



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:

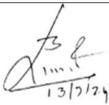
To create potential and competent professionals in Botany through the courses with practical training and advanced technical skills; equipped with knowledge and aptitude for higher education and research.

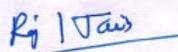
Mission:

- 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

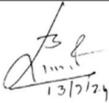
- PO1. Developing the potential for vertical career growth in plant sciences, academic and service sectors and related fields.
- PO2. Development of in-depth analytical and critical thinking, so that students would be able to identify and solve the problems with the help of botany.
- PO3. Proficient 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

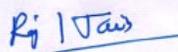
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professional development.

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

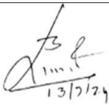
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Name of University	University of Rajasthan, Jaipur
Name of Faculty	Science
Name of Discipline	Botany
Type of Discipline	Major/Minor
List of Programme where offered as Minor Discipline	UG0806, UG0812
Offered to Non-Collegiate Students	Yes

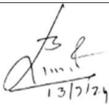
SEMESTER-WISE PAPER TITLES WITH DETAILS

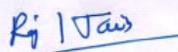
UG0802–Three/Four Year Bachelor of Science (Bio Group)								
#	Level	Semester	Type	Botany Title	Credits			
					L	T	P	Total
1.	5	I	MJR	UG0802 - BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I	4	0	0	4
2.	5	I	MJR	UG0802 - BOT-51P-102 – Practical-I	0	0	2	2
3.	5	II	MJR	UG0802 - BOT-52T- 103 - 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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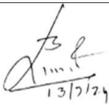
UG0802–Three/Four Year Bachelor of Science (Bio Group)								
#	Level	Semester	Type	Title	Credits			
					L	T	P	Total
14.	8	VII	MJR	UG0802	0	0	2	2
15.	8	VIII	MJR	UG0802	4	0	0	4
16.	8	VIII	MJR	UG0802	0	0	2	2

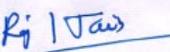
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Examination Scheme

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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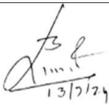
Examination Scheme for Continuous Assessment (CA)

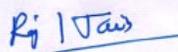
DISTRIBUTION OF CONTINUOUS ASSESSMENT (CA) MARKS

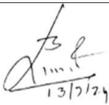
S. No.	CATEGORY	Weightage (out of total internal marks)	THEORY					PRACTICAL			
			CORE (Only Theory)	CORE (Theory + Practical)	AEC	SEC	VAC	CORE (Theory + Practical)	SEC	VAC	
	Max Internal Marks		30	20	20	10	10	10	10	10	
1	Mid-term Exam	50%	15	10	10	5	5	5	5	5	
2	Assignment	25%	7.5	5	5	2.5	2.5	2.5	2.5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

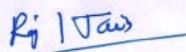
Note:

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

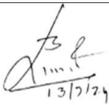
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 15 marks.

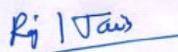
Non-Collegiate Students –

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

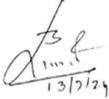
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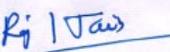

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Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

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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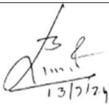
Syllabus

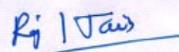
UG0802 – Three/Four Year Bachelor of Science (Bio Group)

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. 				

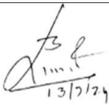
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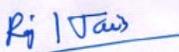

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Course Outcomes:

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**

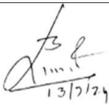
Chromosomes Chromosome number, structure and function, types of chromosomes (metacentric, sub-metacentric, acrocentric, telocentric); Chromosome organization according to Nucleosome model; Special types of chromosomes: Lamp brush and Polytene chromosomes. **5 lectures**

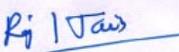
Cell Division Phases of eukaryotic cell cycle; Different stages of mitosis; Different stages of Meiosis I and Meiosis II, synaptonemal complex, chiasmata formation and crossing over. **4 lectures**

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: *Nostoc*; Chlorophyceae: *Volvox*; Xanthophyceae: *Vaucheria*; Phaeophyceae: *Ectocarpus*; Rhodophyceae: *Polysiphonia*. **10 lectures**

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

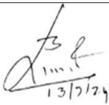
Unit-IV

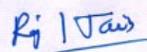
Fungi General characteristics; Thallus organization; Different hyphal forms; Heterokaryosis and Para sexuality; Nutrition and Reproduction in fungi; Economic importance. Classification (*Alexopoulos & Mims, 1996*); Morphology and life history of: Zygomycota: *Rhizopus*, Ascomycota: *Peziza*, Basidiomycota: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

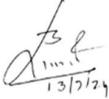
1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). **Molecular Biology of the Cell** (6th Ed.). New York: Garland Science
2. Cooper, G. M., and Hausman, R. E. (2013). **The Cell: A Molecular Approach** (6th Ed.). Washington: ASM; Sunderland.
3. Karp, G. **Cell and Molecular 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

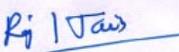
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Suggested E-resources:

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.

