AC/II(22-23).3.RUS9

S. P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)

RUIA COLLEGE
Explore • Experience • Excel

Syllabus for

Program: F.Y.B.Sc.

Program Code: (Microbiology)

RUSSECMIC.O101

(As per the guidelines of National Education Policy 2020-
Academic year 2023-24)

(Choice based Credit System)

GRADUATE ATTRIBUTES

GA	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.

PROGRAM OUTLINE (B.Sc.)

CREDIT STRUCTURE BSc

Semester	Subject 1		Subject 2	GE/ OE course (Across disciplines)	Vocational and Skill Enhancement Course (VSC) & SEC	Ability Enhancement Course/ VEC/IKS	OJT/FP/CEPCC, RP	Total Credits
	DSC	DSE						
1	4		4	4 (2*2)	VSC-2 + SEC -2	AEC- 2 (CSK) + VEC- 2 (Env Sc.) + IKS-2		22
2	4		4	4 (2*2)	VSC-2 + SEC-2	AEC-2 (CSK)+ VEC-2 (Understanding India)	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								
3	Major 8		Minor 4	2	VSC-2	AEC-2 MIL	FP -2, CC-2	22
4	Major 8		Minor 4	2	SEC-2	AEC-2 MIL	CEP-2, CC-2	22
Total	16		8	4	4	4	8	44
Exit option: award of UG Diploma in Major with 88 credits and an additional 4 credit Core NSQF course/ Internship or Continue with Major and Minor								
5	DSC 12	DSE 4	Minor 2		VSC-2		CEP/FP-2	22

6	**DSC 12**	**DSE 4**	**Minor 2**				**OJT-4**	**22**
Total	**24**	**8**	**4**		**2**		**6**	**44**
	Exit option: award of UG Degree in Major with 132 credits or Continue with Major for Honours/ Research							

Course Code-Skill Enhancement Course: RUSSECMIC.O101

Course Title: Techniques for cultivation, handling & preservation of microorganisms

Academic year 2023-24

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Classify the microorganisms based on their growth requirements
CO 2	Design or identify culture media and conditions for their cultivation.
CO 3	Explain the techniques used to cultivate & preserve microorganisms in the lab
CO 4	Comprehend biosafety levels and principle of containment
CO 5	Prepare a microbial growth medium, enrich & isolate organisms under aseptic conditions & preserve the microbial strains for further use

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Credits/ Hours
RUSSECMIC.O101		**Techniques for cultivation, handling & preservation of microorganisms**	**1/15**
	Unit I	**1.1Nutrition and Cultivation of Microorganisms:** a) Nutritional requirements – Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorus, Sulfur and growth factors. b) Nutritional classification based on source of energy, electron and carbon c) Modes of nutrition: Endocytosis, Phagocytosis, movement of solutes across membranes d) Media Design and composition e) Types of Culture media with examples f) VBNC & oligotrophs g) Anaerobic cultivation **1.2 Biosafety in Microbiology** 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 e) Biowarfare & Bioterrorism **1.3 Pure Culture Techniques** a) Streak plate method b) Pour plate method c) Colony characteristics **1.4 Preservation of microorganisms** a) Methods for maintenance and Preservation of Bacteria b) Culture Collection Centers	

Practical: RUSSECMICP.O101

Course code	Practical	1 Credit
RUSSEC MICP.O101	PRACTICAL	
	1. Working in a laminar air flow 2. Nutritional requirements- Designing media using food material 3. Preparation of standard laboratory Culture Media: a. Liquid medium (Nutrient Broth) b. Solid Media (Nutrient agar, Sabouraud's agar) c. Preparation of slant, butts& plates 4. Inoculation techniques and Study of Growth: a. Inoculation of Liquid Medium b. Inoculation of Solid Media (Slants, Butts and Plates) 5. Pure culture techniques- Streak plate method 6. Study of Colony Characteristics of bacteria. 7. Use of Differential & Selective Media: (MacConkey& Salt Mannitol Agar), Enriched (Blood Agar) 8. Cultivation in defined and crude media-Demonstration 9. Cultivation of anaerobic microorganisms 10. Methods of Preservation of culture- Soil stock, oil overlay and preparation of glycerol stocks	

References:

a) A.J.Salle, Fundamental Principles of Bacteriology, 1984, McGraw Hill publications

b) Michael J.Pelczar Jr., E.C.S. Chan ,Noel R , Microbiology TMH 5th Edition

c) Stanier, Ingraham et al, General Microbiology, 5th Ed.1987, Macmillan Education.

d) Michael T. Madigan & J.M. Martin, Brock's Biology of Microorganisms 13th Ed. International edition 2012, Pearson Prentice Hall.

e) Willey, Sherwood and Woolverton, Prescott's Microbiology, 7th edition, 2011, International edition, McGraw Hill.

Modality of Assessment: Skill Enhancement Course

Theory – 1 Credit- Total Marks 25

A) Internal Assessment- 40%- 12 Marks

Sr No	Evaluation type	Marks
1	Class Test/ Project / Assignment / Presentation	10
	TOTAL	**10**

B) External Examination (Semester End)- 60%- 13 Marks

Semester End Theory Examination:

1. Duration – The duration for these examinations shall be of **30 Minutes**.
2. Theory question paper pattern:

Paper Pattern:

Question		Options	Marks
1	A	Any two out of three questions	10
	B	Any 1 out of 2	05
		TOTAL	**15**

Practicals- 1 Credit: Total Marks 50- 1 Credit

Internal Examination: 40%	**Experimental tasks**	20 Marks
Semester End Examination 60%	**Laboratory work**	25 Marks
	Spots/Quiz/Viva	05 Marks
