



University of Rajasthan
Jaipur-302004

SYLLABUS

(UG0802 – Three/Four Year Bachelor of Science)

(Bio Group)

Subject: Botany

For Semester I & II
Examination 2024-25

(From the Academic Year 2024-25 onwards)

(Syllabus as per NEP-2020 and Choice Based Credit System)


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Vision:

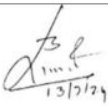
To create potential and competent professionals in Botany through the courses with practical training and advanced technical skills; equipped with knowledge and aptitude for higher education and research.

Mission:

- Dissemination of global demand based knowledge through teaching with technical professionalism.
- Creation of individuals with social and environmental concern.
- Training the students to create economically and environmentally viable solutions in the field of plant science.

Programme Outcomes

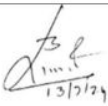
- PO1. Developing the potential for vertical career growth in plant sciences, academic and service sectors and related fields.
- PO2. Development of in-depth analytical and critical thinking, so that students would be able to identify and solve the problems with the help of botany.
- PO3. Proficient knowledge in the major domains of plant sciences including plant identification, plant diseases, microbiology, Plant biotechnology etc.
- PO4. Students can successfully learn tools and techniques related to plant research.
- PO5. After completion of course students would be able to execute their professional roles in society as botanist, plant taxonomist, plant pathologist, etc.
- PO6. Students will be able to learn skills to work as a team with the people from multidisciplinary environment.
- PO7. To design and develop sustainable solutions to major biological problems by applying appropriate tools.
- PO8. Develop skills, attitude and values required for self-directed, lifelong learning and

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professional development.

PO9. Acquire knowledge and understanding of norms and ethics in the field of botany.

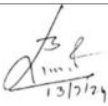
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Name of University	University of Rajasthan, Jaipur
Name of Faculty	Science
Name of Discipline	Botany
Type of Discipline	Major/Minor
List of Programme where offered as Minor Discipline	UG0806, UG0812
Offered to Non-Collegiate Students	Yes

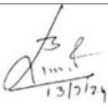
SEMESTER-WISE PAPER TITLES WITH DETAILS

UG0802–Three/Four Year Bachelor of Science (Bio Group)								
#	Level	Semester	Type	Botany Title	Credits			
					L	T	P	Total
1.	5	I	MJR	UG0802 - BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I	4	0	0	4
2.	5	I	MJR	UG0802 - BOT-51P-102 – Practical-I	0	0	2	2
3.	5	II	MJR	UG0802 - BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II	4	0	0	4
4.	5	II	MJR	UG0802 - BOT-52P-104 – Practical-II	0	0	2	2
5.	6	III	MJR	UG0802- BOT-63T-201 – Microbiology and Plant Pathology	4	0	0	4
6.	6	III	MJR	UG0802- BOT-63P-202 – Practical –III	0	0	2	2
7.	6	IV	MJR	UG0802 - BOT-64T-203 Plant Taxonomy and Economic Botany	4	0	0	4
8.	6	IV	MJR	UG0802 BOT-64P-204 Practical-IV	0	0	2	2
9.	7	V	MJR	UG0802 BOT-75T-301 Plant Biochemistry and Physiology	4	0	0	4
10.	7	V	MJR	UG0802 BOT-75P-302 Practical-V	0	0	2	2
11.	7	VI	MJR	UG0802 BOT-76T-303 Angiosperm Anatomy and Embryology	4	0	0	4
12.	7	VI	MJR	UG0802 BOT-76P-304 Practical VI	0	0	2	2
13.	8	VII	MJR	UG0802	4	0	0	4

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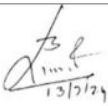
UG0802–Three/Four Year Bachelor of Science (Bio Group)								
#	Level	Semester	Type	Title	Credits			
					L	T	P	Total
14.	8	VII	MJR	UG0802	0	0	2	2
15.	8	VIII	MJR	UG0802	4	0	0	4
16.	8	VIII	MJR	UG0802	0	0	2	2