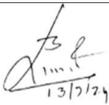
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- Calculate the mitotic index of onion root tip cells.
- Study of induced aberrations in onion root tips employing chemicals and plant extracts.

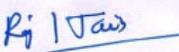
Algae and Lichen

- **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)

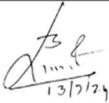
Fungi and Bryophyta

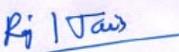
- **Fungi-** Microscopic observation of vegetative and reproductive structures of *Rhizopus*, *Peziza* and *Agaricus* through preparation of temporary slides and permanent slides.
- **Bryophytes-** Study of morphology, anatomy, vegetative and reproductive organs of *Marchantia*, *Anthoceros* and *Funaria* 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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UNIVERSITY OF RAJASTHAN
B.Sc. Semester- I (Bio Group) Botany Practical-I
Scheme of Practical Examination and Distribution of marks

BOT-51P-102

Duration- 4 hrs

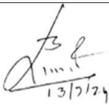
Max. Marks: 10*+40

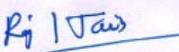
Min. Marks: 4*+16

S.No.	Exercise	Regular	NC/Ex students
1.	Exercise based on cell structure and types.	4	6
2.	Make a suitable acetocarmine preparation of the given material. Draw a well-labelled diagram of any one stage of nuclear division.	4	6
3.	Make a suitable stained preparation of the given material A . Draw a labelled diagram and identify giving reasons. (Algae)	4	6
4.	Make a suitable stained preparation of the given material B . Draw a labelled diagram and identify giving reasons. (Fungi)	4	6
5.	Make a suitable stained preparation of the given material C (vegetative/Reproductive part). Draw a labelled diagram and identify giving reasons. (Bryophyte)	4	6
6.	Comment upon the spots- identify giving reasons. (1 to 5)	10	15
7.	Viva-voce	5	5
8.	Record	5	-
	Total	10*+40=50	50

***Internal marks for regular students only**

Regular Candidates must keep a record of all work done in the practical classes and submit the same for inspection at the time of practical examination.

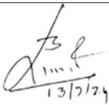
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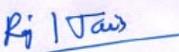

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Course Learning Outcomes:

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

1. Learn, understand and develop skill and hands on training in basics of cell biology.
2. Acquire basic knowledge of hereditary material and chromosomes.
3. Know all the kind of plant groups and understand relationships between them.
4. Understand diversity of lower plant presents on various habitats.
5. Identify microscopic to macroscopic view of the plants.
6. Apply the economic importance of lower plants in their endeavours.
7. Promote shared learning through practical classes, presentations and assignments.

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Examination Scheme for EoSE for Semester II

CA – Continuous Assessment

EoSE – End of Semester Examination

Regular Students –

Type of Examination	CourseCode and Nomenclature	Duration of Examination		Maximum Marks		Minimum Marks	
		CA	01 Hr	CA	20 Marks	CA	08 Marks
Theory	BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II	EoSE	03 Hrs	EoSE	80 Marks	EoSE	32 Marks
		CA	1 Hr	CA	10 Marks	CA	04 Marks
Practical	BOT-52P-104 – Practical-II	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.

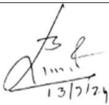
Non-Collegiate Students –

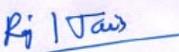
Type	Course Code and Nomenclature	Duration of Examination	Maximum Marks (EoSE)	Minimum Marks (EoSE)
Theory	BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II	03 Hrs	100 Marks	40 Marks
Practical	BOT-52P-104– Practical-II	04 Hrs	50 Marks	20 Marks

The 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.

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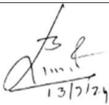

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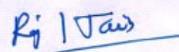
PART-B: 80 Marks

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.

Syllabus**UG0802 – Three/Four Year Bachelor of Science (Bio Group)****II-Semester - Botany****BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II**

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
II	BOT-52T- 103	Molecular Biology, Genetics and Diversity of Plant Kingdom-II			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 Mendel's laws and its deviations. ➤ To impart knowledge on DNA replication, Mendel's laws of inheritance, mutations. ➤ To understand functions of genes, linkage and crossing over. ➤ To understand morphology and anatomy of the Pteridophytes and Gymnosperms. ➤ To understand reproduction in the Pteridophytes and Gymnosperms. ➤ To have a basic idea of Fossil plants. 				

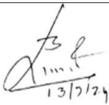
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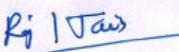

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Course Outcomes:

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

Cognitive level	Course outcomes
Understanding	<ul style="list-style-type: none">• To learn, understand and develop skill and hands on training in basics of genetics.• To understand functions of genes, linkage and crossing over.• To interpret genetics of a large group of population.• To understand characteristic feature and life cycle pattern of pteridophytes and gymnosperms.• To understand adaptation of pteridophytes to land habit.
Memorizing	<ul style="list-style-type: none">• Differentiation between linkage, crossing over, allelic interactions.• Mendel's laws of genetics.• Classification of pteridophytes and gymnosperms.• Evolutionary concepts in pteridophytes and gymnosperms.• Habit, habitat, morphology and anatomy of various members.
Applying	<ul style="list-style-type: none">• Allelic and non-allelic interactions• Possibilities of mutations and mutagens and ploidy in plants.• Ecology and economic importance of pteridophytes and gymnosperms.

