Resolution No. - AC/II(23-24).2.RUS7

S. P. Mandali's

Ramnarain Ruia Autonomous College

(*Affiliated to Mumbai University*)

RUIA COLLEGE
Explore • Experience • Excel

Syllabus for Vocational Skill Course (VSC)

Program: F.Y.B.Sc. Life Science

Program Code: RUSLSc

(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	GA Description **A student completing Bachelor's Degree in Science program will be able to:**
GA 1	Demonstrate an understanding of biological systems across microorganisms, plants and animals. To develop necessary laboratory skills and analytical methods.
GA 2	Employ critical thinking and scientific knowledge to design experiments, record observations, analyse data and interpret results. They can further build their career in research.
GA 3	Create an awareness of environmental issues, biological diversity, and how we can make a positive impact on it.
GA 4	Inculcate scientific temperament and generate problems solving approaches in students when they integrate themselves in the larger society.
GA 5	Develop necessary laboratory skills and analytical methods.

PROGRAM OUTCOMES

PO	Description A student completing Bachelor's Degree in Science program in the subject of Life Science will be able to:
PO 1	To be able to describe the biomolecules and metabolic processes, compare developmental processes and physiological systems in plants and animals, neuroendocrine system, short term and long-term memory, learning and behaviour, neurological disorders, biological evolution, human evolution of thought process, which allows for curiosity, and enhances learning process ahead.
PO 2	To be able to describe interspecific interactions in the ecosystem, Plant Tissue Culture techniques and its significance in agriculture, germplasm conservation and secondary metabolites, and Animal Tissue Culture techniques, Fermentation Technology and its role in industry and society
PO 3	To be able to explain DNA Cloning, use of cloning vectors like *E. coli* plasmids, cosmids, phagemids, viral vectors, significance of restriction enzymes, apply Mendel's laws, gene regulation in prokaryotes and eukaryotes, defence mechanisms in plants and animals, innate and adaptive immune system.
PO 4	Apply Biostatistics to analyse, Probable Chance of Occurrence, Normal Population, Student's t-test, Correlation and Regression analysis, Chi-Square test, data analysis for project work
PO 5	Skills-Perform assays to identify, purify, quantify, immobilize proteins/enzymes using techniques like Centrifugation, Electrophoresis and Chromatography, dissection of animals, protocols to handle preserved animals, working in aseptic conditions, use and maintaining of diagnostic kits, pedigree analysis in humans, karyotyping in plants
PO 6	Environment and Sustainability- to analyse the local biodiversity at residential sites of students and the changes occurring in the biodiversity and to conserve the same, awareness about implementation of Laws Regulations, citizens awareness to oppose under the aegis of NGO

PO 7	Ethics- awareness of plagiarism in scientific work, acknowledging/ citing the work, lab ethics in handling biological materials and chemicals, to be able to apply professional and ethical principles, minimize waste and ethical waste disposal
PO 8	Communication skills- to be able to communicate clearly through presentations as well as document, write effective reports or communicate and work in a team
PO 9	Project Management- to be able to write SOPs for instruments, design experiments, analyse data, work in a team, a scientific way of thinking, a diverse approach to scientific enquiry towards an idea.
PO 10	Life Long Learning- to be able to learn independently and adapt to changing needs of the society

CREDIT STRUCTURE BSc

Semester	Subject 1		Subject 2	GE/ OE course (Across disciplines)	Vocational and Skill Enhancement Course (VSC) & SEC	Ability Enhancement Course (AEC) / VEC/ IKS	OJT/FP/CEP/CC /RP	Total Credits
	DSC	DSE						
1	4		4	4	VSC-2 + SEC -2	AEC- 2 (CSK) + VEC- 2 (Env Sc.) + IKS-2		22
2	4		4	4	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		CEPFP-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 Honors/ Research							

Vocational Skill Course (VSC)

Course Title: Techniques in Life Science

Course Code: RUSVSCLSc.O101

Type of Course: Vocational Skill Course

Academic year 2023-24

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Analyze and calculate molar and percentage solutions of a given chemical compound, demonstrating a clear understanding of the concepts and mathematical skills required
CO 2	Calibrate and use scientific instruments such as pH meters and colorimeters to determine the pH of various substances and estimate the concentration of colored solutions, applying principles of Good Laboratory Practices
CO 3	Evaluate and interpret electron micrographs of cellular structures like mitochondria, lysosomes, and cilia, correlating the structural differences to their functional implications in both normal and pathological states
CO 4	Demonstrate proficiency in preparing fresh mounts of insect mouthparts, compare and contrast the different types, and explain their adaptations to various feeding mechanisms
CO 5	Design and conduct experiments to observe cytoplasmic streaming in plants under different temperature conditions, and critically assess the impact of temperature variations on cellular movement
CO 6	Collect and analyze biostatistical data from biodiversity field studies, using appropriate statistical methods to represent data in various formats such as ogive curves, histograms, and pie diagrams, demonstrating an ability to effectively communicate scientific findings

DETAILED SYLLABUS

RUSVSCLSc .P101	Practicals in Techniques in Life Science	2 Credit/ 30 Lectures
	1. Preparation of solutions of a given chemical compound Molar and percentage solutions – Concept and calculations only. **2.Instrumentation and techniques:** Calibration of the pH Meter with standard buffer pH4 and pH9.2 as per GLP Checking of pH for common foodstuff e.g. Milk/cola drink/Lime juice or any other relevant sample. **3 Microscopy** **Study of Electron Micrographs as listed below:** Mitochondria Lysosomes: Basement membrane/ junctions Cilia: Both normal and pathological Basement membrane/ junctions Cilia or Flagella **4. Study of Mouth parts in insect and Comparative assessment of mouth parts:** Preparation of fresh mount of; Piercing and sucking type- eg Mosquito Sponging type- eg Housefly Biting and Chewing type- eg Cockroach (if available **5. Effect of temp on movements in plants and animals using any system:** Cytoplasmic streaming in Vallisneria and Hydrilla **6. Collection of blood group information from family and construction of pedigree charts**. **7.Colorimetry:** Preparation of dilutions of required concentration from a stock solution of a coloured compound Estimation of Lambda max of a coloured solution. Verification of Beer Lambert's law for a coloured solution Absorption Spectra-Colour solution, plant pigment. Lambda max **8. Effect of ageing on plant leaf pigments / separation of amino acids** – using Paper Chromatography. TLC **9. Microbial growth curve, streak plate method/isolation methods etc**	

	10. Separation techniques: Paper and thin layer chromatography, principle of electrophoresis, differential centrifugation, Salting in and salting out (Ammonium sulphate fractionation). **11. Biostatistics:** Purpose of Biostatistics: Data collection & statistical analysis of the biodiversity field study. Representation – Ogive curve, histogram and pie diagram.	

Modalities of Assessment

Vocational Skill Course - (2 Credit Course for BSc)

Practical Examination Pattern: Total Marks 50

A. **External Examination: 50 Marks**

Semester End Practical Examination:

Question	Options	Marks
1	Main question to perform Experimental task / Estimation / Biostatistical analysis	24
2	Identification (8 spots)	16
3	Viva	05
	Journal	05
	TOTAL	**50**
