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: UG

Program: B. Sc.

Program Code: BOTANY(RUSBOT)
(Minor)

(Choice Based Credit System for the academic year 2024–2025)

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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, 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.
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 in the 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 nomenclature and 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 nutrient flow, relate the physical features of the environment to the structure of populations, 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 genetic engineering 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 statistical tools.
PO 9	Understand the finer aspects of emerging areas such as Molecular biology and Bioinformatics.
PO 10	Develop practical skills in laboratory techniques in various fields of botany along with collection and interpretation of biological materials
PO 11	Apply research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

SEMESTER III

Course Code	UNIT	TOPICS	Credits
RUSMIBOTO202	PLANT SCIENCE - IV		
	I	Anatomy II	03
	II	Developmental botany I	
	III	Physiology I	
RUSMIBOTPO202	Practicals	Practical based on RUSMIBOTO202	01
			04

SEMESTER IV

Course Code	UNIT	TOPICS	Credits
RUSMIBOTE212	PLANT SCIENCE V		
	I	Plant systematics II	03
	II	Environmental Botany- II	
	III	Pharmacognosy I	
RUSMIBOTPE212	Practicals	Practical based on RUSMIBOTE212	01
			04

SEMESTER - III
Course Code: RUSMIBOTO202
(Core Course)
Course Title: PLANT SCIENCE - IV
Academic year 2024 – 2025

COURSE OUTCOMES:

Upon successful completion of this course, learners will be able to;

COURSE OUTCOME	CO DESCRIPTION Students will be able to -
CO 1	Integrate the concepts of plant anatomy with respect to secondary growth, mechanical and conducting tissue systems and their role in adaptations.
CO 2	Apply the fundamentals of palynology in various areas of science.
CO 3	Express fundamental concepts of plant embryology
CO 4	Comprehend the photosynthetic process, the conversion of radiant energy and the diverse carbon fixation pathways.
CO 5	Explain the role of nutrients and nutritional deficiencies in plants.
CO 6	Perform experiments to analyze some parameters, record observations and derive inference of the topics mentioned above.

Detailed Syllabus

Course Code/Unit	Course/ Unit Title	Credits
RUSMIBOTE212	**PLANT SCIENCE IV**	**Credits – 3**
UNIT I	**ANATOMY II**	
	Normal secondary growth in dicotyledonous stem and root.	
	Growth rings, periderm, lenticels, tyloses	
	Mechanical tissue system and • Tissues providing mechanical strength and support and theirdisposition • I-girders in aerial and underground organs conducting tissue system	
	Study of ecological adaptations: Xerophytes and halophytes	
UNIT II	**DEVELOPMENTAL BOTANY I**	
	Palynology I: • Pollen morphology	
	Plant Embryology I: • Microsporogenesis– Structure of microsporangium, microsporogenesis and development of male gametophyte. • Megasporogenesis– Structure of megasporangium, megasporogenesis and development of female gametophyte	
UNIT III	**PHYSIOLOGY I**	
	Structures of carbohydrates: monosaccharides, oligosaccharides and polysaccharides.	
	Photosynthesis: Plant pigments and their interaction with light,	

	Light reactions, photolysis of water, cyclic and non-cyclic photophosphorylation, carbon fixation phase (C_3, C_4 and CAM pathways), Photorespiration	
	Role of macronutrients and micronutrients in plants.	

PRACTICALS

RUSMIBOT PO202		**Credit – 1**
1	Study of normal secondary growth in the stem and root of a Dicotyledonous plant (Sunflower, stem and root)	
2	Study of mechanical tissues in *Typha leaf, Salvia stem and Cyperus leaf.*	
3	Study of conducting tissues, Growth rings, periderm, lenticels, tyloses.	
4	Study of pollen morphology (NPC Analysis) of the following by Chitley's Method • *Hibiscus* • *Datura* • *Ocimum* • *Pancratium*	
5	Study of various stages of microsporogenesis, megasporogenesis with the help of permanent slides / photomicrographs	
6	Estimation of carbohydrates	
7	Study of Hill's reaction	
8	Separation of photosynthetic pigments using TLC.	
Assignments	Pollen study of different flowers other than mentioned above.	
	Study of ecological adaptations: Xerophytes and halophytes	
	Plant nutrient deficiency symptoms in crop plants.	