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Detailed Syllabus

BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II

Unit – I

DNA replication	Enzymes and mechanisms of prokaryotic DNA replication: Initiation, Elongation and Termination; Leading and lagging strands, Okazaki fragments.	7 lectures
Expression of Gene in Prokaryotes	Transcription, Initiation, elongation and termination. Genetic code: Meaning, types of codons, properties. Translation: Initiation, Elongation and Termination in Prokaryotes	8 lectures

Unit –II

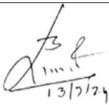
Genetic inheritance	Mendel's laws of inheritance and their exceptions; allelic (incomplete dominance, co-dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes); Multiple allelism (ABO blood groups in men); Quantitative inheritance (Grain color in wheat). Cytoplasmic inheritance: Plastid inheritance (different types of leaves in <i>Mirabilis jalapa</i>); Mitochondrial inheritance (Cytoplasmic male sterility in plants).	8 lectures
Structural and numerical aberrations	Deletion, Duplication, Translocation, Inversion, Aneuploidy and Polyploidy. Mutations: Types of Mutations, Spontaneous and induced Mutations, Physical and Chemical mutagens.	7 lectures

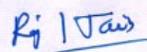
Unit –III

Pteridophytes	General characteristics; Affinities with bryophytes & gymnosperm; Heterospory and seed habit; Evolution of stele in Pteridophytes; Economic importance. Classification (Riemers, 1954); Study of life history of fossil Pteridophyte – <i>Rhynia</i> . Life history of Psiloptopsida: <i>Psilotum</i> ; Lycopsida: <i>Selaginella</i> ; Sphenopsida: <i>Equisetum</i> ; Pteropsida: <i>Marsilea</i> .	15 lectures
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Unit-IV

Gymnosperms	General characteristics; Affinities with Pteridophytes and Angiosperms, Distribution; Economic importance. Classification (Sporne, 1965); Life history of Cycadopsia: <i>Cycas</i> ; Coniferopsida: <i>Pinus</i> ; Gnetopsida:	12 lectures
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Ephedra.

Paleobotany Introduction, Basic concept and significance, Geological time scale;
Types of Fossils.

3 lectures

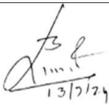
Suggested Books and References –

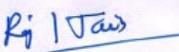
1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). **Molecular Biology of the Cell** (6thEd.). New York: Garland Science
2. Cooper, G. M., and Hausman, R. E. (2013). **The Cell: A Molecular Approach** (6th Ed.). Washington: ASM; Sunderland.
3. Karp, G. **Cell and Molecular Biology. Concepts and experiments.** John Harris, D., Wiley & sons, New York
4. Lodish, HF. Berk, A. Kaiser, CA, Krieger, M. Bretscher, A. Ploegh, H. Aman, A. Martin, K. (2016). **Molecular Cell Biology** (8th Ed.). New York: W.H. Freeman
5. Gupta P.K. **Cell and Molecular Biology** 2018. 5thedition Rastogi Publication India.
6. Veer Bala Rastogi. **Genetics.** Medtech
7. Veer Bala Rastogi. **A Textbook of Cell Biology and Genetics.** Kedarnath Ramnath
8. Singh, Pande and Jain. **A Textbook of Botany,** Rastogi publications
9. B.R. Vashishta and P.C. Vashishta. **Botany for Degree Students: Pteridophyta - Vascular Cryptogams),** S.Chand (G/L) & Company Ltd
10. B.R. Vashishta and P.C. Vashishta. **Gymnsperms (Botany for Degree Students),** S.Chand (G/L) & Company Ltd

Suggested E-resources:

1. <https://youtu.be/K2teJ6-DBLw>
2. <https://archive.org/details/cellmolecularapp6edcoop>
3. https://assets.cambridge.org/97805217/07725/excerpt/9780521707725_excerpt.pdf
4. https://books.google.co.in/books?id=Xz1RCgAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

B.Sc. Semester- I (Bio Group) BOT-52P-104-Botany Practical-II Syllabus

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Practicals related to DNA

- Isolation of Genomic DNA from Onion/Banana/Pineapple/etc.
- Demonstration of Gel-electrophoresis

Practicals related to Genetics

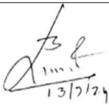
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid cross, Dihybrid cross, Back cross and test cross.
- Induction of polyploidy using colchicines
- Emasculation, Bagging and Tagging

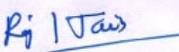
Pteridophytes-

- Study of vegetative and reproductive stages of *Selaginella*, *Equisetum* and *Marsilea* by preparing temporary slides and studying permanent slides.
- Study of fossil plant: *Rhynia*

Gymnosperms

- Study of Vegetative and reproductive stages of *Cycas*, *Pinus* and *Ephedra* by preparing temporary slides and studying permanent slides.

