

S. P. Mandali's
Ramnarin Ruia Autonomous College
(Affiliated to University of Mumbai)



Syllabus for

Program: F.Y.B.Sc. (Microbiology)

Program Code: (RUSSECMIC.O101)

(As per the guidelines of National Education Policy 2020-
Academic year 2024-25)

(Choice based Credit System)

Graduate Attributes

S. P. Mandali's Ramnarain Ruia Autonomous College has adopted the Outcome Based Education model to make its science graduates globally competent and capable of advancing in their careers. The Bachelors Program in Science also encourages students to reflect on the broader purpose of their education.

GA	Description
	A student completing Bachelor's Degree in Science program will be able to:
GA 1	Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline. Interpret scientific ideas and relate its interconnectedness to various fields in science.
GA 2	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences.
GA 3	Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.
GA 4	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyse results.
GA 5	Take complex challenges; work responsibly and independently, as well as in cohesion with a team for completion of a task. Communicate effectively, convincingly and in an articulate manner.
GA 6	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
GA 7	Follow ethical practices at work place and be unbiased and critical in interpretation of scientific data. Understand the environmental issues and explore sustainable solutions for it.
GA 8	Keep abreast with current scientific developments in the specific discipline and adapt to technological advancements for better application of scientific knowledge as a lifelong learner

PROGRAM OUTCOMES

PO	Description
	A student completing Bachelor's Degree in Science program in the subject of Statistics will be able to:
PO 1	Recall, explain and summarize basic concepts related to cytology, biochemistry, physiology, genetics and reproduction of prokaryotes and compare it with eukaryotes.
PO 2	Appreciate and exemplify the diversity in the microbial world and evaluate their ecological role as well as state their significance to humankind.
PO 3	Understand the basic concepts associated with growth and control of microorganisms and apply it in pure culture and preservation techniques.
PO 4	Differentiate, classify and characterize microorganisms based on their morphological, cultural, biochemical, and molecular properties.
PO 5	Explore, compare and evaluate the role of microorganisms in different natural environments as well as plants, animals and humans, and evaluate and exemplify their interrelationships.
PO 6	Apply the understanding of microbial processes to diverse science areas such as medical, industrial, agricultural and food and evaluate their potential for human well-being, for tackling environmental issues and exploring sustainable solutions
PO 7	Recall and explain the nature of biomolecules and metabolic processes; the role and kinetics of enzymes as well as the thermodynamic laws that drive these reactions.
PO 8	Recall the basic working principles of various bioanalytical techniques and tools and apply them to detect, estimate and structurally evaluate biomolecules present in the microbial cells.
PO 9	Understand and explain the nature of genetic material and elaborate the molecular mechanisms underlying various genetic processes like replication, transcription, translation, gene transfer and recombination in bacteria; and explain basic concepts in virology.

PO 10	Apply the basics of genetics and molecular biology to understand and evaluate techniques in genetic engineering and also for the use of bioinformatic tools for presentation and processing of data.
PO 11	Recognize and explain the role of microorganisms in different diseases, attribute pathogenesis mechanisms to their properties and extrapolate it to disease diagnosis, treatment and prevention. Outline and recall concepts in epidemiology of diseases. Classify and evaluate different chemotherapeutic agents.
PO 12	Recall, classify and summarize mechanisms of defense in humans, detail out the functioning of our immune system, correlate it to disease and its prevention and outline its association to health. Apply immunological principles for diagnosis of diseases.
PO 13	Understand and outline different biochemical mechanisms and their regulation; retrieve and construct biochemical pathways in microbial metabolism of major macromolecules and, recall and integrate the bioenergetics of metabolic reactions.
PO 14	Evaluate, exemplify and outline the role of microorganisms in different industrial fermentations, summarize technological aspects of bioprocesses, recall knowledge about patents, copyright and regulatory practices and QA.
PO 15	Demonstrate key practical skills/competencies in working with microbes for their study and use in the laboratory as well as outside, including the use of good microbiological practices. Analyze problems involving microbes, articulate them and devise innovative and creative solutions.
PO 16	Hypothesize, design experiments, construct experimental plans, execute them and analyze data with a basic understanding of statistics. Demonstrate an ability to be unbiased and critical in interpretation of scientific data
PO 17	Communicate effectively to express scientific ideas and/or their experimental data in an effective, precise and concise manner.