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Examination Scheme

1. 1 credit = 25 marks for examination/evaluation
2. For Regular Students there will be Continuous assessment, in which sessional work and the terminal examination will contribute to the final grade. Each course in Semester Grade Point Average (SGPA) has two components- Continuous assessment (20% weightage) and (End of end-semester examination) EoSE (80% weightage).
3. For Regular Students, 75% Attendance is mandatory for appearing in the EoSE.
4. To appear in the EoSE examination of a course/subject a regular student must appear in the mid-semester examination and obtain at least a C grade in the course/subject.
5. Credit points in a Course/Subject will be assigned only if, the regular student obtains at least a C grade in the CA and EoSE examination of a Course/Subject.
6. In the case of Non-Collegiate Students there will be no Continuous assessment and credit points in a course/subject will be assigned only if, the non-collegiate student obtains at least a C grade in the EoSE examination of a Course/Subject.

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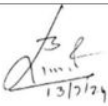
Examination Scheme for Continuous Assessment (CA)

DISTRIBUTION OF CONTINUOUS ASSESSMENT (CA) MARKS

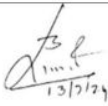
S. No.	CATEGORY	Weightage (out of total internal marks)	THEORY					PRACTICAL			
			CORE (Only Theory)	CORE (Theory + Practical)	AEC	SEC	VAC	CORE (Theory + Practical)	SEC	VAC	
	Max Internal Marks		30	20	20	10	10	10	10	10	
1	Mid-term Exam	50%	15	10	10	5	5	5	5	5	
2	Assignment	25%	7.5	5	5	2.5	2.5	2.5	2.5	2.5	
3	Attendance	25%	7.5	5	5	2.5	2.5	2.5	2.5	2.5	
		<i>Regular Class Attendance</i>	= 75%	3	2	2	1	1	1	1	1
			75- 80%	4	3	3	1.5	1.5	1.5	1.5	1.5
			80- 85%	5	4	4	2	2	2	2	2
> 85%	7.5		5	5	2.5	2.5	2.5	2.5	2.5		

Note:

1. Continuous assessment will be the sole responsibility of the teacher concerned.
2. For continuous assessment no remuneration will be paid for paper setting, Evaluation, Invigilation etc.
3. For continuous assessment Paper setting and Evaluation responsibility will be of teacher concern.
4. For continuous assessment no Answer sheets/question papers etc. will be provided by the University.
5. Colleges are advised to keep records of continuous assessment, attendance etc.

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Examination Scheme for EoSE for Semester I

CA – Continuous Assessment

EoSE – End of Semester Examination

Regular Students –

Type of Examination	Course Code and Nomenclature	Duration of Examination		Maximum Marks		Minimum Marks	
		CA	01 Hr	CA	20 Marks	CA	08 Marks
Theory	BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I	EoSE	03 Hrs	EoSE	80 Marks	EoSE	32 Marks
		CA	1 Hr	CA	10 Marks	CA	04 Marks
Practical	BOT-51P-102 – Practical-I	EoSE	04 Hrs	EoSE	40 Marks	EoSE	16 Marks

The theory question paper will consist of **two** parts A&B.

PART-A: 20 Marks

Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 60 Marks

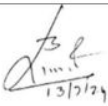
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 15 marks.

Non-Collegiate Students –

Type	Course Code and Nomenclature	Duration of Examination	Maximum Marks(EoSE)	Minimum Marks(EoSE)
Theory	BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I	03 Hrs	100 Marks	40 Marks
Practical	BOT-51P-102 – Practical-I	04 Hrs	50 Marks	20 Marks

The theory question paper will consist of **two** parts A&B.

PART-A: 20 Marks

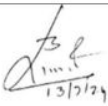
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Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 80 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 20 marks.