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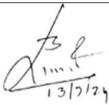
UNIVERSITY OF RAJASTHAN
B.Sc. Semester- I (Bio Group) Botany Practical-II
Scheme of Practical Examination and Distribution of marks
BOT-52P-104 **Duration- 4 hrs**
Max. Marks: 10*+40 **Min. Marks: 4*+16**

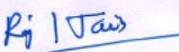
S.No.	Exercise	Regular	NC/Ex students
1.	Exercise-based on Nucleic acids	5	7
2.	Exercise-based on Genetics	5	7
3.	Make a suitable stained preparation of the given material A (vegetative/Reproductive part). Draw a labelled diagram and identify giving reasons. (Pteridophyte)	5	8
4.	Make a suitable stained preparation of the given material B (vegetative/Reproductive part). Draw a labelled diagram and identify giving reasons. (Gymnosperm)	5	8
5.	Comment upon the spots- identify giving reasons. (1 to 5)	10	15
6.	Viva-voce	5	5
7.	Record	5	-
	Total	10*+40= 50	50
*Internal marks for regular students only			
Regular Candidates must keep a record of all work done in the practical classes and submit the same for inspection at the time of practical examination.			

Course Learning Outcomes:

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

1. Learn, understand and develop skill and hands on training in basics of genetics.
2. Acquire basic knowledge of Mendel's laws of genetics.
3. Develop possibilities of mutations and mutagens and ploidy in plants.
4. Understand characteristic feature and life cycle pattern of pteridophytes and gymnosperms.

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5. Apply the economic importance and evolutionary concepts of pteridophytes and gymnosperms.
6. Comprehend information about fossil plants.
7. Promote shared learning through practical classes, presentations and assignments.



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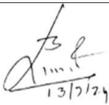
SYLLABUS

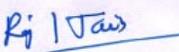
(UG0802 – Three/Four Year Bachelor of Science)

(Bio Group)

Subject: Botany

For Semester III & IV

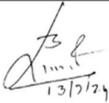
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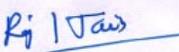

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Examination 2024-25

(From the Academic Year 2024-25 onwards)

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

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Vision:

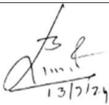
To create potential and competent professionals in Botany through the courses with practical training and advanced technical skills; equipped with knowledge and aptitude for higher education and research.

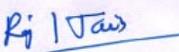
Mission:

- 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

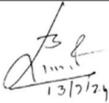
- PO10. Developing the potential for vertical career growth in plant sciences, academic and service sectors and related fields.
- PO11. Development of in-depth analytical and critical thinking, so that students would be able to identify and solve the problems with the help of botany.
- PO12. Proficient knowledge in the major domains of plant sciences including plant identification, plant diseases, microbiology, Plant biotechnology etc.
- PO13. Students can successfully learn tools and techniques related to plant research.
- PO14. After completion of course students would be able to execute their professional roles in society as botanist, plant taxonomist, plant pathologist, etc.
- PO15. Students will be able to learn skills to work as a team with the people from multidisciplinary environment.
- PO16. To design and develop sustainable solutions to major biological problems by applying appropriate tools.
- PO17. Develop skills, attitude and values required for self-directed, lifelong learning and

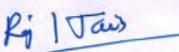
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professional development.

PO18. Acquire knowledge and understanding of norms and ethics in the field of botany.

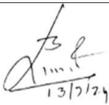
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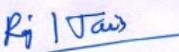

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Name of University	University of Rajasthan, Jaipur
Name of Faculty	Science
Name of Discipline	Botany
Type of Discipline	Major/Minor
List of Programme where offered as Minor Discipline	UG0806, UG0812
Offered to Non-Collegiate Students	Yes

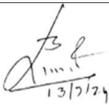
SEMESTER-WISE PAPER TITLES WITH DETAILS

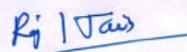
UG0802–Three/Four Year Bachelor of Science (Bio Group)								
#	Level	Semester	Type	Botany Title	Credits			
					L	T	P	Total
17.	5	I	MJR	UG0802 -	4	0	0	4
18.	5	I	MJR	UG0802 -	0	0	2	2
19.	5	II	MJR	UG0802 -	4	0	0	4
20.	5	II	MJR	UG0802 -	0	0	2	2
21.	6	III	MJR	UG0802- BOT-63T-201 – Microbiology and Plant Pathology	4	0	0	4
22.	6	III	MJR	UG0802- BOT-63P-202 – Practical -III	0	0	2	2
23.	6	IV	MJR	UG0802 - BOT-64T-203 Plant Taxonomy and Economic Botany	4	0	0	4
24.	6	IV	MJR	UG0802 BOT-64P-204 Practical-IV	0	0	2	2
25.	7	V	MJR	UG0802 BOT-75T-301 Plant Biochemistry and Physiology	4	0	0	4
26.	7	V	MJR	UG0802 BOT-75P-302 Practical-V	0	0	2	2
27.	7	VI	MJR	UG0802 BOT-76T-303 Angiosperm Anatomy and Embryology	4	0	0	4
28.	7	VI	MJR	UG0802 BOT-76P-304 Practical VI	0	0	2	2
29.	8	VII	MJR	UG0802	4	0	0	4
30.	8	VII	MJR	UG0802	0	0	2	2
31.	8	VIII	MJR	UG0802	4	0	0	4

