

RAJ RISHI GOVT. (AUTONOMOUS) COLLEGE, ALWAR (RAJ.)



(An Autonomous Institute Affiliated to RRBMU, Alwar)



THREE/FOUR YEAR UNDERGRADUATE

PROGRAMME

FACULTY OF SCIENCE

Programme : Bachelor of Science

Programme Code: UG0101 Bachelor of Science (Biology Group)

Subject/Course/Discipline-Botany

Medium of Instruction : Hindi / English

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

(Academic Year 2023-24 Onwards)

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RAJ RISHI GOVT. (AUTONOMOUS) COLLEGE, ALWAR

Vision:

To create potential and competent professionals in Botany through the courses with practical training and advanced technical skill 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 professional development.

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Name of College	Raj Rishi Govt. (Autonomous) College Alwar (Rajasthan)
Name of Faculty	Science
Name of Programme	Three/Four Year Bachelor of Science
Name of Discipline	Botany

SEMESTER - WISE PAPER TITLES WITH DETAILS

Three/Four Year Bachelor of Science											
S. No.	Level	Semester	Type	Botany		Credits	Title	L	T	P	Total
				Programme Code	Course Code						
1.	5	I	MJR	UG0101	BOT-51T-101		Diversity of Plant Kingdom	4	0	0	4
2	5	I	MJR	UG0101	BOT -51P-102		Botany Lab-I	0	0	2	2
3	5	II	MJR	UG0101	BOT -52T-103		Cell Biology, Molecular Biology and Genetics	4	0	0	4
4	5	II	MJR	UG0101	BOT -52P-104		Botany Lab-II	0	0	2	2
5	6	III	MJR	UG0101	BOT -63T-201		Microbiology and Plant Pathology	4	0	0	4
6	6	III	MJR	UG0101	BOT -63P-202		Botany Lab-III	0	0	2	2
7	6	IV	MJR	UG0101	BOT -64T-203		Plant Taxonomy and Economic Botany	4	0	0	4
8	6	IV	MJR	UG0101	BOT -64P-204		Botany Lab-IV	0	0	2	2
9	7	V	MJR	UG0101	BOT -75T-301		Plant Biochemistry and Physiology	4	0	0	4
10	7	V	MJR	UG0101	BOT -75P-302		Botany Lab-V	0	0	2	2
11	7	VI	MJR	UG0101	BOT -76T-303		Angiosperms Anatomy and Embryology	4	0	0	4
12	7	VI	MJR	UG0101	BOT -76P-304		Botany Lab-VI	0	0	2	2
13	8	VII	MJR	UG0101	BOT -87T-401		Ecology and Conservation Biology	4	0	0	4
14	8	VII	MJR	UG0101	BOT -87P-402		Botany Lab-VII	0	0	2	2
15	8	VIII	MJR	UG0101	BOT -88T-403		Plant Biotechnology	4	0	0	4
17	8	VIII	MJR	UG0101	BOT -88P-404		Botany Lab-VIII	0	0	2	2

Scheme of Examination (Common for all theory papers)

Continuous assessment (20%weightage)

(End of Semester Examination) EoSE (80% weightage)

Question Paper Setting for Each theory paper in EoSE in two parts A & B.

Part A: 20 marks

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

Part B: 60 marks

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

Bachelor of Science

	Continuous assessment (C A)	End of Semester Examination (EoSE)	Total
Theory Time	1:00 Hours	3:00 Hours	
Marks (Max Marks)	20	80	100
Minimum Marks	8	32	40
Practical Time	2:00 Hours	4:00 Hours	
Marks (Max Marks)	10	40	50
Minimum Marks	4	16	20

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Semester I
BOT-51T-101 - Diversity of Plant Kingdom

Objectives

- To understand microscopic to macroscopic view of the plants.
- To differentiate algal members from different class of the kingdom Algae
- To understand structure and reproduction in bryophytes.
- To understand difference between Hepaticopsida, Anthocerotopsida and Bryopsida.
- To interpret structure, reproduction, life cycle and economic importance of Lichens.

Course Outcome:

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

BOTANY	
Cognitive level	Course outcomes
1. Understanding	<ul style="list-style-type: none"> ➤ To aware students, diversity of plants present in 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"> ➤ Diagrammatic representation of the algae, bryophytes and lichens. ➤ Habit, habitat, thallus organization of various members. ➤ Typical type of Life cycles found in algae and bryophytes.
3. Applying	<ul style="list-style-type: none"> ➤ Economic importance of algae, bryophytes and lichens. ➤ Microscopic identification of algae, bryophytes and lichens.