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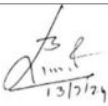
Syllabus

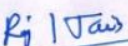
UG0802 – Three/Four Year Bachelor of Science (Bio Group)

I-Semester - Botany

BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
I	BOT-51T-101	Cell Biology and Diversity of Plant Kingdom-I			5	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method
		Theory	Practical	Total		
Introductory	Major/Minor	4	2	6	Yes	60 lectures with diagrammatic and informative assessments during lecture hours
List of Programme Codes in which Offered as Minor Discipline		UG0806, UG0812				
Prerequisites		Biology Courses of Senior Secondary level				
Objectives of the Course:		<ul style="list-style-type: none"> ➤ To understand the structural organization and functions of organelles in the cell. ➤ To differentiate between prokaryotic and eukaryotic cells and plant and animal cells. ➤ To gain understanding on Nucleic acids and chromosome organization. ➤ To understand cell cycle and analyze different stages of mitosis and meiosis. ➤ To understand microscopic to macroscopic view of the Algae and Fungi. ➤ To be able to differentiate algal and fungal members. ➤ To understand difference between Hepaticopsida, Anthocerotopsida and Bryopsida. ➤ To be able to identify and know about Lichens. 				

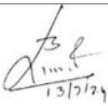
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Course Outcomes:

At the completion of the course, the student would be able to:

Cognitive level	Course outcomes
1. Understanding	<ul style="list-style-type: none">• To know the structural and functions properties of prokaryotic and eukaryotic cells.• To learn, understand and develop skill and hands on training in basics of cell biology.• To make students know of all the kind of plant groups and understand relationships between them.• To aware students about diversity of lower plant presents on various habitats.• To understand microscopic to macroscopic view of the plants.• To interpret amphibious to symbiotic relationship of the plants.
2. Memorizing	<ul style="list-style-type: none">• Composition of cell.• Human chromosomes and organization of chromosomes.• Names of all plant groups and relationships between them.• Diagrammatic representation of the algae, bryophytes and lichens.• Typical type of Life cycles found in algae, Fungi and bryophytes.
3. Applying	<ul style="list-style-type: none">• Variations in functions of cell organelles.• Concept of cell cycle, abnormalities, cell membrane, cell-cell interactions.• Economic importance of algae, fungi and lichens.• Microscopic identification of algae, bryophytes, fungi and lichens.

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Detailed Syllabus
BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I

Unit – I

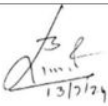
Cell and Cytoskeleton	Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Plant and animal cells; Chemistry, structure and function of Plant cell wall. Overview of plasma membrane: fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filaments.	(8 lectures)
Cell Organelles	Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semi-autonomous nature of mitochondria and chloroplast. Lysosomes and Vacuoles. Endomembrane system: Endoplasmic Reticulum – Types and Structure. Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus.	(7Lectures)

Unit –II

Nucleic acids	DNA as genetic material (Griffith’s transformation experiment and Hershey and Chase blender experiment); Structure and function of DNA (Watson and Crick Model); Structure and function of different types of RNA (rRNA, mRNA, tRNA, snRNA).	6 lectures
Chromosomes	Chromosome number, structure and function, types of chromosomes (metacentric, sub-metacentric, acrocentric, telocentric); Chromosome organization according to Nucleosome model; Special types of chromosomes: Lamp brush and Polytene chromosomes.	5 lectures
Cell Division	Phases of eukaryotic cell cycle; Different stages of mitosis; Different stages of Meiosis I and Meiosis II, synaptonemal complex, chiasmata formation and crossing over.	4 lectures

Unit –III

Plant Kingdom	Introduction to Plant kingdom- Basic idea of hierarchy in all groups of plants	2 lectures
Algae	General characteristics; Diverse Habitats; Range of thallus organization; methods of reproduction (Vegetative, Asexual, Sexual); Economic importance. Criteria and classification system of Fritsch (1935) (distinguishing features upto classes). Morphology and life history of: Cyanophyceae: <i>Nostoc</i> ; Chlorophyceae: <i>Volvox</i> ; Xanthophyceae: <i>Vaucheria</i> ; Phaeophyceae: <i>Ectocarpus</i> ; Rhodophyceae: <i>Polysiphonia</i> .	10 lectures

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Lichen General characteristics; Habitat; Structure; Reproduction; Ecological and Economic importance. **3 lectures**

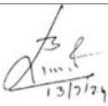
Unit-IV

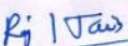
Fungi General characteristics; Thallus organization; Different hyphal forms; Heterokaryosis and Para sexuality; Nutrition and Reproduction in fungi; Economic importance. Classification (Alexopoulos & Mims, 1996); Morphology and life history of: Zygomycota: *Rhizopus*, Ascomycota: *Peziza*, Basidiomycota: *Agaricus*. **7 Lectures**