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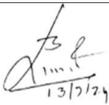
UG0802–Three/Four Year Bachelor of Science (Bio Group)								
#	Level	Semester	Type	Title	Credits			
					L	T	P	Total
32.	8	VIII	MJR	UG0802	0	0	2	2

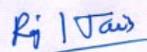
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Examination Scheme

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 EoSE for Semester III

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	1 Hrs	CA	20 Marks	CA	8 Marks
Theory	BOT-63T-201 Microbiology and Plant Pathology	EoSE	3 Hrs	EoSE	80 Marks	EoSE	32 Marks
		CA	1 Hrs	CA	10 Marks	CA	4 Marks
Practical	BOT-63P-202 Practical-III	EoSE	4 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

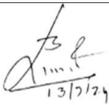
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 15 marks.

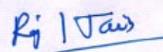
Non-Collegiate Students –

Type	Course Code and Nomenclature	Duration of Examination	Maximum Marks (EoSE)	Minimum Marks (EoSE)
Theory	BOT-63T-201 Microbiology and Plant Pathology	3 Hrs	100 Marks	40 Marks
Practical	BOT-63P-202 Practical-III	4 Hrs	50 Marks	20 Marks

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

PART-A: 20 Marks

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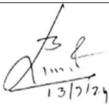
Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

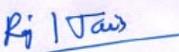
PART-B: 80 Marks

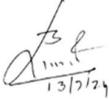
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 20 marks.

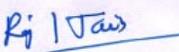
Syllabus
UG0802 – Three/Four Year Bachelor of Science (Bio Group)
III-Semester- Botany
BOT-63T-201-Microbiology and Plant Pathology

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
III	BOT-63T-201	Microbiology and Plant Pathology			6	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method
		Theory	Practical	Total		
Intermediate	Major/Minor	4	2	6	Yes	60 lectures with diagrammatic presentations and informative assessments during lecture hours
List of Programme Codes in which Offered as Minor Discipline		UG0806, UG0812				
Prerequisites		Botany course of Foundation/Introductory level				
Objectives of the Course:		<ul style="list-style-type: none"> ➤ To gain in-depth knowledge about bacteria, viruses and other microorganisms, including their structure, function, genetics, and role in ecosystems, ➤ To learn about the interactions between plants and microorganisms, ➤ To understand the beneficial relationships (e.g., symbiosis) and harmful interactions (e.g., plant diseases) between plants and microorganisms 				

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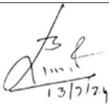
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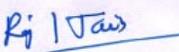

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COURSE OUTCOMES

On completion of the course the student would be able to develop the following

Understanding	<ul style="list-style-type: none">• To gain in-depth knowledge about bacteria, viruses and other microorganisms, including their structure, function, genetics, and role in ecosystems.• To learn about the interactions between plants and microorganisms,• To understand the beneficial relationships (e.g., symbiosis) and harmful interactions (e.g., plant diseases) between plants and microorganisms.
Memorizing	<ul style="list-style-type: none">• Different types of microbes with structure, function and their economic importance.• Host pathogen interaction and its effects on plants.• Symptomology, disease cycle and control of different pathogens causing diseases.
Applying	<ul style="list-style-type: none">• Acquire proficiency in various laboratory techniques, such as culturing microorganisms, gram staining, microscopy, and biochemical assays.• Will be helpful for students in further developing interest in agricultural research, crop protection, and pest management to improve crop yield and quality.• Work in disease prevention and control, focusing on plant diseases that impact food safety and public health.

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Detailed Syllabus
BOT-63T-201 - [Microbiology and Plant Pathology]

Unit – I

Microbiology	Introduction to microbial world: History and Development in the field of microbiology, Systemic position of Micro-organism (R.H. Whittaker's five kingdom concept, Carl Woese's Domain System), Origin of Life, contribution of Louis Pasteur and Robert Koch, Germ theory of disease.	(7 Lectures)
Virus	Discovery, General account, structure with special reference to TMV, Pox virus, Bacteriophage; Replication of T4 phage (Lytic and Lysogenic).	(6 Lectures)
Mycoplasma	General Characteristics, Morphology and Reproduction.	(2 Lectures)

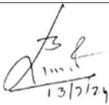
Unit –II

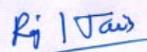
Bacteria	General Characteristics, Classification, Cell structure, endospore formation, Reproduction- asexual and recombination (Conjugation, Transformation and Transduction).	(10 Lectures)
Applied Microbiology	Economic importance of viruses, Economic importance of Bacteria with reference to their role in agriculture and food industry, Biofilms	(5 Lectures)

