

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



Syllabus for

Program: UG Biotechnology

Program Code: RUSBTK

(Credit Based Semester and Grading
System for Academic Year 2023–2024)

GRADUATE ATTRIBUTES

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 Biotechnology will be able to:
PO 1	Adept in basic sciences along with a thorough understanding of biotechnology principles and chemical sciences to create a foundation for higher education with the insights into interdisciplinary approach.
PO 2	Demonstrate the applications of fundamental biological processes from the molecular, cellular, industrial and environmental perspective.
PO 3	Develop effective communication skills with improved individual and team work abilities in the domain of scientific research writing. Showcase their innovative ideas and research work efficiently.
PO 4	Reflect, analyse and interpret information or data for investigating the problem in fields of biotechnology. Acquire scientific and entrepreneur skills to furnish sustainable solutions to coeval problems
PO 5	Illustrate the relevance of ethical implications and standard laboratory practices in tissue culture techniques, forensic biology, developmental biology and other fields of biotechnology.
PO 6	Apply the conceptual knowledge to develop coherent, efficacious and proficient practical, technical and analytical skills.

PROGRAMME OUTLINE

YEAR	SEMESTER	PAPER	COURSE CODE	COURSE TITLE	CREDITS
FYBSc	I		RUSBTK.O101	Biotechnology I- Fundamentals of biotechnology	3
			RUSBTKP.O10 1	Practicals based on Biotechnology I- (Fundamentals of biotechnology)	1
			RUSBTK.O102	Fundamentals of chemistry for biotechnology	3
			RUSBTKP.O10 1	Practicals based on Fundamentals of chemistry for biotechnology	1
		GE	RUSGEBTK.O 101	IPR-I	2
		VSE	RUSVSCBTK. O101	Techniques of forensic science - I	1
			RUSVSCBTKP .O101	Practicals of VSE	1
		SEC	RUSSECBTK.O1 01	Microscopy and microbial techniques	1
			RUSSECBTKP.O 101	Practicals of SEC	1
FYBSc	II		RUSBTK.E111	Biotechnology II- Fundamentals of genetics	3
			RUSBTKP.E111	Practical of Biotechnology-II	1
I			RUSBTK.E112	Bioorganic chemistry	3

			RUSBTKP.E112	Practical of subject 2	1
		GE	RUSGEBTK.E111	IPR-II	2
		VSE	RUSVSCBTK.E11 1	Techniques in forensic science -II	1
			RUSVSCBTKP.E1 11	Practicals of VSE	1
		SEC	RUSSECBTK.E11 1	Techniques in tissue culture	1
			RUSSECBTKP.E1 11	Practicals of SEC	1

Course Code: RUSSECBTK.O101

Course Title: Microscopy and microbial technique

Academic year 2023-24

COURSE OUTCOMES:

COURSE OUTCOME	CO DESCRIPTION
CO 1	Describe the structure and functions of different components of prokaryotic cells and distinguish them on the basis of shape, arrangement.
CO 2	Describe the principle and working of instruments used in biotechnology laboratories.
CO 3	Enrich and isolate different microorganisms using appropriate culture medium under suitable aseptic conditions. Comment on their maintenance.
CO 4	Comment on the different methods of enumerations.
CO 5	Illustrate the different phases of the growth curve.

Course Code	Unit	Course/ Unit Title	Lectures
	I	<p>Introduction to structure of microorganisms</p> <p>Concept of Cell Shape and Size. Detail. Structure of Slime Layer, Capsule, Flagella, Pili, Cell Wall (Gram Positive and Negative), Cytoplasm and Storage Bodies and Spores</p> <p>Sterilisation techniques -Definition: Sterilisation and Disinfection. Methods-Physical and chemical. (Physical types: -Temperature, radiation, Filtration. Chemical types: -Phenol and phenolic compounds, alcohols, halogens, heavy metals and their compounds, dyes, detergents, quaternary ammonium compounds, aldehydes, gaseous agents) Ideal Disinfectant. Examples of Disinfectants and Evaluation of Disinfectant</p>	15

	<p>Nutrition, Cultivation and Enumeration of Microorganisms</p> <p>Nutrition and Cultivation of Microorganisms</p> <p>Nutritional Requirements: Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorus, Sulphur and Growth Factors. Classification of Different Nutritional Types of Organisms. Design and Types of Culture Media. Simple Medium, Differential, Selective and Enrichment Media, Concept of Isolation and Methods of Isolation. Pure Culture Techniques Growth and Enumeration Growth Phases,</p> <p>Enumeration of Microorganisms- Direct and Indirect Methods</p>	
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Course Code: RUSSECBTKP.O101

