AC/27.06.2023/RS1

SIES College of Arts, Science & Commerce (Autonomous)

RISE WITH EDUCATION

NAAC REACCREDITED - 'A' GRADE

SIES College of Arts, Science and Commerce (Autonomous)
Sion (West) Mumbai: 400022

Affiliated to Mumbai University

Syllabus under NEP effective from June 2023

Offered by: Department of Botany

Program: F. Y. B.Sc.

Course: Botany (DSC)

Choice Based Credit System (CBCS)

with effect from the academic year 2023-24

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

After completing the graduation (B.Sc.) course in Botany, the learners would be able to -

PSO1: Identify the different groups of plants and gain the knowledge about plant biodiversity and its conservation.

PSO2: Learn different techniques, protocols, methodologies during study and apply them in future.

PSO3: Utilize the botanical knowledge for problem solving and for taking real time decisions while working with plants.

PSO4: Learn good laboratory practices and acquire research skills required for industrial support services.

PSO5: Inculcate scientific temperament, good reasoning power, technological and analytical skills while designing the experiments.

PSO6: Develop interest in pursuing higher studies in plant sciences and developbetter future.

PSO7: Understand the scope, current trends, job prospects and career avenues in Botany.

PSO8: Share social and environmental consciousness with the fellow citizens and motivate them towards taking fundamental steps towards environmental conservation.

DSC: BOTANY FYBSC (BOTANY) SEMESTER – I (Credits: 4)				
Theory: Paper I – Plant Diversity and Functional Botany I				
Paper Code	**Unit No.**	**Unit Name**	**Credits**	**Lectures/week**
	1	Algae and Fungi	03	01
	2	Plant Anatomy		01
	3	Genetics and Biometry		01
Practical I – Plant Diversity and Functional Botany I				
	Based on theory (Practical I)		01	02

DSC: BOTANY FYBSC (BOTANY) SEMESTER – II (Credits: 4)				
Theory: Paper I – Plant Diversity and Functional Botany II				
Paper Code	**Unit No.**	**Unit Name**	**Credits**	**Lectures/week**
	1	Bryophyte, Pteridophytes and Gymnosperms	03	01
	2	Angiosperms (Morphology and Families)		01
	3	Cell Biology		01
Practical I – Plant Diversity and Functional Botany II				
	Based on theory (Practical I)		01	02

<table>
<tr><td colspan="2">Semester I</td><td>Hr. 45</td></tr>
<tr><td colspan="2">Paper I – Plant Diversity and Functional Botany I</td><td>Cr. 03</td></tr>
<tr><td colspan="2">Learning Objectives: The course entitled Plant Diversity and Functional Botany – I of semester – I under paper – I includes the units on Algae, Fungi, Plant anatomy, Genetics and Biometry. It will highlight the algal fungal life cycles and the economic importance of algae and fungi. The course will help them learn mendelian genetics. It will teach them applications of statistical tools in biological data analysis. The course will provide insight into plant anatomy with respect to structure and function of plant tissue systems.</td><td></td></tr>
<tr><td colspan="2">Course Outcomes:
After completion of the course, learners would be able to:
CO1: Understand and differentiate between chlorophycean and cyanophycean algae with special reference to their general characters, thallus structure, life-cycle patterns, systematic positions.
CO2: Identify and differentiate between Phycomycetous and Ascomycetous fungi based on their general characters, mycelial structure, life cycles and systematic positions.
CO3: Appreciate the commercial applications of algae and fungi at various industrial levels.
CO4: Sketch, Label and differentiate between types of simple tissues, stomata, vascular bundles, and cell inclusions.
CO5: Study the structure and functions of epidermal tissue systems.
CO6: Draw and structurally differentiate among the primary structure of dicotyledonous and monocotyledonous root, stem, and leaf.
CO7: Study and understand Mendelian genetics, gene, and allelic interactions.
CO8: Solve the problems based on epistasis, multiple genes, and multiple allelic interactions.
CO9: Represent the biological data graphically and analyse the same using statistical measurement tools like mean, median, mode and standard deviation.</td><td></td></tr>
<tr><td colspan="2">UNIT I – Algae and Fungi</td><td>15</td></tr>
<tr><td>1</td><td>General characters of Chlorophyta & Cyanophyta. (01)</td><td></td></tr>
<tr><td>2</td><td>Structure, life cycle and systematic position of Nostoc and Spirogyra. (04)</td><td></td></tr>
<tr><td>3</td><td>Economic importance of Algae: Biofertilizers, Food & Nutraceuticals, Biofuel, Medicines, and industrial applications. (01)</td><td></td></tr>
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4	General characters of Phycomycetes and Ascomycetes. (01)	
5	Structure, life cycle and systematic position of *Rhizopus* and *Aspergillus*. (04)	
6	Applications of Fungi in industry, agriculture & medicines. (01)	
UNIT II –Plant Anatomy		**15**
1	Simple tissues - Parenchyma, Collenchyma, Sclerenchyma. Complex tissues – Xylem and Phloem. (04)	
2	**Epidermal Tissue System**: Epidermal Tissue System- Functions of epidermis, Epidermal appendages - A) Hair-Root hair, Unicellular hair, and Multicellular hair B) Scales C) Colleters D) Water vesicles/Bladders. (04)	
3	Primary structure of dicot and monocot root, stem, and leaf. (03)	
4	Types of stomata: Diacytic, Paracytic, Anomocytic, Anisocytic and Graminaceous (01)	
5	Types of vascular bundles (01)	
6	**Cell Inclusions** – Starch, protein, Calcium oxalate and calcium carbonate crystals (02)	
UNIT III – Genetics and Biometry		**15**
1	Mendelian genetics (02)	
2	Interaction of genes – Interaction between alleles. (02)	
3	Interaction involving two pair of genes - Epistatic and non-epistatic interactions. (03)	
4	Multiple alleles (02)	
5	Multiple genes (01)	
6	Biometry – Characteristics of biostatistics, Applications and limitations, Common Statistical Terms, types of data. (02)	
7	Measures of central tendency: Mean, Median, Mode and Standard deviation (03)	