Unit –III

Phyto-pathology	Terminology and basic concepts (Primary and Secondary inoculum; infection, Pathogenicity, Pathogenesis, Disease Cycle); Biotic and abiotic diseases, General symptoms caused by Viruses, Bacteria, Fungi, Mycoplasma, Nematodes, Insects (smut, rust, mildews, canker, mosaic, vein clearing, spots, lesion, knot, galls).	(8 Lectures)
Diseases	Viral, Mycoplasmal and Bacterial diseases: Brief account, Symptomology and control of the following plant diseases:- Tobacco Mosaic, Little leaf of Brinjal, Citrus canker and Angular leaf spot of Cotton.	(7 Lectures)

Unit-IV

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Fungal Diseases	Symptomology, disease cycle and control of the following plant diseases with special reference to Rajasthan: White rust of crucifers, Downy mildew/green ear disease of Bajra, Black/stem rust of Wheat, Loose and covered smut of Barley, Early blight of Potato	(10 Lectures)
Diseases	Disease caused by insects and nematodes: General account of diseases caused by insects and nematodes, Brief account and histopathology of root knot of vegetables, leaf gall of <i>Pongamia</i> .	(5 Lectures)

Suggested Books and References –

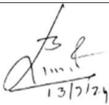
1. Pelczar, M.J. (2001) Microbiology, 5th edition. New Delhi, Delhi: Tata Mc-Graw- Hill Co.
2. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, 6th edition: McGraw Hill, New Delhi.
3. Agrios G.N. (2004) Plant Pathology, 5th Edition, Academic Press
4. Pandey B.P. (2001) Plant Pathology (Pathogen and Plant Disease), S. Chand Publishing
5. Mehrotra RS and Aggarwal A. (2003) Plant Pathology, 2nd Edition. Delhi: Tata Mc-Graw-Hill Co.
6. Sharma P.D. (2013). *Plant pathology*. Deep and Deep Publications.

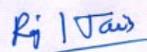
Suggested E-resources:

1. <https://archive.nptel.ac.in/courses/102/103/102103015/>
2. https://onlinecourses.swavam2.ac.in/cec21_bt16/preview
3. <https://www.pdfdrive.com/plant-pathology-concepts-and-laboratory-exercises-e179105354.html>

**University of Rajasthan
B.Sc. Semester – III (2024-25)
BOT-63P-202 Botany Practical-III**

- I** Microscopic techniques- handling of light microscope, general idea of SEM and TEM.
Write major contribution of leading scientists of Microbiology
Study of TMV, Bacteriophage and Pox virus, Mycorrhiza (Photographs/3D Models)
- II** Study of Bacteria by Gram Staining and Negative staining
Preparation of Liquid and solid media for culturing microbes
Pure culture techniques- pour plate, spread plate, streaking

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- III** Study of symptoms of plant diseases (specimen/permanent slide)-
Downy mildew/green ear disease of Bajra,
Tobacco Mosaic, Citrus canker, Little leaf of Brinjal,
Study of spores of *Alternaria* from Early blight of Potato
- IV** Study and identification of spores from temporary slide preparation from infected plant material:- white rust of crucifers (conidia stage), Black/ stem rust of Wheat (all stages).
Study of histopathology using temporary slide preparation of infected part of root knot of tomato, Leaf gall of *Pongamia*

UNIVERSITY OF RAJASTHAN
B.Sc. Semester- I (Bio Group) Botany Practical-III
Scheme of Practical Examination and Distribution of marks

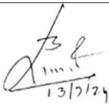
BOT-63P-202

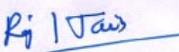
Maximum Marks 10*+40 Marks

Duration: 4 Hrs

Minimum marks 4*+16 Marks

S.No.	Exercise	Regular	Ex./N.C. Students
1.	Perform exercise of Microbiology Gram ⁺ /negative staining of bacteria or Identification of virus/mycoplasma	4	5
2.	Perform the exercise based on the microbiology – media preparation/any pure culture technique	6	10
3.	Study the material “A” carefully, prepare a suitable stained preparation, and identify the casual organism associated with the disease giving reasons (Fungal disease)	6	10
4.	Identify the material “B” carefully, prepare a suitable stained preparation, and identify the casual organism associated with the disease giving reasons (Insect/Nematode disease)	4	5
5.	Spotting (5 spots)	10	15
6.	Viva voce	5	5
7.	Record	5	-
	TOTAL	10*+40=50	50
*Internal marks for regular students only			

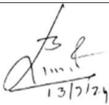
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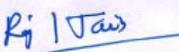

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Regular Candidates must keep a record of all work done in the practical classes and submit the same for inspection at the time of practical examination.
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Course Learning Outcomes: Upon completion of course, students will be able to

1. Understand about morphology and function diverse microbes.
2. Understand about diagnosing plant diseases, understanding their causes, and implementing management strategies to control or prevent them.
3. Understand and perform different laboratory exercise to further understand about microorganisms.
4. Acquire knowledge about different types of microbes with structure, function and their economic importance, Host pathogen interaction and its effects on plants.
5. Apply control and management strategies for plant diseases caused by fungi, bacteria, nematodes, insects etc.
6. Acquire proficiency in various laboratory techniques, such as culturing microorganisms, gram staining, microscopy, and biochemical assays.
7. Develop interest among students in agricultural research, crop protection, and pest management to improve crop yield and quality.
8. Work in disease prevention and control, focusing on plant diseases that impact food safety and public health

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Examination Scheme for EoSE for Semester IV

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	1 Hrs	CA	20 Marks	CA	8 Marks
Theory	BOT-64T-203 – Plant Taxonomy and Economic Botany	EoSE	3 Hrs	EoSE	80 Marks	EoSE	32 Marks
		CA	1 Hrs	CA	10 Marks	CA	4 Marks
Practical	BOT-64P-204 – Practical IV	EoSE	4 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.

