

AC/II(23-24).2.RUS3

**S. P. Mandali's**

**Ramnarain Ruia Autonomous College**

*(Affiliated to University of Mumbai)*



## **Syllabus for UG Biotechnology**

**Program: S.Y.BSc.**

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

(Choice based Credit System)

<b>GA</b>	<b>GRADUATE ATTRIBUTES</b> <b>A student completing Bachelor's Degree in Science program will be able to:</b>
<b>GA 1</b>	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.
<b>GA 2</b>	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences.
<b>GA 3</b>	Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.
<b>GA 4</b>	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyse results.
<b>GA 5</b>	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.
<b>GA 6</b>	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
<b>GA 7</b>	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.
<b>GA 8</b>	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
	<b>A student completing Bachelor's Degree in Science program in the subject of Biotechnology will be able to:</b>
<b>PO 1</b>	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.
<b>PO 2</b>	Demonstrate the applications of fundamental biological processes from the molecular, cellular, industrial and environmental perspective.
<b>PO 3</b>	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.
<b>PO 4</b>	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
<b>PO 5</b>	Illustrate the relevance of ethical implications and standard laboratory practices in tissue culture techniques, forensic biology, developmental biology and other fields of biotechnology.
<b>PO 6</b>	Apply the conceptual knowledge to develop coherent, efficacious and proficient practical, technical and analytical skills.

## Credit Structure for SYBSc. Biotechnology 24-25

Semester	Subject 1 (Major)		Subject 2 (Minor)	GE/OE course	Vocational and Skill Enhancement Course (VSC) & SEC	Ability Enhancement Course/VEC/IKS	OJT/FP/CEP CC, RP	Total Credits
	DSC	DSE						
3	Major 8 4*2/ (3T+1P) *2		Minor 4 (3T+1P)	2	VSC-2-Major	AEC-2 MIL (Marathi/Hindi)	FP -2, CC-2	22
4	Major 8 4*2/ (3T+1P) *2		Minor 4 (3T+1P)	2	SEC-2	AEC-2 MIL (Marathi/Hindi)	CEP-2, CC-2	22
<b>Total</b>	<b>16</b>		<b>8</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>8</b>	<b>44</b>

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

## PROGRAMME OUTLINE

YEAR	SEMESTER	PAPER	COURSE CODE	COURSE TITLE	CREDITS
SYBSc	III	DSC-I	RUSBTKMJO201	IMMUNOLOGY	3
		DSC-I	RUSBTKMJPO201	PRACTICAL BASED ON IMMUNOLOGY	1
		DSC-II	RUSMJBTKO202	PLANT AND ANIMAL PHYSIOLOGY	3
		DSC-II	RUSMJBTKPO202	PRACTICAL OF PLANT AND ANIMAL PHYSIOLOGY	1
		MINOR	RUSMIBTKO203	BIOCHEMISTRY	3
		MINOR	RUSMIBTKPO202	PRACTICAL BASED ON BIOCHEMISTRY	1
		VSC	RUSVSCBTKPO201	ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY	2

SYBSc	IV	DSC-I	RUSMJBTKE211	AIR WATER AND SOIL MICROBIOLOGY	3
		DSC-I	RUSMJBTKE211	PRACTICAL BASED ON AIR WATER AND SOIL MICROBIOLOGY	1
		DSC-II	RUSMJBTKE212	MOLECULAR BIOLOGY	3
		DSC-II	RUSMJBTKE212	PRACTICAL BASED ON MOLECULAR BIOLOGY	1
		MINOR	RUSMIBTKE213	BIOPHYSICAL CHEMISTRY	3
		MINOR	RUSMIBTKE213	PRACTICAL BASED ON BIOPHYSICAL CHEMISTRY	1
		SEC	RUSSECBTKE211	BIOINFORMATICS AND BIostatISTICS	2

## SEMESTER IV

**Course Code: RUSSECBTKPE211**

**Course Title: Bioinformatics and Biostatistics**

**Type of Course: Skill enhancement course**

**Academic year 2024-25**

### COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION
	<b>A student completing this course will be able to:</b>
CO 1	Explore the tools available in Bioinformatics.
CO 2	Classify between the raw and processed database
CO 3	Compare and distinguish between different biological databases.
CO 4	Use the BLAST and Multiple sequence alignment tools for local and global alignment
CO 5	Demonstrate the use of appropriate software in visualization of 3D structures
CO6	Apply various statistical tools for analysis of biological data
CO7	Design a relevant hypotheses , analyze the rejection and acceptance criteria of them using different statistical methods
CO8	Demonstrate applications of different softwares for referencing

### DETAILED SYLLABUS

Course Code: RUSSECBTKPE211	
Sr. No.	Practical Title
1.	Protein and Nucleotide data mining using NCBI
2.	Protein data mining using UniprotKB

3.	Protein data mining using PDB
4.	Protein data mining using specialized database :KEGG
5.	Protein data mining using secondary database - INTERPRO
6.	Protein data mining using secondary database - PROSITE
7.	Protein data mining and annotations using secondary database:SWISS PROT
8.	Classification of Protein using SCOP
9.	Classification of Protein using CATH
11	Visualization of protein structure using RASMOL & PYMOL
12	Visualization and comparison of protein structure using Chimera
15	Study Sequence comparison BLAST
16	Study Sequence comparison using PSI BLAST
17	Primer Designing using Primer Blast and NEBuilder
18	Study of multiple Sequence alignment using clustal / muscle/ t coffee
20	Excel based study of central tendency
21	Excel based study of measures of dispersion
22	testing of hypothesis using z test
23	Excel based testing of hypothesis using t test
24	Excel based testing of hypothesis using chi square test



25	Excel based correlation and regression analysis
26	Online referencing and paraphrasing softwares : Grammarly and Mendeley

**References :**

1. Introductory Biostatistics. 1st edition. (2003), Chap T. Le. John Wiley, USA
2. Methods in Biostatistics- B. K. Mahajan –Jaypee Brothers
3. Bioinformatics- methods and S.C.Rastogi, N. Mendiratta, PHL Course Pvt. Ltd.

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**MODALITY OF ASSESSMENT****SEC****Practical Examination Pattern:****(Semester end practical examination):**

<b>PARTICULARS</b>	<b>PRACTICAL COMPONENTS</b>
<b>Experimental Tasks</b>	
<b>Major</b>	<b>20</b>
<b>Minor 1</b>	<b>10</b>
<b>Minor 2</b>	<b>10</b>
<b>Journal</b>	<b>05</b>
<b>Viva/spots</b>	<b>05</b>
<b>TOTAL</b>	<b>50</b>