Resolution No. – AC/II(23-24).2.RUS4

S. P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)

RUIA COLLEGE
Explore • Experience • Excel

Syllabus for

Program: B.Sc

Program Code: RUSBOT

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

(Choice based Credit System)

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.

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, 1rganize 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.
GA7	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	PO Description **A student completing Bachelor's Degree in Science program inthe subject of Botany will be able to:**
PO 1	Understand the basic concepts of lower & higher plants their life cycle, economic and ecological importance, also evolution from algae to angiosperms and their industrial applications
PO 2	Develop an understanding of the principles underlying nomenclatureand classification of Angiosperms, identify plants belonging to various families according to Bentham and Hooker's system.
PO 3	Elucidate ecological interconnectedness of life by energy and nutrientflow, relate the physical features of the environment to the structure ofpopulations, communities, ecosystems, pollution, bioremediation, natural resources, sustainability and importance of conservation.
PO 4	Understand and relate priority areas such as genetics, cell and molecular biology, plant biotechnology and application of geneticengineering for the improvements of plants.
PO 5	Gain knowledge about laws of inheritance, various genetic interactions, chromosomal aberrations, multiple alleles and mutations.
PO 6	Analyze morphological and anatomical plant structures in the context of metabolic /physiological functions of plants, including embryological and palynological aspects
PO 7	Apply ethnobotanical aspects and medicinal, dietary and cosmetic uses of plants with special reference to phytochemistry and usage as mentioned in different Pharmacoepia
PO 8	Acquire the skills in handling scientific instruments, planning and performing laboratory experiments and application of suitable statisticaltools.
PO 9	Understand the finer aspects of emerging areas such as Molecular biology and Bioinformatics.
PO10	Develop practical skills in laboratory techniques in various fields of botany along with collection and interpretation of biological materials
PO11	Apply research based knowledge and research methods including design of experiments, analysis and interpretation of data andsynthesis of the information to provide valid conclusions.

CREDIT STRUCTURE- FYBSc

Semester	Subject 1		Subject 2	GE/ OE course	Vocational and Skill Enhancement Course (VSC) & SEC	Ability Enhancement Course/ VEC/IKS	OJT/FP/CEPCC, RP	Total Credits
	DSC	DSE						
1	4		4	4	VSC-2 Sub 1+ SEC -2	AEC- 2 (CSK) + VEC- 2 (Understanding India) + IKS-2		22
2	4		4	4	VSC-2 Sub 2+ SEC -2	AEC-2 (CSK)+ VEC-2 (Env Sc)	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								

COURSE OUTLINE

Discipline Specific Core

Course Code: RUSBOTO101

YEAR	SEM	COURSE CODE	Type of Course	COURSE TITLE	CREDITS
F.Y.	I	RUSBOTO101	Discipline Specific Core(DSC)	**PLANT SCIENCE- I** 1.Microbiology, Algae and Bryophyta 2. Environmental Botany 3. Cytogenetics	3
	I	RUSBOTPO101	Practical	**PLANT SCIENCE- I**	1
F.Y.	II	RUSBOTE111	Discipline Specific Core(DSC)	**PLANT SCIENCE- II** 1. Fungi, Lichens, Pteridophyta and Gymnosperms 2 Plant Systematics 3. Anatomy	3
	II	RUSBOTPE111	Practical	**PLANT SCIENCE- II**	1

SEMESTER I

Course Code :RUSBOTO101

Course Title: PLANT SCIENCE- I

Discipline Specific Core Course

Academic year 2024-25

COURSE OUTCOMES5

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Explain the diversity and techniques used for visualisation of microorganisms.
CO 2	Outline the classification of Algae and interpret their Industrial applications
CO 3	Outline the classification and salient features of Bryophytes and their ecological significance and economic importance
CO 4	Explain the basic principles of plant ecology and examine the structure and functions of eco-system
CO 5	Discuss climate change, biodiversity and its conservation.

CO 6	Explain Mendelian Genetics, genetic basis of loci and alleles, sex determination in plants and jumping genes
CO 7	Relate the structure with functions of thallophytes and classes of plants adapted to different environmental conditions.

