopic life encompasses bacteria, protozoa, algae, fungi, and viruses. These organisms impact many aspects of plant, animal and human life and progress.

The Undergraduate curriculum provides fundamental and applied aspects of Microbial life that impacts the rest of the biosphere.

The instructions methodology focuses on providing the fundamental basic information on Microbiology and progressing to the advances. Furthermore, there is emphasis on developing critical and analytical thinking and reasoning skills through problem solving in keeping with the changing times. The courses provide training in Genetics, Biochemistry, Medical Microbiology, Immunology, Bioprocess technology, Food Science and Environmental Science. This interdisciplinary approach helps learners meet the requirements of higher education, research, and industry.

PROGRAMME OBJECTIVES

PO 1	To introduce the learners to Basic and Applied Microbiology.
PO 2	To build a strong knowledge base in the learner as well as impart sound practical skills in the subject.
PO 3	To provide opportunities for logical thinking, and critical reasoning, such that the learners can handle the demands of higher education, industry and research.
PO 4	To impart soft skills in learners thereby enhancing employability.

PROGRAMME SPECIFIC OUTCOMES

PSO 1	The learners will gain and apply knowledge of Genetics, Virology, Microbial Biochemistry, Medical Microbiology, Immunology, Cell Biology, Bioprocess technology, Environmental Microbiology, Food and Dairy Microbiology, etc to solve problems.
PSO 2	The learners will acquire basic knowledge about scientific methodology, plan and execute experiments using good laboratory practices, and interpret the experimental results effectively.
PSO 3	The students will undertake research projects, internships, visit industries, in order to become ready for higher studies, industry and research.
PSO 4	The students will do value added courses in order to enhance their soft skills and employability.

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: **Sciences** **Microbiology DSE**	**Semester – 5**
Course Title: Medical Microbiology	**Course Code: SMCB351E**

COURSE OBJECTIVES:

1. To introduce the virulence factors and other features of the pathogen
2. To explain the mode of transmission, epidemiology and modes of prophylaxis of diseases
3. To understand how to identify the likely causative agent of a disease using a few key clinical features
4. To outline the detailed method of diagnosis of a disease

COURSE OUTCOMES:

The learner will be able to:

1. explain details of the virulence factors and other features of the pathogen.
2. correlate these virulence factors with the pathogenesis and clinical features of the disease.
3. comment on the mode of transmission, modes of prophylaxis, and methods of diagnosis of the diseases.

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**1 Hour**	**30 marks**
	Internal Assessment	**--**	**20 marks**

UNIT 1 Specific infections I: Bacterial strategies for evasion and study of some infectious diseases of the respiratory tract. (1 Credit)	1.1	Study of virulence mechanisms in bacteria a. Identifying bacteria that cause disease b. Genomics and bacterial pathogenicity i. The clonal nature of bacterial pathogens ii. Mobile genetic elements iii. Pathogenicity islands c. Bacterial virulence factors i. Adherence factors ii. Invasion of host cells and tissues iii. Toxins − Exotoxins − Exotoxins associated with diarrhoeal diseases and food poisoning − LPS of gram negative bacteria iv. Enzymes − Tissue degrading enzymes − IgA1 proteases v. Antiphagocytic factors vi. Intracellular pathogenicity vii. Antigenic heterogeneity viii. The requirement for iron ix. The role of biofilms	**15 Hours**
	1.2	Study of infectious diseases of the respiratory tract caused by bacterial and viral agents with emphasis on the cultural characteristics of the aetiological agents, pathogenesis, clinical features, laboratory diagnosis, and prevention: a. Bacterial infections – caused by *Streptococcus pyogenes, Klebsiella pneumoniae*, and *Mycobacterium tuberculosis* b. Viral infections – caused by viruses responsible for COVID-19 and the Common Cold	