Credit Structure for FYBA/BSc/BVoc/BACM

Semester	Subject 1		Subject 2	GE/OE course	Vocational and Skill Enhancement Course (VSC) & SEC	Ability Enhancement Course/VEC/IKS	OJT/FP/CEP CC, RP	Total Credits
	DSC	DSE						
1	4		4	4	VSC-2 Sub 1+ SEC -2	AEC- 2 (CSK) + VEC- 2 (Understanding India) + IKS-2		22
2	4		4	4	VSC-2 Sub 2+ SEC -2	AEC-2 (CSK)+ VEC-2 (Env Sc)	CC-2	22
Total	8		8	8	8	10	2	44
Exit option: award of UG certificate in Major with 44 credits and an additional 4 credit Core NSQF course/ Internship or Continue with Major and Minor								

Course Code-Skill Enhancement Course: RUSSECMIC.O101
Course Title: Basic Laboratory practices in Microbiology and Microscopic Techniques

Academic year 2024-25

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION
	A student completing this course will be able to:
CO 1	Explain principle and working of basic instruments in Microbiology lab
CO 2	Handle microbes with an understanding of biosafety norms
CO 3	Explain the principle, construction & functionality differences of various microscopes, handle and maintain compound microscopes.
CO 4	Elaborate principle of the techniques used for visualization of microorganisms.
CO 5	Carry out different staining techniques to visualize microorganisms

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Credits/ Hours
RUSSECMIC.O101		Basic Laboratory practices in Microbiology and Microscopic Techniques	2/60
	Unit I		2/60
		<p>1.1 Instrumentation in Microbiology lab Structure and working of:</p> <ul style="list-style-type: none"> a) Autoclave b) Hot air oven c) Water bath d) Incubators e) Anaerobic jars f) Shaker g) Biosafety cabinets h) Colorimeter <p>1.2 Biosafety in Microbiology</p> <ul style="list-style-type: none"> a) Precautions to be taken while working in a Microbiology lab b) Biosafety- general principles and terminology with equipment c) Biological containment and laboratory safety levels d) Safe disposal of biohazardous waste <p>1.2 Microscopy</p> <p>Types of microscopes</p> <ul style="list-style-type: none"> a) History of microscopy, Optical spectrum, Lenses and mirrors with ray diagrams b) Simple and compound light microscope c) Dark field Microscopy d) Phase contrast Microscopy e) Electron Microscopy f) Confocal Microscopy g) Fluorescence Microscopy <p>Microscopic techniques:</p> <ul style="list-style-type: none"> a) Wet mounts-Hay infusion b) Hanging drop technique c) Micrometry d) Staining techniques: 	

		i. Dyes and stains: Types, Physicochemical basis, Fixatives, Mordants, Decolorizers ii. Simple (Monochrome, Negative staining) and differential staining (Gram staining and demonstration of acid fast staining) iii. Special Staining- Cell wall, Capsule, Endospore, Metachromatic granule, lipid granule, flagella iv. Vital Staining v. Fluorescent Staining vi. Permanent slides	
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References:

- A.J.Salle, Fundamental Principles of Bacteriology, 1984, McGraw Hill publications
- Michael J.Pelczar Jr., E.C.S. Chan ,Noel R , Microbiology TMH 5th Edition
- Stanier, Ingraham et al, General Microbiology, 5th Ed.1987, Macmillan Education.
- Michael T. Madigan & J.M. Martin, Brock's Biology of Microorganisms 13th Ed. International edition 2012, Pearson Prentice Hall.
- Willey, Sherwood and Woolverton, Prescott's Microbiology, 7th edition, 2011, International edition, McGraw Hill.

Modality of Assessment: Skill Enhancement Course

2 Credit- Total Marks 50

Sr No	Evaluation type	Marks
1	Laboratory work	30
2	Spots/Quiz/Viva	15
3	Journal	05
	TOTAL	50