Semester I		**Hr. 15**
Practical Paper I – Plant Diversity and Functional Botany I		**Cr. 01**
Learning Objectives: The course will provide an insight into the diversity of algae and fungi along with their applications for commercial purposes. The course will give hands-on training for section cutting and mounting of plant parts. It would provide a tool of biostatistical analysis of mean, median, mode and standard deviation. It will also teach to present biological data with the help of frequency distribution, graphical representation of data- frequency polygon, histogram, pie chart.		
Course Outcomes: After completion of the course, learners would be able to: **CO1**: Identify, classify, and describe the stages in the life cycle of few algae and fungi. **CO2**: Appreciate and comment upon the economic importance of commercially used algae and fungi. **CO3**: Cut the sections and differentiate between dicotyledonous and monocotyledonous root, stem, and leaf. **CO4**: Mount, sketch and label the various types of stomata, vascular bundles, and cell inclusions. **CO5**: Represent the biological data graphically and analyse the same using statistical measurement tools like mean, median, mode and standard deviation.		
1	Study of stages in the life cycle of *Nostoc* from fresh/ preserved material and permanent slides.	
2	Study of stages in the life cycle of *Spirogyra* from fresh/ preserved material and permanent slides.	
3	Economic importance of algae: *Spirulina* (Nutraceutical), *Ulva* (Biofuel), *Ascophyllum* (Alginates), *Gelidium* (Agar)	
4	Study of stages in the life cycle of *Rhizopus* from fresh/ preserved material and permanent slides.	
5	Study of stages in the life cycle of *Aspergillus* from fresh/ preserved material and permanent slides.	
6	Economic importance of Fungi: Mushroom and Yeast	
7	Study of primary structure of dicot and monocot root.	
8	Study of primary structure of dicot and monocot stem.	
9	Study of primary structure of dicot and monocot leaf.	
10	Study of cell inclusions: Starch grains, Aleurone layer, Raphides, Sphaeraphides,	

	Cystolith.	
11	Study of Epidermal tissue system in plants as per theory.	
12	Study of types of stomata as per theory.	
13	Study of types of Vascular bundles	
14	Frequency distribution, graphical representation of data: Frequency polygon, Histogram, Pie-chart.	
15	Calculation of mean, median and mode.	
16	Calculation of standard deviation.	

Semester II	**Hrs. 30**
Paper I - Plant Diversity and Functional Botany II	**Cr.01**
Learning Objectives: The course entitled Plant Diversity and Functional Botany – II of semester – II under paper – I includes the units on Bryophytes, Pteridophytes, Gymnosperms, Angiosperms and Cell Biology. It will highlight life cycles and the economic importance of bryophytes, pteridophytes and gymnosperms. The course will help them learn morphology of plants and systematic botanical studies. The course will provide insight into various aspects of cell biology.	
Course Outcomes: After completion of the course, learners would be able to: **CO1:** Understand and recognize bryophytes, pteridophytes and gymnosperms with special reference to their general characters, thallus structure, life-cycle stages, and systematic positions. **CO2:** Appreciate the commercial applications of bryophytes, pteridophytes and gymnosperms at various industrial levels. **CO3:** Study the morphology of leaf and inflorescence and appreciate the economic importance of plants. **CO4:** Apply the knowledge gained through morphological studies in classifying plants into their families using Bentham and Hooker's system of classification. **CO5:** Differentiate between prokaryotic and eukaryotic cell structure. **CO6:** Study the ultrastructure and functions of various cell organelles. **CO7:** Understand cell cycle and mitosis along with their significance.	
UNIT I – Bryophyta, Pteridophyta and Gymnosperms	**15**
1 General characters of Bryophyta. (01)	
2 Structure, life cycle and systematic position of *Riccia*. (03)	
3 Economic and Ecological importance of bryophytes. (01)	
4 General characters of Pteridophyta. (01)	
5 Structure, life cycle and systematic position of *Nephrolepis*. (03)	
6 Economic importance of pteridophytes. (01)	
7 General characters of Gymnosperms. (01)	
8 Structure, life cycle and systematic position of *Cycas*. (03)	
9 Economic and Ecological importance of Gymnosperms. (01)	
UNIT II – Angiosperms: Morphology and Systematic Botany	**15**