UNIT 2 Specific infections II: Study of some skin, gastrointestinal and urinary tract infections. (1 Credit)	2.1	Study of infectious diseases of the skin caused by bacterial, fungal and viral agents with emphasis on the cultural characteristics of the aetiological agents, pathogenesis, clinical features, laboratory diagnosis, and prevention a. Bacterial infections - *Mycobacterium leprae*, *Pseudomonas* and *S. aureus*. b. Fungal infections- Oral Thrush c. Viral infections- Chickenpox, Shingles	**15 Hours**
	2.2	Study of infectious diseases of the gastrointestinal tract caused by bacterial and viral agents with emphasis on the cultural characteristics of the aetiological agents, pathogenesis, clinical features, laboratory diagnosis, and prevention a. *Salmonella* b. *Shigellosis* c. *Rotavirus* d. *Entamoeba histolytica* e. *E.coli* strains	
	2.3	Study of urinary tract infections a. Types of UTI b. Collection and transport of specimen c. Laboratory diagnosis	

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL **Course Title: Medical Microbiology Practicals**	**Course Code: SMCB351EP**

COURSE OUTCOMES:

The learner will be able to:

1. develop proficiency in acid-fast staining techniques for identifying *Mycobacterium* species.
2. develop the ability to successfully diagnose the bacterial pathogens causing respiratory tract, skin, gastrointestinal tract and urinary tract infections using various selective, differential and biochemical media.
3. identify *Candida species* using the germ tube test and growth on Chrom agar.
4. demonstrate an understanding of the laboratory workflow and interpretative skills gained through visiting a pathology laboratory.
5. perform antibiotic susceptibility testing using the Kirby-Bauer method for bacterial and yeast isolates and guide as to the line of treatment to be used.
6. evaluate the synergistic activity of antibiotics and explain its clinical implications in using combined therapy for treatment of infections caused by antibiotic resistant pathogens.
7. explain the results and implications of the E test method used for determining the minimum inhibitory concentration.
8. carry out determination of minimum bactericidal concentration (MBC) of antibiotics by subculturing the broths used for MIC determination onto fresh agar plates in order to understand the bacteriostatic and bactericidal effects of the antibiotics.

Lectures per week (1 Lecture is 120 minutes)		**2**	
Total number of Hours in a Semester		**60**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**3 Hours**	**50 marks**
	Internal Assessment	**--**	

	1	Acid-fast staining	60 hours
	2	Study of standard cultures- *Escherichia coli, Klebsiella pneumoniae, Proteus spp., Pseudomonas aeruginosa, Salmonella typhi, Salmonella paratyphi A, Salmonella paratyphi B, Shigella spp., Streptococcus pyogenes, and Staphylococcus aureus*	
	3	Diagnosis of Respiratory tract infections	
	4	Diagnosis of skin infections	
	5	Diagnosis of Gastrointestinal tract infections	
	6	Diagnosis of Urinary tract infections.	
	7	Identification of *Candida* species using germ tube test and growth on Chrom agar	
	8	Antibiotic susceptibility testing (Kirby-Bauer method) for bacterial isolates	
	9	Synergistic activity of antibiotics.	
	10	E test (Demonstration).	
	11	Determination of MBC of an antibiotic	
	12	Visit to a pathology laboratory	

ASSESSMENT DETAILS:

1. Internal Assessment (IA): Any one activity / assignment / test of 20 marks
2. Semester End Examination (SEE): Theory exam of 30 marks – One hour duration
3. Semester End Examination (SEE): Practical exam of 50 marks – Three hours duration

REFERENCES:

SMCB351E Medical Microbiology

1. Willey, J.M., Sherwood, L.M., and Woolverton, C.J. (2008). Prescott, Harley and Klein's Microbiology, 7th edn. *New York, McGraw Hill International Edition.*
2. Ananthanarayan and Paniker. (2009). Textbook of Microbiology", 8th edn. *Universal Press.*
3. Dugal, Suparna., Mantri, Jyoti. (2018). Understanding Emerging and Re-emerging Infectious Diseases, *Himalaya Publishing House.*
4. Mims, Cedric., Dockrell, Hazel M., Goering, Richard V., Roitt, Ivan M., Wakelin, Derek., Zuckerman, Mark. (2004). Medical Microbiology, 3rd edn, *Mosby.*
5. Koneman, Elmer W., Allen, Stephen D., Janda, William M., Schreckenberger, Paul C., Winn, Washington C. (1997) . Color Atlas and Textbook of Diagnostic Microbiology, 5th edn. *Lippincott Williams and Wilkins*.
6. Winn Jr., Washington., Allen, Stephen., Janda, William., Koneman, Elmer., Procop, Gary., Schreckenberger, Paul., Woods, Gail. (2005). Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 6th edn. *Lippincott Williams and Wilkins*.
7. Shors, Teri. (2009). Understanding viruses. *Jones and Bartlett Publishers.*

.