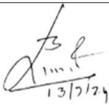
Non-Collegiate Students –

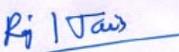
Type	Course Code and Nomenclature	Duration of Examination	Maximum Marks (EoSE)	Minimum Marks (EoSE)
Theory	BOT-63T-201 Microbiology and Plant Pathology	3 Hrs	100 Marks	40 Marks
Practical	BOT-64P-204 – Practical IV	4 Hrs	50 Marks	20 Marks

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

PART-A: 20 Marks

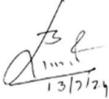
Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

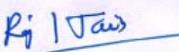
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PART-B: 80 Marks

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.

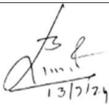
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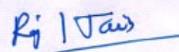

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Syllabus

UG0802 -BOT-64T-203
Plant Taxonomy and Economic Botany
IV-Semester- B.Sc. (Bio Group)
Botany

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
IV	BOT-64T-203	Plant Taxonomy and Economic Botany			6	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method
		Theory	Practical	Total		
Intermediate	Major/Minor	4	2	6	Yes	60 lectures with diagrammatic presentations and informative assessments during lecture hours
List of Programme Codes in which Offered as Minor Discipline		UG0806, UG0812				
Prerequisites		Botany course of Foundation/Introductory level				
Objectives of the Course:		<ul style="list-style-type: none"> ➤ To gain in-depth knowledge about plant taxonomy and economic botany. ➤ To learn about the various aspects of taxonomy like nomenclature, classification and identification ➤ To understand the benefits of plants with their products in various field. ➤ To learn about plant collection and preservation of plants in lab (herbarium). 				

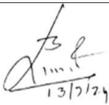
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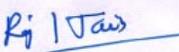

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COURSE OUTCOMES

On completion of the course the student would be able to develop the following

Understanding	<ul style="list-style-type: none">• To Understand the historical development and modern approaches to plant classification systems, including the principles and criteria used for categorizing plants• Understand the evolutionary relationships among different plant groups and how phylogenetic trees represent these relationships.• Understand the key morphological features that are used to identify and classify plants at various taxonomic levels (family, genus, species).
Memorizing	<ul style="list-style-type: none">• Memorize the hierarchical classification of plants, including ranks such as domain, kingdom, phylum, class, order, family, genus, and species.• Memorize the characteristics and representative species of major plant families, including their economic and ecological significance.
Applying	<ul style="list-style-type: none">• Apply knowledge to identify plant species in the field using keys, guides, and floras, demonstrating proficiency in using diagnostic features.• Apply techniques for collecting, preserving, and preparing plant specimens for herbarium collections, ensuring accurate labeling and documentation.• Conduct independent or group research projects involving the collection, identification, and classification of local plant species, integrating field and laboratory work.

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Detailed Syllabus

BOT-64T-203 - Plant Taxonomy and Economic Botany

UNIT-I

Classification	Artificial (Linneaus), Natural (Bentham&Hooker) and Phylogenetic (Engler and Prantle's) System.	5 lectures
Nomenclature	Angiosperm Phylogeny Group (APG). International Code of Botanical Nomenclature. Introduction, principles, rules (Name of Taxon, Priority & publication) and Recommendations. Introduction to International code of Nomenclature for algae, fungi and plants (ICNafp),	5 lectures
Herbarium	Equipments, herbarium sheet preparation & preservation and significances. Introduction to Botanical Survey of India (BSI).	5 lectures

UNIT-II

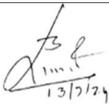
Taxonomic literature	Floras, Monographs, Icons.	3 lectures
Modern Trends	Cytotaxonomy, Chemotaxonomy, Palynology, Embryology Anatomy and Numerical taxonomy.	7 lectures
Study of Families	Diagnostic characters and economic importance of Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Apiaceae, Rubiaceae and Asteraceae.	5 lectures

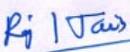
UNIT-III

Study of Families	Diagnostic characters and economic importance of Apocynaceae, Asclepiadaceae, Convolvulaceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae and Poaceae.	7 lectures
Economic Botany	Vavilov concept of centre of origin. Primary and secondary centres. Cereals (General account): Rice, Wheat, Maize. Millets (General account): Ragi (finger millet), Jowar (Sorghum), Sama (Little millet), Bajra (pearl millet), Variga (Porso millet).	8 lectures