**Course Title: Practicals Based on SEC
DETAILED SYLLABUS**

Course Code	Course/ Unit Title	Credits
	<p>Components and working of Simple, Compound, Dark Field, Fluorescent and Phase Contrast Microscope</p> <p>Study of Beer Lambert's law and λ_{max}</p> <p>Monochrome Staining, Differential Staining, Gram Staining, and Acid-Fast Staining and Romanowsky Staining</p> <p>Special Staining Technique for Cell Wall, Capsule and Endospores and Fungal Staining, Lipid granules, metachromatic, flagella, spirochetes</p> <p>Motility test</p> <p>Sterilisation of Laboratory Glassware and Media using Autoclave</p> <p>Aseptic transfer technique</p> <p>Preparation of Media- Nutrient broth and Agar, MacConkey Agar, Sabouraud's Agar</p> <p>Isolation of Organisms, Macroscopic and microscopic studies: T-streak, Polygon method, Colony characteristics of microorganisms</p> <p>Enumeration of microorganisms: Serial Dilution, Pour Plate, Spread Plate Method, Nephelometry, Haemocytometry, Breeds count</p> <p>Growth Curve of <i>E. coli</i></p> <p>Effect of pH and temperature on growth of organisms</p> <p>Slide culture technique</p> <p>Contact slide method</p>	<p>1</p>

Semester II
Course Code: RUSSECBTK.E111
Course Title: Techniques in tissue culture
Academic year 2023-24

COURSE OUTCOME	CO DESCRIPTION
CO 1	Define tissue culture and its types. Enlist requirements for establishing and maintaining cell culture in laboratory
CO 3	Elaborate on the sterility measures to be followed in animal and plant tissue culture laboratories
CO 4	Assess and select appropriate glasswares/ plastic wares and other basic equipments
CO 5	Comprehend the current trends in plant and animal tissue culture
CO 6	Design and perform suitable experiments related to tissue culture techniques.

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lectures
	I	<p>Plant Tissue Culture</p> <p>Cell Theory, Concept of Cell Culture, Cellular Totipotency, Organization of Plant Tissue Culture Laboratory: Equipments and Instruments Aseptic Techniques: Washing of Glassware, Media Sterilization, Aseptic Workstation, Precautions to Maintain Aseptic Conditions. Culture Medium: Nutritional requirements of the explants, PGR's and their in-vitro roles, Media Preparation, Plant hormones. Callus Culture Technique: Introduction, Principle and Protocols.</p> <p>Animal Tissue Culture</p> <p>Basics of Animal Tissue Culture Introduction, Laboratory organization, Culture vessels, Culture media and Cell Culture Techniques, Equipment and Sterilization Methodology. Introduction to Animal Cell Cultures: types of cell culture</p>	15

Course Code: RUSSECBTKP.E111
Course Title: Practicals Based on SEC
DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
	Working and use of various Instruments used in tissue culture lab (Filter Assembly, LAF, pH metre and incubator) Aseptic Transfer Techniques in tissue culture Laboratory Organization and Layout for Plant and Animal Tissue Culture Laboratory Preparation of Stock Solutions and Preparation of Media for PTC Surface Sterilisation and inoculation of seeds in suitable media. Induction of Callus Culture Preparation of Artificial seeds Media Preparation and Sterilisation (ATC) Trypsinization of Tissue and Viability Count Formation of Monolayer from chick embryo cells. Subculturing of adherent cells Cryopreservation and thawing	1

MODALITY OF ASSESSMENT

SEC

Theory Examination Pattern

Internal assessment -40%- 12 Marks

Sr.No	Evaluation Type	Marks
1	One Assignment/ class test/ open book test (Animations/Presentations/Posters/ Video Making/ Skits/ Written assignments)	12
	Total Marks	12

B) External examination - 60 %: 13 marks

Semester End Theory Assessment - 13 marks

I. Duration - These examinations shall be of 45 mins duration.

II. Paper Pattern:

- There shall be 01 questions each of 13 marks. On each unit there will be one question. All questions shall be compulsory with internal choice within the questions.
- 60% options will be provided.

Questions	Options	Marks	Questions from
Q. 1	a. Objective (1M each) any 4 out of 5 b. Brief (3M each) any 3 out of 4	4 9	
	TOTAL	13	

Practical Examination Pattern:

(Semester end practical examination):

PARTICULARS	PRACTICAL COMPONENTS
Experimental Tasks	
Major	10
Minor I	6
Minor II	6
Journal	3

TOTAL	25
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