DETAILED SYLLABUS

Course Code/Unit	Course/ Unit Title	Credits/ Hrs
RUSBOTO101	**PLANT SCIENCE – I**	**Credits-3**
UNIT I	**Microbiology, Algae and Bryophyta**	**Hours -15**
	• Introduction to Microbiology: Microorganisms in the living World, Groups of Microorganisms- Distribution of Microorganisms in Nature • Major Characteristics of Bacteria, Basic principles of staining	
	• Outline of Classification of algae according to G.M. Smith upto orders and the general characters of Cyanophyta and Chlorophyta. • Range of thallus structure in algae. • Role of Algae in (nutraceutical, pharmaceutical, biofuels, food, biofertilizers, and agar)	
	• Outline of classification of Bryophyta according to G.M. Smith upto orders and the general characters of Hepaticopsida. • Plant succession and Pollution monitoring, importance of bryophytes with special reference to *Sphagnum*	
UNIT II	**Environmental Botany**	**Hours-15**
	• Types of ecosystems: aquatic and terrestrial and Mangrove ecosystem • Effect of climate change on ecosystems, role of IPCC, • Biodiversity: types of biodiversity, endemics and wides • Conservation of Biodiversity*: ex situ* and *in situ* methods, People's Biodiversity Register • Biodiversity Hotspots and PAN • The Biological Diversity Act, 2002; Convention on Biological Diversity • Sustainable heritage management • Sustainable Development Goals (SDG's)	
UNIT III	**CytoGenetics**	**Hours -15**
	• Prokaryotic and eukaryotic cell structure, General structure of plant cell: cell wall, Plasma membrane (bilayer lipid structure, fluid mosaic model) • Mitosis	
	• Phenotype/Genotype, Mendelian Genetics- monohybrid, dihybrid ratios, test cross and back cross. • Epistatic and non-epistatic interactions; multiple alleles.	

	• Sex determination in plants • Genic Balance Theory of sex determination in Drosophila, Lyon's Hypothesis of X chromosome inactivation.	
	• Jumping genes	

PRACTICAL		
RUSBOTP.O101	**Plant Science I**	**Credits – 1**
1	Introduction on handling, use and maintenance of microscopes and other laboratory equipments. To study bacteria using Gram staining method	
2	Study of stages in the life cycle of *Nostoc* and *Spirogyra* from fresh/ preserved material and permanent slides	
3	Study of stages in the life cycle of *Riccia* from fresh/ preserved material.	
4	Examining various stages of mitosis in root tip cells (*Allium*)	
5	Cell inclusions**:** Starch grains (Potato and Rice); Aleurone layer, Maize; Cystolith (*Ficus*); Raphides (*Pistia*); Sphaeraphides (*Opuntia*).	
6	Identification of plants adapted to different environmental conditions: Hydrophytes free floating (*Pistia*), Rooted floating(*Nymphaea*), submerged (*Hydrilla),* Mesophytes (any common plant), Hygrophytes (*Typha*), Epiphytes (Orchid aerial root), Halophytes (*Avicennia)*	
7	Calculation of mean, median and mode, Calculation of Standard deviation	
8	Frequency distribution, graphical representation of data- frequency polygon, histogram, pie chart.	
9	Study of Karyotype – Human and *Allium cepa*	
	Preparing Biodiversity register- report submission	

SEMESTER II

Course Code: RUSBOTE111

Course Title: PLANT SCIENCE- II

Academic year 2024-25

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Classify fungi, lichens and appreciate their adaptive strategies
CO 2	Outline the classification and salient features of Pteridophytes, Gymnosperms and Angiosperms and their ecological significance and economic importance.
CO 3	Summarize the principles underlying Bentham & Hooker's system of classification
CO 4	Identify plants from prescribed families
CO 5	Outline the concepts and fundamentals of plant anatomy.
CO 6	Interpret the adaptive and protective systems of plants.
CO 7	Relate the structure with function of diverse groups of plants.