B.Sc. BOTANY (SEM-I)

BOT-51T-101 Diversity of Plant Kingdom

UNIT I

Algae: General characters, Classifications (Fritsch) upto classes. Diverse Habitat. Range of thallus structure. Reproduction (Vegetative, Asexual, Sexual). Types of the life cycle. Type studies of: Cyanophyceae- Nostoc, Oscillatoria, Chlorophyceae-Chara; Rhodophyceae-Polysiphonia.

Fungi: General characteristics; Thallus organization; types of fruiting bodies, Cell wall composition; Heterokaryosis and parasexuality; Nutrition; Classification (*Alexopoulos*); reproduction, economic importance. Type studies: Oomycetes: Albugo, Zygomycota: *Rhizopus*, Basidiomycota: *Agaricus*.

Lichens- General characters, habitat, morphology and reproduction.

15 hrs

UNIT II

Bryophytes: General characters, Origin, and evolution of Bryophyta. Classification (Rothmaler), Habitat, Range of thallus structure, Reproduction (Vegetative and Sexual), Alternation of generations and Economic importance. Study of Morphology, Anatomy, Reproduction, Gametophytes and sporophytes of *Marchantia*, *Anthoceros*, and *Funaria*.

15 hrs

UNIT III

Pteridophytes: General characters of Pteridophytes, affinities with Bryophytes & Gymnosperms, classification, economic importance, study of life histories of fossil Pteridophytes – Rhynia. Type studies Life histories of *Selaginella*- (Heterospory and seed habit) *Marsilea*. Stelar System in Pteridophytes

15 hrs

UNIT IV

Gymnosperms: General characters, classification, Gymnosperms: Type studies Life histories of *Cycas* and *Ephedra* Economic importance of gymnosperms.

Angiosperms: General characters, Differences between Monocotyledons and Dicotyledons, Typical life cycle of Angiosperm.

15 hrs

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BOT-51P-102 - (Botany Lab-I) Suggested Laboratory Exercises:

- Visit Local Garden / field study of plants
- Study of anatomy by making suitable temporary slides and study of permanent slides of *Chara*, *Vaucheria*, *Ectocarpus*, *Polysiphnia* (vegetative and reproductive).
- Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
- *Rhizopus*: study of asexual stage from temporary mounts and sexual structures through permanent slides.; *Agaricus*: *Peziza* , Specimens of button stage and full grown mushroom; sectioning of gills of *Agaricus*.
- **Bryophytes**- morphology of vegetative and reproductive stages of *Marchantia*, *Anthoceros* and *Funaria*.
- **Pteridophytes**- study of vegetative and reproductive stages of *Selaginella*- (Heterospory and seed habit), *Equisetum*, *Marsilea*
- Study of Vegetative and reproductive stages of *Cycas*, *Pinus* and *Ephedra* using temporary and permanent slides.
- Study of monocot and dicot flowers and seeds.

Suggested Readings:

- Alexopoulos, C.J. and Mims, C.W.: *Introductory Mycology*, John Wiley and Sons, New York, 2000
- Dube, H.C. : *Fungi*, Rastogi Publication, Meerut, 1989.
- Vashista, B.R. *Botany for Degree Students -Fungi*, S. Chand & Co., New Delhi, 2001.
- Gilbert, M.Smith: *Cryptogamic Botany*, Vol. I & II (2nd Ed.) Tata McGraw Hill. Publishing Co., Ltd., New Delhi, 1985.
- Kumar, H.D.: *Introductory Phycology*, Affiliated East—West Press, Ltd. New York, 1988.
- Puri. P.: *Bryophytes*, Atmaram & Sons. Delhi, Lucknow, 1985.
- Aneja, K.R.: *Experiments in Microbiology, Plant Pathology and Biotechnology* New Age International (P) Ltd., Publishers, New Delhi 2003.
- Pandey BP(2022) *Algae, Bryophytes and Lichens*, S Chand Publication

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Semester-II

BOT-52T-103 Cell biology, Molecular Biology and Genetics

Objectives

- To understand the structural organization of cells.
- To understand functions of organelles in the cell.
- To differentiate between plant and animal cells and to analyse different stages of mitosis and meiosis
- To understand Mendel laws.
- To understand functions genes, linkage and crossing over.

Course Outcomes:

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

BOTANY	
Cognitive level	Course outcome
1. Understanding	<ul style="list-style-type: none">➤ The functions and structural properties of different cells.➤ Learn, understand and develop skill and hands on training in basics of cell biology and genetics.➤ Function of genes, linkage and crossing over.➤ To interpret genetics of a large group of population.
2. Memorizing	<ul style="list-style-type: none">➤ The structural and functional aspects of cellular organelles.➤ Human chromosomes and organization of chromosomes.➤ Differentiation between linkages, crossing over, allelic interactions.➤ Mendel's laws of genetics.
3. Applying	<ul style="list-style-type: none">➤ Variations in functions of cell organelles.➤ Concept of cell cycle, abnormalities, cell membrane, cell-cell interactions.➤ Possibilities of mutations and mutagens.

