Resolution No. AC/II(22-23).3.RUS12

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: (RUSZOO)

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

(Choice based Credit System)

GRADUATES 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	**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 the values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.**
GA 7	**Follow ethical practices at the workplace and be unbiased and critical in the 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 ZOOLOGY will be able to:**
PO 1	Identify the major groups of organisms, discuss the basis of their biodiversity, and draw parallels with their phylogenetic relationship, using well-thought cardinal features of classification on the basis of morphology and molecular information.
PO 2	Understand and analyse the evolutionary link amongst the animals and also understand the basic classification patterns of invertebrates and vertebrates. They will be able to compare and contrast the anatomy and physiology of different invertebrates and vertebrate phylum.
PO 3	Analyse the genes, genomes, cells, cell organelles, tissues and histological studies, understand the linkage of genes, mechanisms of sex determination, various structures of DNA and apply the knowledge of genetics to the process of evolution.
PO 4	Analyse and understand the broad concepts of ecology, food webs, food chains and the interconnectedness of biotic and abiotic factors. Comprehend the concepts of Population dynamics, communities and its dependence on the ecosystems.
PO 5	Objectively understand and evaluate information about animal behaviour and ecology encountered in our daily lives.
PO 6	Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within Zoology.
PO 7	Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.

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: RUSSECZOO.E111

Course Title: LABORATORY PRACTICES
Type of Course: Skill Enhancement Courses (SEC)

Academic year 2023-24

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Recall good laboratory practices and work safely in the department Laboratory.
CO 2	Identify the different Lab safety symbols and describe them.
CO 3	Use of appropriate glassware.
CO 4	Explain the principle and working of various basic laboratory instruments like colorimeter, microscope, pH meter.
CO 5	Analysis the data and prepare correct graphical presentation for it.
CO 6	Calculate the concentration of solutions, Rf values, central tendencies of group and ungroup data.
CO 7	Prepare simple solution of different concentration
CO 8	Trained In technical skills for further studies..

DETAILED SYLLABUS

Course Code	Unit	Course Title - LABORATORY PRACTICES	Credits/ Hours
RUSSECZOOP. E 111	**Unit I**	**1.1. Laboratory safety :** a) **Introduction to good laboratory practices** Concept b)Types of hazards, c) symbols and d) Precautions **1.2. Laboratory glassware** a) Pipettes b) Conical flask c) Beakers d) Volumetric flask e) Measuring cylindrical f) Test tubes **1.3.Units of measurement:** a)Temperature scale and interconversion : Celsius, Fahrenheit, Kelvin b) Calculations and related conversions : • Metric system- length (meter to micrometer) • Weight (gram to microgram) • Volumetric (Cubic measures) • Problem solving based conversions c) Concentrations • Percent solutions • ppt, ppm, ppb • Normality • Molarity • Molality • Problem solving based solution preparation **1.4.Laboratory Instrument** a)Microscope b)Colorimeter c)pH meter **1.5.Biostatistics** Introduction and scope a) Sampling and its types	**1/15**

		c) Central Tendencies (mean, median, mode) d) Tabulation and Graphical representations (Histograms, bar diagrams, pie diagrams)	

Practical

Course Code: RUSSECZOOP.E111	
Sr. No.	**Practical Title- LABORATORY PRACTICES**
1.	Problem based unit conversions.
2.	Problem based solution preparation.
3.	Handling of glassware used in Lab
4	Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous infectious material, Radioactivity, Environmental toxicity.
5.	Study of Central tendencies and plotting of Bar diagram, histogram and pie diagram.
6.	a) Study of parts of microscope and their functions. b) Technique of focusing a permanent slide under 10X and 45X.
7.	a) Dilution of given sample and estimation of OD using colorimeter b) Calculation of concentration from the given OD using formula.
8.	Calculation of pH of three different samples and confirming the result with pH meter
9.	Separation of amino acids from the mixture by paper chromatography.

References:

1. Upadhyay and Upadhyay, Biophysical Chemistry, Himalaya Publishing House, 2009
2. Irwin H Segal Biochemical Calculation, Wiley & Sons Inc, 1976
3. Introduction to Practical Biochemistry, Tata McGraw Hill Publishing Co. Ltd.
4. Statistical Methods In Biology - N.T.J Bailey
5. Experimental biology (measurement and analysis)- R. H. Kay
6. Elements Of Mathematical Biology -Alfred J .Log ka
7. Introduction to Practical Biochemistry, Tata McGraw Hill Publishing Co. Ltd.
8. S.K. Sawhney and Randhir Singh. Introductory Practical Biochemistry, Narosa Publishing House.
9. B. K. Mahajan. Methods in Biostatistics, Jaypee Publications.
10. V. K. Sharma. Microscopy and Cell Biology, Tata McGraw Hill Publishing Co. Ltd.
11. L. Veerakumari. Bioinstrumentation, M.J.P. Publishers.
12. Keith Wilson and John Walker. Principles and Techniques of Practical Biochemistry, Cambridge University Press.
13. A. H. Patel. A Manual of Medical Laboratory Technology, Navneet Prakashan Ltd.
14. Dr. P. K. Bajpai. Biological instruments and methodology, S. Chand company Ltd.
15. Frank H. Stephenson. Calculations in Molecular biology and Biotechnology, Academic Press.

Modality of Assessment: Skill Enhancement Courses (SEC) (1 Credit Theory Course for BSc)

A) Internal Assessment- 40%- 30 Marks

Sr No	Evaluation type	Marks
2	Class Test/Assignment/Open Book Test	10
	TOTAL	**10**

B) External Examination (Semester End)- 60%- 45 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	Questions Based on
1	A) (OR) B) (i and ii)	8 OR 8(4+4)	UNIT 1
2	B)	7	
	TOTAL	**15**	

Practical Examination Pattern: Total Marks 50

C. Internal Examination: 40%- 20 Marks

Heading	Practical
Journal	05
Lab Participation	05
Lab work/ Field report/ Presentation	10
Total	**20**

D. External Examination: 60%- 30 Marks
Duration – The duration for these examinations shall be of 2 hours.
Semester End Practical Examination:

Particulars	Practical
Major Experiment and/or Minor Experiment, Identification and *Viva voce*	30
Total	**30**