DETAILED SYLLABUS

Course Code/Unit	Course/ Unit Title	Credits/ Hours
RUSBOTE 111	PLANT SCIENCE – II	Credits 3
UNIT I	Fungi, Lichens, Pteridophyta and Gymnosperms	Hours -15
	• Outline of Classification of fungi according to G. M. Smith upto orders and the general characters of Phycomycetes. • Modes of nutrition in Fungi (Saprophytism, predation and Parasitism). • Fungi in the field of Medicine, Agriculture, Biofertilizers, Biopesticides, brewing & baking, enzymes, Colorants, bioluminescent fungi, human and plant pathogens, Association of fungi with Algae (roots of higher plants), leafcutter ants, termites. • Introduction to lichens, types of lichens, ecological significance	
	• Outline of classification of Pteridophyta according to G. M. Smith upto orders and the general characters of Lepidophyta. • Stelar evolution. • Applications in food, medicine, horticulture and agriculture,	

	Scope of ferns inhorticulture and economic development.	
	• General characters, Outline of classification of Gymnosperms according to C.J.Chamberlin upto orders and the general characters of Cycadophyta . • Economic importance: Wood, Resins, Essential oils, food and Drugs	
UNIT II	**Plant systematics I**	**Hours -15**
	• Definition and aims of taxonomy, systematic botany, concepts of taxonomy, Plant nomenclature. • Study of following families: Malvaceae, Leguminosae: Caesalpinaceae, Papilionaceae, Mimosae, Rubiaceae, Amaranthaceae, Amaryllidaceae • Secret life of plants: Curious plants and extremophiles	
Unit III	**Anatomy**	**Hours -15**
	• Simple tissues, complex tissues, meristematic tissues, permanent tissues, wall ingrowths and transfer cells, adcrustation and incrustation, ergastic substances. • Primary structure of dicot and monocot root, stem and leaf (Kranz anatomy). • Epidermal tissue system: types of hair, monocot and dicot stomata.	

PRACTICAL		
RUSBOTPE111	**PLANT SCIENCE – II**	**Credits – 1**
1	Study of stages in the life cycle of *Rhizopus* from fresh/ preserved material and permanent slides	
2	Study of stages in the life cycle of *Selaginella*, *Selaginella* stem and rachis, strobilus	
3	*Cycas*: T.S of leaflet (*Cycas* pinna) microsporophyll, megasporophyll, L.S. of ovule of *Cycas*– all specimens to be shown.	
4	Stelar evolution with the help of permanent slides, Protostele, haplostele , actinostele, plectostele, mixed protostele, siphonostele, ectophloic, amphiphloic,	
5	Study of following families: Malvaceae; Leguminosae: Caesalpinaceae Papilionaceae, Mimosae; Amaryllidaceae	
6	.Primary structure of dicot and monocot root.	
7	Primary structure of dicot and monocot stem.	
8	Study of dicot and monocot stomata.	
9	Epidermal outgrowths: with the help of mountings: Unicellular: *Gossypium*, *Argyreia; M*ulticellular: *Lantana*; Glandular: *Drosera* and Stinging: *Urtica* – only identification with permanent slides.Peltate: *Thespesia,* Stellate: *Erythrina,* T-shaped: *Avicennia*	
	Field visit and report submission	

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MODALITY OF ASSESSMENT

Discipline Specific Core Course (3 credits)

A) Internal Assessment(Theory)- 40%- 30 Marks

Sr No	Evaluation type	Marks
1	**Class Test**	**20**
2	**Project / Assignment / Presentation/ Case study**	**10**
	TOTAL	**30**

B) External Examination (Semester End)- 60%- 45 Marks

Semester End Theory Examination:

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

Paper Pattern:

Question	Options	Marks	Questions Based on
Q.1	**Attempt ANY 3 out of 4**	**15**	**Unit I**
Q.2	**Attempt ANY 3 out of 4**	**15**	**Unit II**
Q.3	**Attempt ANY 3 out of 4**	**15**	**Unit III**
	TOTAL	**45**	

Practical Examination Pattern: Total Marks -25

SEMESTER END EXAMINATION	
Laboratory work	15
Field study	5
Journal	2
Practical participation	3
Total marks	**25**

PRACTICAL JOURNAL

The students are required to present **a duly certified journal** for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

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