Bryophytes General characteristics; affinities with algae and pteridophytes; Distribution; Range of thallus structure; Reproduction (Vegetative and Sexual); Alternation of generations and evolution of sporophytes. Classification (Proskauer, 1957); Structures of gametophyte & sporophyte and life history (Development details not included) of: Hepaticopsida: *Marchantia*, Anthocerotopsida: *Anthoceros* and Bryopsida: *Funaria*. **8 lectures**

Suggested Books and References –

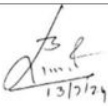
1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). **Molecular Biology of the Cell** (6th Ed.). New York: Garland Science
2. Cooper, G. M., and Hausman, R. E. (2013). **The Cell: A Molecular Approach** (6th Ed.). Washington: ASM; Sunderland.
3. Karp, G. **Cell and Molecular Biology. Concepts and experiments**. John Harris, D., Wiley & sons, New York
4. Veer Bala Rastogi. **Genetics**. Medtech
5. Veer Bala Rastogi. **A Textbook of Cell Biology and Genetics**. Kedarnath Ramnath
6. Alexopoulos, C.J. and Mims, C.W.: **Introductory Mycology**, John Wiley and Sons, New York, 2000
7. Singh, Pande and Jain. **A Textbook of Botany**, Rastogi publications
8. Dube, H.C.: **Fungi**, Rastogi Publication, Meerut, 1989.
9. Vashishtha, **B.R. Botany for Degree Students -Fungi**, S. Chand & Co., New Delhi, 2001.
10. Gilbert, M. Smith: **Cryptogamic Botany**, Vol. I & II (2nd Ed.) Tata McGraw Hill. Publishing Co., Ltd., New Delhi, 1985.
11. Puri. P.: **Bryophytes**, Atmaram & Sons. Delhi, Lucknow, 1985.
12. Aneja, K.R.: **Experiments in Microbiology, Plant Pathology and Biotechnology**. New Age International (P) Ltd., Publishers, New Delhi 2003.
13. Pandey B. P.(2022) **Algae, Bryophytes and Lichens**. S Chand Publication

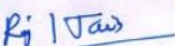
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Suggested E-resources:

1. <https://youtu.be/K2teJ6-DBLw>
2. <https://archive.nptel.ac.in/courses/102/108/102108086/>
3. <https://archive.org/details/cellmolecularapp6edcoop>

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B.Sc. Semester- I (Bio Group)
BOT-51P-102 Botany Practical-I
Syllabus

Cell and Cell Organelles

- Study of electron microphotographs of prokaryotic and eukaryotic cell.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of cell structure in Onion, *Hydrilla* and *Spirogyra*.
- Study of plastid for pigment distribution in *Lycopersicon*, *Cassia* and *Capsicum*.

Cell Division and Chromosomes

Study of permanent slides/photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.

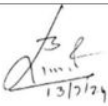
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- Calculate the mitotic index of onion root tip cells.
- Study of induced aberrations in onion root tips employing chemicals and plant extracts.

Algae and Lichen

- **Algae-** Study of morphology and anatomy of *Nostoc*, *Volvox*, *Chara*, *Vaucheria*, *Ectocarpus* and *Polysiphonia* (vegetative and reproductive structures) by preparing temporary slides and studying permanent slides.
- **Lichens:** Study of growth forms of lichens (crustose, foliose and fruticose)

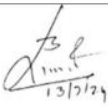
Fungi and Bryophyta

- **Fungi-** Microscopic observation of vegetative and reproductive structures of *Rhizopus*, *Peziza* and *Agaricus* through preparation of temporary slides and permanent slides.
- **Bryophytes-** Study of morphology, anatomy, vegetative and reproductive organs of *Marchantia*, *Anthoceros* and *Funaria* by preparing temporary slides and studying permanent slides.
- Study of renowned Indian scientists in the fields of phycology (M.O.P Iyengar), mycology (K. C. Mehta), bryology (S.R.Kashyap) and lichens (D.D.Awasthi).

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- Make a list of national and international institutes of repute in the fields of cytology, phycology, mycology, bryology and lichens.

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