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: **Sciences** **Microbiology DSE**	**Semester – 5**
Course Title: Instrumentation	**Course Code: SMCB352E**

COURSE OBJECTIVES:

1. To describe the principle, working and applications of spectroscopy methods
2. To explain the different chromatography techniques, centrifugation and electrophoretic methods.

COURSE OUTCOMES:

The learner will be able to:

1. explain the principle and working of various spectroscopic methods, compare and contrast different techniques and recall their applications.
2. explain and distinguish between different centrifuges and their rotors.
3. explain, compare and apply different chromatographic techniques.
4. describe and distinguish between different electrophoretic techniques.

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**1 Hour**	**30 marks**
	Internal Assessment	**--**	**20 marks**

UNIT 1 Spectroscopic methods and Centrifugation (1 Credit)	1.1	Spectroscopy methods Principle, working and applications of a. UV-visible spectrophotometry b. Infrared spectroscopy c. Atomic spectroscopy -Atomic emission spectroscopy, Atomic absorption spectroscopy d. Fluorimetry e. Mass spectrometry	**15 Hours**

	1.2	Centrifugation a. Calculation of RCF b. Types of rotors – fixed angle and swinging bucket c. Low speed centrifuges d. High speed centrifuges e. Ultracentrifuges f. Differential centrifugation g. Density gradient centrifugation	**15 Hours**
UNIT 2 Chromatography and Electrophoresis (1 Credit)	2.1	Chromatography a. Basic principle and significance b. Paper chromatography c. Thin Layer chromatography d. High Performance liquid chromatography e. Gas chromatography f. Ion-exchange chromatography g. Affinity Chromatography h. Molecular exclusion chromatography	
	2.2	Electrophoresis a. Principle, vertical and horizontal apparatus b. Factors affecting electrophoresis c. Support media- Agarose, Acrylamide d. Electrophoresis of proteins - Native-PAGE, SDS-PAGE, Isoelectric focussing gel electrophoresis e. Agarose electrophoresis of DNA	

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL **Course Title: Instrumentation Practicals**	**Course Code: SMCB352EP**

COURSE OUTCOMES:

The learner will be able to:

1. develop skills to operate and handle UV-visible spectrophotometer.
2. apply paper, thin layer and column chromatography techniques to separate biomolecules.
3. develop skills to operate and handle different centrifuge models and different types of rotors.
4. calculate and convert the speeds from rpm to rcf while using a centrifuge.
5. set-up density gradient centrifugation to separate a mixture of cells.
6. develop skills to separate proteins and DNA using gel electrophoresis.
7. connect the concepts learnt in theory with the field visit to a laboratory/research institute.
8. create a video of them explaining the concept of an instrumentation technique.
9. search and select a research paper and explain the role of the instrumentation technique in that research.

Lectures per week (1 Lecture is 120 minutes)		**2**	
Total number of Hours in a Semester		**60**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**3 Hours**	**50 marks**
	Internal Assessment	**--**	

	1	UV-visible spectrophotometry	60 hours
	2	Separation of biomolecules using descending paper chromatography	
	3	Separation of fatty acids using thin layer chromatography	
	4	Separation of bacterial/fungal/algal pigments using thin layer chromatography	
	5	Separation of biomolecules using column chromatography	

	6	Use of basic centrifuge using fixed angle and swinging bucket rotors	
	7	Separation of bacterial and yeast cells using rate zonal density gradient centrifugation	
	8	Student activity- calculations of conversion of rpm to rcf	
	9	Separation of proteins using Native PAGE	
	10	Separation of proteins using SDS-PAGE	
	11	Separation of DNA using agarose gel electrophoresis	
	12	Visit to a laboratory/research institute for demonstration of Infrared spectroscopy, Atomic spectroscopy, Mass spectrometry, HPLC, GC, Ion exchange chromatography and gel filtration.	
	13	Student activity- Video making - students will make a video of them doing any chromatography/spectroscopic/electrophoresis related practical or explaining any of these concepts.	
	14	Student activity/Assignment- To search a recent research paper that involves use of any of the spectroscopic/chromatography methods listed in the syllabus and understand its application/role in the research.	

