



**MAHARAJA SURAJMAL BRIJ UNIVERSITY**  
**BHARATPUR (RAJASTHAN)**

**SYLLABUS FOR B.Sc. BOTANY**  
**(THREE/FOUR YEAR UNDER GRADUATE PROGRAMME)**

**I & II SEMESTER**  
**EXAMINATION-2023-24**

  
डॉ. अरुण कुमार पाण्डेय  
उप कुलसचिव

  
आचार्य  
महाराणी श्री ज्योती महाविद्यालय  
भरतपुर (राज०)

**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.

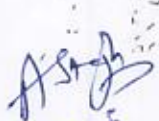
**Mission:**

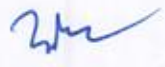
- Dissemination of global demand- based knowledge through teaching with technical professionalism.
- Creation of individuals with social and environmental concern.
- Training the students to create economically and environmentally viable solutions in the field of plant science.

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

2

  
आचार्य  
महारानी श्री जया महाविद्यालय  
भस्तरपुर (राज०)

  
डॉ. अरुण कुमार पाण्डेय  
उपकुलसचिव  
प्रभारी अकादमिक प्रथम

**B.Sc. BOTANY**  
COURSE STRUCTURE UNDER C.B.C.S. AND NEP-2020

Year	Sem	Course Code	Course Title	Credit		Marks
				T	P	
1 <sup>st</sup>			Hindi			
			English			
	I	BOT-UG-CC01	Diversity of Plant Kingdom	4	2	
	II	BOT-UG-CC02	Cell Biology, Molecular Biology and Genetics	4	2	
2 <sup>nd</sup>	III	BOT-UG-CC03	Microbiology and Plant Pathology	4	2	
	VI	BOT-UG-CC04	Plant Taxonomy and Economic Botany	4	2	
3 <sup>rd</sup>	V	BOT-UG-CC05	Plant Biochemistry and Physiology	4	2	
	VI	BOT-UG-CC06	Angiosperms Anatomy and Embryology	4	2	
4 <sup>th</sup>	VII	BOT-UG-CC07	Ecology and Conservation Biology	4	2	
	VIII	BOT-UG-CC08	Plant Biotechnology	4	2	
		Discipline specific Elective	Plant Tissue Culture	2	2	
			Plant Disease Management	2	2	
			Plant Stress Biology	2	2	
			Phytopharmacology	2	2	
			Genetic Engineering	2	2	
			Molecular Genetics	2	2	
		Multidisciplinary Elective course	Plant Propagation Techniques	2	2	
			Herbal Medicine and Human Health	2	2	
			Plant Diseases	2	2	
			Management of Crop Diseases	2	2	
			Plant Biodiversity and conservation	2	2	
			Ethnobotany	2	2	
			Phytochemistry	2	2	
			Paleobotany			

*Asst. Prof.*  
आचार्य  
महाराणी श्री जया महाविद्यालय  
भरतपुर (राज०)

*Dr.*  
डॉ. अरुण कुमार पाण्डेय  
उपकुलसचिव  
प्रभारी अकादमिक प्रथम

## BOT-UG-CC01 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:

BOT A02	
Cognitive level	Course outcome
1. Understanding	<ul style="list-style-type: none"><li>➤ To aware students, diversity of plants present in various habitats.</li><li>➤ To understand microscopic to macroscopic view of the plants.</li><li>➤ To interpret amphibious to symbiotic relationship of the plants.</li></ul>
2. Memorizing	<ul style="list-style-type: none"><li>➤ Diagrammatic representation of the algae, bryophytes and lichens.</li><li>➤ Habit, habitat, thallus organization of various members.</li><li>➤ Typical type of Life cycles found in algae and bryophytes.</li></ul>
3. Applying	<ul style="list-style-type: none"><li>➤ Economic importance of algae, bryophytes and lichens.</li><li>➤ Microscopic identification of algae, bryophytes and lichens.</li></ul>

  
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उपकुलसचिव  
प्रभारी अकादमिक प्रथम