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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** and a field notebook (applicable to the semester) 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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SEMESTER - IV
Course Code: RUSMIBOTE212
(Core Course)
Course Title: PLANT SCIENCE - V
Academic year 2024 – 2025

COURSE OUTCOMES:

COURSE OUTCOME	CO DESCRIPTION
CO 1	Apply the principles underlying Bentham and Hooker's classification and identify plants from the prescribed families.
CO 2	Associate the principles governing ecology and environmental biology with respect to biogeochemical cycles, edaphic factors, and community ecology.
CO 3	Explain the fundamental concepts of phytochemistry in relation to secondary metabolites.
CO 4	Identify adulterants in crude drugs.
CO 5	Identify plants from prescribed families, conduct experiments in ecological studies and isolate few secondary metabolites.

Upon successful completion of this course, learners will be able to;

Course Code/Unit	Course/ Unit Title	Credits -3
RUSMIBOTE212	**Title: PLANT SCIENCE V**	
UNIT I	**PLANT SYSTEMATICS - II**	
	Systematics: Categories and taxonomic hierarchy; Plant Nomenclature, John Hutchinsons system of classification	
	With the help of Bentham and Hooker's system of Classification for flowering plants study the vegetative, floral characters and economic importance of the following families: • Brassicaceae • Capparidaceae • Myrtaceae • Combretaceae • Solanaceae • Convolvulaceae • Euphorbiaceae • Palmae	
UNIT II	**ENVIRONMENTAL BOTANY – II**	
	Edaphic factors: Soil as an edaphic factor, Soil composition, types of soil, soil formation, soil profile.	
	Community ecology - Characters of community - Quantitative characters and Qualitative characters	
	Environmental and Social Impact Assessment (ESIA)	
UNIT III	**PHARMACOGNOSY – I**	
	Concept of primary and secondary metabolites	

	Study of secondary metabolites: Sources, properties, extraction, active constituents and therapeutic uses of alkaloids, glycosides, phenolic compounds (tannins, flavonoids), saponins and terpenoids (volatile oils).	
	Classification of crude drugs, drug adulteration.	

PRACTICALS		
RUSMIBOT PE212		**Credit – 1**
1	Study of one plant from each family prescribed for theory: • Brassicaceae • Capparidaceae • Myrtaceae • Combretaceae • Solanaceae • Convolvulaceae • Euphorbiaceae • Palmae	
2	Study of the working of the following Ecological Instruments- Soil thermometer, Wind anemometer.	
3	Mechanical analysis of soil by the sieve method and pH of soil.	
4	Quantitative estimation of organic matter of the soil by soil testing kit.	
5	Study of vegetation by the list quadrat method.-on field – Assignment	
6	Tests for secondary metabolites: • Tests for alkaloids from *Strychnos* (seeds) / *Holarhhoena* (bark) • Tests for glycosides from *Glycyrhhiza* rhizome/*Aloe* leaf • Tests for tannins from *Terminalia arjuna bark* / *Acacia catechu.* • Tests for flavonoids from *Momordica charantia/ Clitorea flowers* • Tests for saponins from *Sapindus laurifolius/ Trigonella foenum- graecum*	
7	Study of Stomatal index (use of micrometer for measurement of size of stoma)	
8	Study of vein islet number	
9	Study of drug adulterants in black pepper seeds, cinnamon bark, turmeric powder, chilli powder)	
Assignments	Preparation of herbarium and wet preservation technique.	
	Quadrat/ Transect study.	
	Tests for secondary metabolites / adulterants from plants other than mentioned above.	

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