ASSESSMENT DETAILS:

1. Internal Assessment (IA): Any one activity / assignment / test of 20 marks
2. Semester End Examination (SEE): Theory exam of 30 marks – One hour duration
3. Semester End Examination (SEE): Practical exam of 50 marks – Three hours duration

REFERENCES:

SMCB352E

1. Boyer, Rodney. (2000). Modern Experimental Biochemistry, 3rd edn. *Benjamin Cummings*
2. Plummer, David. T. (2005). An Introduction to Practical Biochemistry, 3rd edn. *Tata McGraw-Hill Publishing Company Limited.*
3. Wilson, Keith., & Goulding, Kenneth H. (1986). A Biologist's guide to principles and techniques of practical biochemistry, 3rd edn, *London ; Baltimore, Md., U.S.A. : E. Arnold.*
4. Wilson, Keith., & Walker, John. (2010). Principles and techniques of Biochemistry and Molecular Biology, 7th edn, *Cambridge University Press.*

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences Microbiology DSE	**Semester – 6**
Course Title: Immunology	**Course Code: SMCB363E**

COURSE OBJECTIVES:

1. To learn the concept of how innate and adaptive immune responses of the human body coordinate to fight invading pathogens
2. To understand the effector responses- humoral immunity & cell mediated immunity
3. To understand antigens and their role in initiating immune response
4. To learn the structure & functions of immunoglobulin
5. To understand the importance of T cells, B cells, NK cells, APCs, cytokines, MHC molecules in immune response

COURSE OUTCOMES:

The learner will be able to:

1. conceptualize how adaptive immune responses coordinate to fight invading pathogens and differentiate between humoral and cell-mediated immunity.
2. explain the role of antigen in initiating the immune response.
3. explain the structure and role of T and B cells in generating adaptive immunity and study effector responses in both humoral and cell-mediated immunity, while correlating the structure and functions of immunoglobulins.
4. recognize the importance of T cells, B cells, NK cells, complement system, cytokines, MHC and APCs.

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**1 Hour**	**30 marks**
	Internal Assessment	**--**	**20 marks**

UNIT 1 General Immunology-I (1 Credit)	1.1	Introduction to Immunology a. Basic introduction b. Innate and adaptive immunity c. Humoral response - overview d. Cell mediated response overview	15 hours
	1.2	Antigens a. Immunogenicity versus antigenicity b. Factors that influence immunogenicity – foreignness, molecular size, chemical composition, heterogeneity, ability to be processed and presented, contribution of the biological system to immunogenicity – genotype of the recipient, animal, immunogen dosage, route of administration and adjuvants c. Types of antigens: heterophile antigens, isophile antigens, sequestered antigens, superantigens d. Tumor antigens (overview) - Tumor specific antigen - Tumor associated antigen e. Chimeric antigen receptors (CAR)- T cells therapy.	

	1.3	Immunoglobulins a.Immunoglobulins – basic and fine structure b. Immunoglobulin classes and biological activities c. Antigenic determinants on immunoglobulins – isotypes, allotypes, idiotypes (only concept) d. Immunoglobulin Superfamily	
	1.4	T cells a. Receptors and their structure (alpha-beta, gamma-delta TcR) b. TcR-CD3 complex: structure & functions. Accessory molecules. c. T cell activation, Costimulatory molecules, T cell differentiation (memory & effector cell)	
	1.5	B cells a. Receptors: structure & organization b. B cell activation and differentiation i) B cell activating signals ii) Role of Th cells in B cell response, formation of T – B conjugates, CD40 / CD40L interaction, Th cell cytokine signals.	
UNIT 2 General Immunology-II (1 Credit)	2.1	The Complement System a. The classical, alternative and lectin complement pathways. b. Biological consequences of complement activation.	
	2.2	Cytokines a. Properties and biological functions b. Cytokines secreted by Th1 and Th2 cells c. Cytokine based therapies	
	2.3	MHC complex and MHC molecules a. Structure of class I, class II and class III molecules b. Differences in the peptide binding cleft of class I and class II MHC molecules. c. Peptide – MHC interaction	

	2.4	Antigen presenting cells a. Antigen presentation- professional and non-professional cells b. Cytosolic and Endocytic processing pathways.	