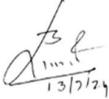
UNIT-IV

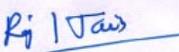
Economic Botany of	Vegetable oil : Ground nut and Mustard Spices : General account of turmeric, asafoetida, Cumin, Coriander & RedChilli. Beverages : Tea and Coffee. Medicinal plants : General account (Tulsi, Isabgol,
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Ashwagandha, Neem and Ephedra). **Fibres:** Cotton&Jute.Processing of **15 lectures**
Rubber & Sugarcane

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Suggested Books and References –

- Principles of Angiosperm Taxonomy by Davis & Heywood. Publisher: Oliver & Boyd
- Taxonomy of Vascular Plants by Lawrence H M George. Publisher : Scientific Publishers
- Plant Systematics: An Integrated Approach. by Gurcharan Singh. Publisher : CRC Press
- Plant Taxonomy by O. P. Sharma. Publisher : McGraw Hill Education
- Taxonomy of Angiosperms by A.V.S.S. Sambamurty. Publisher : Dreamtech Press
- Modern Plant Taxonomy by N.S. Subrahmanyam. Publisher : S Chand
- Economic Botany by B.P. Pandey. Publisher : S Chand & Company
- Economic botany: a comprehensive study by S.L.Kochhar. Publisher : Cambridge University Press
- Economic Botany by Singh, Pandey & Jain. Publisher -S. Chand Publishing

Suggested E-resources:

1. https://www.google.co.in/books/edition/The_Flowering_Plants_Handbook/yoLaBAAAQB-AJ?hl=en&gbpv=1&dq=james+byng+taxonomy&printsec=frontcover
2. <https://www.pdfdrive.com>

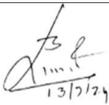
University of Rajasthan
B.Sc. Semester – IV (2024-25)
BOT-64P-204 Botany Practical-IV

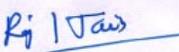
Exercises based on Plant Taxonomy: -

- Plant description and identification of following families: Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Apiaceae, Rubiaceae, Asteraceae Apocynaceae, Asclepieadaceae, Convolvulaceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae and Poaceae
- Exercise based on using taxonomic modern tools
- Preparation of Herbarium sheets
- Campus Flora writing/ Excursion/Field study
- Herbarium tools

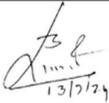
Exercises based on Plant Taxonomy

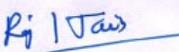
- Biochemical test for Starch, Protein, Oil, Cellulose, lignin and tannin
- Medicinal plant-identification and collection
- Study of specimens with reference to economic use of Cereals, millets, Pulses, Oil, Fibres, Spices, and Beverages (common name, Botanical name, Family, Parts used, Economic uses)

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- Collection of specimens of locally available medicinal/ wild plants
- Any other exercise based on theory syllabus

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B.Sc. Semester- IV (Bio Group) Botany Practical-IV Scheme of Practical Examination and Distribution of marks

BOT-64P-204

Duration: 4Hrs

Maximum Marks 10*+40 Marks

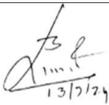
Minimum marks 4*+16 Marks

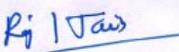
S.No.	Exercises	Regular	Ex./N.C. Students
1.	Identify the family of the given flower and describe floral characters in semi-technical language, draw floral diagram and write floral formula.	7	10
2.	Identify and describe the given herbarium tool	4	6
3.	Perform the biochemical test of given material.	3	4
4.	Identify the given material (economic botany), write botanical characters and economic importance	6	10
5.	Spotting (5)	10	15
6.	Viva voce	5	5
7.	Record	5	-
	TOTAL	10*+40=50	50
*Internal marks for regular students only			
Regular Candidates must keep a record of all work done in the practical classes and submit the same for inspection at the time of practical examination.			

Course Learning Outcomes:

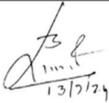
On completion of the course the student will be able to:

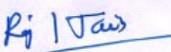
- Learn the types of classifications- artificial, Natural and phylogenetic.
- Gain knowledge about Botanical Survey of India (BSI).
- Briefly study herbarium techniques.
- Learn the taxonomic evidences from molecular, numerical and chemicals.
- Brief study the economic products with special reference to the Botanical name, family, morphology of useful part and the uses
- Acquire an increased awareness and recognition of economical important plants.
- Learn diverse human uses of plants and plant products.

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- Apply the knowledge gained in seeking employment to reputed institutions and organizations known in the field of plant taxonomy, diversity, conservation, agro-industry, pharmaceuticals etc.
- Memorize the various classification with the botanical names, distinctions, distribution, habit, characteristics and affinities of various taxon.
- Learn the perspective of origin, history and role of important plants and plant products for the development of human culture.
- Acknowledge the economic uses of plants in modern society.
- Acquire an increased awareness and appreciation of plants & plant products encountered in everyday life.
- Develop scientific insights into the development of many plant products that have shaped our society.
- Appreciate the diversity of plants and the plant products in human use.

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