### 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*, Economic importance.

**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), *Equisetum* Stellar system in pteridophytes

15 hrs

### UNIT-IV

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

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

15 hrs

*AS Singh*  
आचार्य  
महाराणी श्री जवा महाविद्यालय  
भक्तपुर (यज्ञ०)

*Dr. Arun Kumar Pandey*  
डॉ. अरुण कुमार पाण्डेय  
उपकुलसचिव  
प्रमारी अकादमिक प्रथम

### 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 nostoc*, *oscillatoria*, *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*, *Albugo*, *Rhizopus*, 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), *Rhynia*, *Equisetum*.
- Study of Vegetative and reproductive stages of *Cycas*, *Pinus* and *Ephedra* using temporary and permanent slides.
- Study of monocot and dicot; Root, Stem and Leaf.

### 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.
- Vashihsta, B.R. Botany for Degree Students - Fungi, S. Chand & Co., New Delhi, 200].
- Gilbert, M.Smith: Cryptogamic Botany, Vol. I & II (2nd Ed.) Tata McGraw Hill, Publishing Co., Ltd., New Delhi, 1985.
- Kumar, HD.: Introductory Mycology, 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, chand Publication.

  
अचार्य  
महाराणी श्री जया महाविद्यालय  
भक्तपुर (राज०)

  
डॉ. अरुण कुमार पाण्डेय  
उपकुलसचिव  
प्रमारी अकादमिक प्रथम

BOT-UG-CC02

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

BOT A03	
Cognitive level	Course outcome
1. Understanding	<ul style="list-style-type: none"><li>➤ The functions and structural properties of different cells.</li><li>➤ Learn, understand and develop skill and hands on training in basics of cell biology and genetics.</li><li>➤ Function of genes, linkage and crossing over.</li><li>➤ To interpret genetics of a large group of population.</li></ul>
2. Memorizing	<ul style="list-style-type: none"><li>➤ The structural and functional aspects of cellular organelles.</li><li>➤ Human chromosomes and organization of chromosomes.</li><li>➤ Differentiation between linkages, crossing over, allelic interactions.</li><li>➤ Mendel's laws of genetics.</li></ul>
3. Applying	<ul style="list-style-type: none"><li>➤ Variations in functions of cell organelles.</li><li>➤ Concept of cell cycle, abnormalities, cell membrane, cell-cell interactions.</li><li>➤ Possibilities of mutations and mutagens.</li></ul>

  
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उपकुलसचिव  
प्रभारी अकादमिक प्रथम

### Unit-I

Ultrastructure of cell and cell organelles; Principles of microscopy 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 and packaging. 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, mRNA, tRNA). DNA replication: Mechanisms of Eukaryotes DNA replication: Initiation, Elongation and Termination; Leading and lagging strands, Okazaki fragments. Genetic code, Reverse Transcription, Central Dogma Transcription and translation of Prokaryotes and Eukaryotes.

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). Cytoplasm inheritance: Plastid inheritance (different types of leaves in *Mirabilis jalapa*); Mitochondrial inheritance (Cytoplasmic male sterility in plants).

15 hrs

  
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भरतपुर (राजस्थान)

  
डॉ. अरुण कुमार पाण्डेय  
उपकुलसचिव  
प्रभारी अकादमिक प्रथम



### Suggested Labogtory Exercises:

- Study of plant cell structure in Onion.
- Study of cyclosis in *Tredescantis* spp.
- Study of plastid for pigment distribution in *Lycopersicon*, *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 in onion, permanent slide and photographs.
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid, Dihybrid, Back cross and test cross.
- DNA isolation (Demonstration).

### 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 (6<sup>th</sup> 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, 5<sup>th</sup> 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.

Asi  
आचार्य  
महाराणी श्री जया महाविद्यालय  
मन्तपुर (राज०)

Dr  
डॉ. अरुण कुमार पाण्डेय  
उपाकुलसचिव  
प्रमारी अकादमिक प्रथम