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL COURSE **Course Title: Immunology Practicals**	**Course Code: SMCB363EP**

COURSE OUTCOMES:

The learner will be able to:

1. demonstrate and count various cells present in the blood using the field's staining method and diagnose a medical condition if the number is high or low
2. perform blood grouping, direct and reverse typing, ABO and Rh grouping, and explain the importance of blood typing in transfusion and transplantation.
3. determine Isoagglutinin titres and discuss their clinical significance in blood transfusion.
4. use Coombs test method in order to detect antibodies and antigens on red blood cells and discuss its use in immunohematology.
5. prepare O and H antigens of *Salmonella species*, use slide agglutination tests to confirm their presence, and explain the significance of the results in order to judge the stage of infection and or vaccination.

Lectures per week (1 Lecture is 120 minutes)	**2**
Total number of Hours in a Semester	**60**
Credits	**2**

Evaluation System	**Semester End Examination**	**3 Hours**	**50 marks**
	Internal Assessment	**--**	

	1	Differential staining of blood by the Field's staining method.	60 hours
	2	Blood grouping, Direct and Reverse typing, ABO and Rh grouping.	
	3	Determination of Isoagglutinin titre.	
	4	Coombs test- direct method.	
	5	Antigen preparation: O and H antigen preparation of *Salmonella,* confirmation by slide agglutination.	
	6	Widal test (Qualitative)	
	7	Cross-matching of blood (major and minor)	
	8	Ficoll-Hypaque technique for the separation of lymphocytes	

ASSESSMENT DETAILS:

1. Internal Assessment (IA): Any one activity / assignment / test of 20 marks
2. Semester End Examination (SEE): Theory exam of 30 marks – One hour duration
3. Semester End Examination (SEE): Practical exam of 50 marks – Three hours duration

REFERENCES:

SMCB363E Immunology

1. Kindt, Thomas J., Goldsby, Richard A., Osborne, Barbara Anne., Kuby, Janis. (2006). Immunology, 6th edn. *W. H. Freeman and company.*
2. Owen, Judith A., Punt, Jenni., Stranford, Sharon A., Jones, Patricia P., Kuby, Janis. (2013). Immunology, 7th edn. *W. H. Freeman and company.*
3. Khan, Fahim Halim. (2009). The elements of Immunology. *Pearson Education.*
4. Pathak, S., Palan U. (2005). Immunology Essential and Fundamental, 2nd edn. *Science Publishers, U.S.*
5. Pathak, S., Palan U. (2011). Immunology Essential and Fundamental, 3rd edn. *Anshan Ltd*
6. Tizard, Ian R. "Immunology, An Introduction", 4th edn, *Saunders college publishing.*
7. Goldsby, Richard A., Kuby, Janis. "Immunology", 5th edn. *W. H. Freeman and company.*
8. De Marco, R. C., Monzo, H. J., & Ojala, P. M. (2023). CAR T Cell Therapy: A Versatile Living Drug. International journal of molecular sciences, 24(7), 6300. https://doi.org/10.3390/ijms24076300

.

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences **Microbiology DSE**	**Semester – 6**
Course Title: Microbial Biodiversity	**Course Code: SMCB364E**

COURSE OBJECTIVES:

1. To understand and differentiate the structural, functional and ecological characteristics of major microbial domains.
2. To analyse the diversity of viruses and bacteriophages using the Baltimore classification and assess their roles in ecosystems.
3. To analyse the role of the various microscopic, cultural, and molecular techniques to study microbial communities from various environments.
4. To evaluate microbial interactions and evolutionary adaptations in extreme environments, and explain how diverse model systems are used to investigate key biological processes.

COURSE OUTCOMES:

The learner will be able to:

1. explain microbial diversity through experimental and bioinformatic approaches, including microscopy, culture, and molecular tools.
2. interpret and analyze microbial interactions in natural and extreme ecosystems and their role in nutrient cycling.
3. describe the key features of the diverse group of eukaryotic microorganisms and their ecological and economic significance.