1	**Morphology of leaf**: Simple leaf, types of compound leaves, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf shapes, venation. (04) **Modifications of leaf**: Spine, tendril, hooks, phyllode, pitcher. (01)	
2	**Types of Inflorescences**: Racemose: Simple raceme, spike, catkin, spadix, panicle, corymb, umbel, capitulum. (02) Cymose: Monochasial, dichasial, polychasial. (01) Compound: Cyathium, Verticellaster, Hypanthodium. (01)	
3	**Study of the following families** according to Bentham and Hooker system of classification with special emphasis on morphological peculiarities and economic importance: Annonaceae, Cruciferae, Malvaceae, Convolvulaceae, Amaryllidaceae. (05)	
4	**Wonders of plants:** *Rafflesia arnoldii*, *Victoria regia*, Venus Fly trap, Sequoia, Orchids. (1L)	
UNIT III – Cell biology		**15**
1	General structure of prokaryotic cell and eukaryotic plant cell. (02)	
2	Ultrastructure and functions of Cell wall, Plasma membrane. (02)	
3	Ultrastructure and functions of the cell organelles – Chloroplast, Endoplasmic reticulum, Mitochondrion, Golgi apparatus, Peroxisomes and Glyoxysomes, Ribosomes (06)	
4	Ultrastructure and functions of eukaryotic nucleus, chromosomes. (02)	
5	Cell cycle and its significance. (01)	
6	Mitosis in plant cell and its significance. (02)	

Semester II		**Hr. 15 Cr. 01**
Practical Paper I – Plant Diversity and Functional Botany II		
Learning Objectives: The course will provide an insight into the diversity of bryophytes, pteridophytes and gymnosperms along with their commercial applications. The course will give hands-on training for classifying the plant into family based on its morphology. It would give them clarity on the ultrastructure and functions of various cell organelles. It will also teach to prepare slides for mitotic cell divisions and differentiate between the stages of mitosis.		
Course Outcomes: After completion of the course, learners would be able to: **CO1**: Identify, classify, and describe the stages in the life cycle of few bryophytes, pteridophytes, and gymnosperms. **CO2**: Appreciate and comment upon the commercial applications of bryophytes, pteridophytes, gymnosperms, and angiosperms. **CO3**: Identify, classify, and assign the plant to its respective family based on its morphological character study. **CO4**: Study and comment upon the ultrastructure and functions of cell-organelles using photomicrograph. **CO5**: Learn the technique of squash preparation and differentiate between the stages of mitotic cell division in plants.		
1	Study of stages in life cycle of *Riccia* from fresh/preserved materials & permanent slides.	
2	Identification of economically important bryophytes with respect to their applications in agriculture (*Funaria*), in horticulture (*Sphagnum*).	
3	Study of stages in the life cycle of *Nephrolepis* from fresh/ preserved materials and permanent slides.	
4	Identification of economically important pteridophytes with respect to their applications in agriculture (*Azolla*) & horticulture (*Selaginella, Pteris, Adiantum*).	
5	Study of stages in the life cycle of *Cycas* from fresh/preserved materials & permanent slides.	
6	Identification of economically important gymnosperms: Sago (*Cycas*); Turpentine (*Pinus*); Chilgoza (*Pinus*); Ornamental (*Araucaria*).	
7	Leaf morphology: As per theory	
8	Types of inflorescences: As per theory	
9	Study of Family: Annonaceae.	

10	Study of Family: Cruciferae.	
11	Study of Family: Malvaceae	
12	Study of Family: Convolvulaceae.	
13	Study of Family: Amaryllidaceae.	
14	Study of various stages of mitosis in root tip cells (*Allium*)	
15	Identification of parts of cell and cell organelles with the help of photomicrographs: Chloroplast, Endoplasmic reticulum, Mitochondrion, Golgi apparatus, Peroxisomes and Glyoxysomes, Ribosomes.	
16	Staining of mitochondria by using Janus Green B Stain.	
18	Structure and Types of Chromosomes from photo micrographs.	

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