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B.Sc. BOTANY (SEM-II)

BOT-52T-103 Cell biology, Molecular Biology and Genetics

UNIT I

Ultrastructure of Cell and Cell Organelles: Eukaryotic and Prokaryotic cell structure; Ultrastructure and functions of different cell organelles (Cell wall, Plasma membrane, Nucleus, Mitochondria, Chloroplast, Ribosome, Peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum); Basic idea of Mitochondrial and Chloroplast genome.

15 hrs

UNIT II

Chromosome organization: Chromosome Morphology, Specialized types of chromosomes: Polytene chromosomes. **Cell Division:** Cell cycle; Mitosis and Meiosis, **Chromosomal aberrations in human and ploidy in plants:** Deletion, Duplication, Translocation, Inversion, Aneuploidy and Polyploidy. **Mutations:** Spontaneous and induced Mutations, Physical and Chemical mutagens.

15 hrs

UNIT III

Gene and DNA: Concept of Genome, Gene. **Genetic material:** DNA as genetic material (Griffith's transformation experiment); structure of DNA (Watson and Crick Model); Structure and function of different types of RNA (rRNA, m RNA, tRNA). **DNA replication:** Mechanisms of Eukaryotes DNA replication: Initiation, Elongation and Termination; Leading and lagging strands, Okazaki fragments. **Transcription:** initiation, elongation and termination. **Translation:** initiation, elongation and termination in Eukaryotes Genetic code

15 hrs.

UNIT IV

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 *Mirabilis jalapa*); Mitochondrial inheritance (Cytoplasmic male sterility in plants).

15 hrs

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BOT-52P-104 (Botany-Lab-II) Suggested Laboratory Exercises:

- Study of cell structure from Onion,
- Study of cyclosis in *Tradescantia* spp.
- Study of plastid for pigment distribution in *Lycopersicom*, *Cassia* and *Capsicum*.
- Study of electron microphotographs of Prokaryotic cells for various cell organelles.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid, Dihybrid, Back cross and Test cross.
- Permanent slides/photographs of different stages of mitosis and meiosis, polytene chromosome

Suggested Reading

- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). **Molecular Biology of the Cell** (6th Ed.). New York: Garland Science
- Cooper, G.M., and Hausman, R.E. (2013). **The Cell: A Molecular Approach** (6th Ed.). Washington: ASM ; Sunderland.
- Karp, G. **Cell and Molecular Biology. Concepts and experiments**. John Harris, D., Wiley & sons, New York
- Lodish, H.F., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Aman, A., Martin, K. (2016). **Molecular Cell Biology** (8th Ed.). New York: W.H. Freeman
- Gupta P.K. **Cell and Molecular Biology** 2018. 5th edition Rastogi Publication India.
- Hartl, D.L., & Jones, E.W. (1998). **Genetics: Principles and Analysis**. Sudbury, MA: Jones and Bartlett.
- Pandey BP (2022) Cell Biology and Genetics, S Chand Publication

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Skeleton Paper

BOT-51P-102- Diversity of Plant Kingdom

Max.M. 40

Min.M.16

Time 4 Hrs

1. Study of anatomy by making suitable temporary slide of Material – A (Algae). 3 marks
2. Study of anatomy by making suitable temporary slide of Material – B (Fungi or Lichens). 3 marks
3. Morphology of vegetative and reproductive stages of Material – C (Bryophytes). 3 marks
4. Morphology of vegetative and reproductive stages of Material – D (Pteridophytes). 3 marks
5. Morphology of vegetative and reproductive stages of Material – E (Gymnosperms). 3 marks
6. Spots(1-5) 10 marks
7. Viva-Voce 5 marks
8. Practical Record/ Field Study 10 marks

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Skeleton Paper

BOT-52P-104 Cell biology, Molecular Biology and Genetics

Max.M. 40

Min.M.16

Time 4 Hrs

1. Study of Electron micro-photograph of Prokaryotic cells/ Eukaryotic cells/
various cell organelles. 5 marks

2. Study of different stages of Mitosis in root tip cells/ Meiosis flower buds.
5 marks

3. To solve problems based on Mendel's laws of Inheritance, Monohybrid
cross, Dihybrid cross, Back cross, Test cross etc. 5 marks

4. Study of specialized types of Chromosomes. 5 marks

5. Spots (1-5) 10 marks

6. Viva-Voce 5 marks

7. Practical Record 5 marks

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