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**1 Hour**	**30 marks**
	Internal Assessment	**--**	**20 marks**

UNIT 1 Prokaryotic and viral biodiversity (1 Credit)	1.1	a. Microbial diversity- Introduction to Microbial domains- Bacteria, Archaea, and Eukarya b. Major bacterial phyla (Proteobacteria, Firmicutes, Actinobacteria, etc.) c. Archaeal diversity: Halophiles, Thermophiles, Methanogens	15 hours
	1.2	Extremophiles and their ecological significance (overview)	
	1.3	Viruses and Phage Diversity a. Baltimore classification b. Bacteriophage diversity c. Viral roles in marine ecosystems and microbial mortality	
	1.4	Microbial Ecology and Evolution a. Microbial interactions (symbiosis, competition, syntrophy)- with examples b. Microbial communities in soil, water, extreme habitats c. Microbial evolution in extreme environments	
	1.5	Study of microbial biodiversity a. microscopic methods, b. cultural methods c. Molecular methods i.16S/18S rRNA sequencing ii. metagenomic approaches	
UNIT 2 Eukaryotic biodiversity (1 Credit)	2.1	Eukaryotic Microorganisms	

	2.2	Fungi: a. Classification- the five true fungal phyla (Chytridiomycota (Chytrids), the Zygomycota (conjugated fungi), the Ascomycota (sac fungi), the Basidiomycota (club fungi) and Glomeromycota b. Morphology, reproduction and ecological and economical significance of the five fungal phyla	
	2.3	General characteristics, major groups and economical and ecological significance of Protists: a. Algae b. Protozoa c. Slime molds	
	2.4	Model systems- *Chlamydomonas reinhardtii, Tetrahymena thermophila* and *Dictyostelium discoideum*	

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL COURSE **Course Title: Microbial Biodiversity**	**Course Code: SMCB364EP**

COURSE OUTCOMES:
The learner will be able to:

1. isolate and characterize bacteria, fungi, algae, and protozoa from diverse environments using appropriate standard microbiological techniques.
2. perform and interpret biochemical tests to detect thermostable enzymes in microbial isolates.
3. compare and document microbial diversity through microscopy and digital resources, and effectively communicate findings through conventional and creative media.
4. utilize online databases to explore microbial taxonomy and diversity.

Lectures per week (1 Lecture is 120 minutes)	**2**
Total number of Hours in a Semester	**60**
Credits	**2**

Evaluation System	**Semester End Examination**	**3 Hours**	**50 marks**
	Internal Assessment	**--**	

	1	Isolation of bacteria from soil and identification of the isolates based on morphological and biochemical characteristics of the isolates.	60 hours
	2	Isolation of halophiles	
	3	Isolation of thermophiles	
	4	Detection of thermostable amylase and protease	
	5	Isolation of fungi from air, soil, and decaying/ spoiled materials and microscopic observations of fungal morphology	
	6	Study of fungal morphology through wet mount and online resources - Report submission	
	7	Cultivation and microscopy examination of algae from freshwater and marine water samples	
	8	Detection of lipids in algae	
	9	Protozoal biodiversity- from water samples- wet mount	
	10	Qualitative detection of phages	
	11	Browsing BacDive a bacterial biodiversity database (link - https://bacdive.dsmz.de/)- report	
	12	Video making - fungal diversity in nature- Students will create a video of fungal growth on various natural materials.	

ASSESSMENT DETAILS:

1. Internal Assessment (IA): Any one activity / assignment / test of 20 marks
2. Semester End Examination (SEE): Theory exam of 30 marks – One hour duration
3. Semester End Examination (SEE): Practical exam of 50 marks – Three hours duration

REFERENCES:

SMCB364E Microbial Biodiversity

1. Maier, R. M., Pepper, I. L., & Gerba, C. P. (2009). *Environmental microbiology* (2nd ed.). Academic Press.
2. Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2018). Brock biology of microorganisms (15th ed.). Pearson.
3. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (1993). Microbiology (5th ed.). McGraw-Hill.
4. Stainer, R. Y., Ingraham, J. L., Wheelis, M. L., & Painter, P. R. (1986). General Microbiology (5th ed.). Macmillan Education.
5. Tortora, G. J., Funke, B. R., & Case, C. L. (2018). Microbiology: An introduction (13th ed.). Pearson.
6. Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2014). Prescott's microbiology (9th ed.). McGraw-Hill Education.
7. Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2017). Prescott's microbiology (10th ed.). McGraw-Hill Education.