

Academic Council

Item No: _____

Devrukh Shikshan Prasarak Mandal's

**Nya. TATYASAHEB ATHALYE ARTS, Ved. S.R. SAPRE
COMMERCE & Vid. DADASAHEB PITRE SCIENCE
COLLEGE, DEVRUKH [AUTONOMOUS]**



Syllabus for F.Y. B.Sc.

Program: B.Sc.

Course: Botany

**Credit Based Semester and Grading System with the
Effect from
Academic Year 2019-20**

B. Sc. General (Semester Pattern) B. Sc. First Year

BOTANY – CURRICULUM

Semester	Paper Code	Paper	Lectures /Practicals	Marks			Credits
				External	Internal	Total	
Semester I	ASPBOT101	Theory Paper I - Plant Diversity 1	45	70	30	100	02
	ASPBOT102	Theory Paper II – Form and Function 2	45	70	30	100	02
	ASPBOTP 1	Practical Paper I – Plant Diversity 1	09	35	15	50	01
	ASPBOTP 1	Practical Paper II – Form and Function 2	10	35	15	50	01
Semester II	ASPBOT101	Theory Paper I - Plant Diversity 1	45	70	30	100	02
	ASPBOT102	Theory Paper II – Form and Function 2	45	70	30	100	02
	ASPBOTP 2	Practical Paper I – Plant Diversity 1	11	35	15	50	01
	ASPBOTP 2	Practical Paper II – Form and Function 2	09	35	15	50	01

Semester I Theory Paper I

Learning Objectives:

The students will be able to understand-

- The morphology, structure and importance of the organisms.
- State the meaning of scientific terms.
- Differentiate between various groups of Algae, Fungi and Bryophyte.

Course Code ASPBOT101	Title	Lectures	Credits
Unit	Plant Diversity I	45	02
Unit I Algae	1. Algae: General characters Classification of algae (G.M. Smith) 2. Chlorophyta: Distribution, range of thallus, reproduction and life cycle 3. <i>Nostoc</i> and <i>Spirogyra</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Economic importance of algae	15	
Unit II Fungi	1. Fungi: General characters Classification of fungi (G.M. Smith) 2. Phycomycetes: Distribution, structure, reproduction and life cycle 3. <i>Rhizopus</i> and <i>Aspergillus</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Economic importance of fungi 5. Modes of nutrition in fungi (Saprophytism and Parasitism)	15	
Unit III Bryophyta	1. Bryophyta: General characters Classification of bryophyte (G.M. Smith) 2. Hepaticae : Distribution, structure, reproduction and life cycle 3. <i>Riccia</i> . Occurrence, structure, systematic position reproduction and life cycle 4. Economic importance of bryophytes	15	

Semester I Theory Paper II

Learning Objectives:

The students will be able to understand-

- Structure and function of cell and cell organelles.
- The interactions taking place in the ecosystem and flow of Energy.
- The phenomenon of inheritance

Course Code ASPBOT102	Title	Lectures	Credits
Unit	Form and Function 1	45	02
Unit I Cell Biology	1. Cell: Introduction, types of cells 2. General structure of plant cell: cell wall, plasma membrane (bilayer lipid structure, fluid mosaic model) 3. Cell organelles: Introduction, functions 4. Ultra structure and functions of the following cell organelles: endoplasmic reticulum and chloroplast	15	
Unit II Ecology	1. Ecology: Introduction 2. Energy flow in an ecosystem, energy pyramids 3. Ecosystem: Introduction, types of ecosystems: aquatic and terrestrial	15	
Unit III Genetics	1. Genetics: Introduction, basics of genetics, genotype and phenotype 2. Mendelian Genetics- monohybrid, dihybrid; test cross; back cross ratios 3. Epistatic and non epistatic interactions; multiple alleles.	15	

Course Code ASPBOTP1 Semester I Practical Paper I – Plant Diversity 1

Sr.No.	Practicals	L	Cr
		30	01
1	Study of stages in the life cycle of <i>Nostoc</i> from fresh/ preserved material and permanent slides		
2	Study of stages in the life cycle of <i>Spirogyra</i> from fresh/ preserved material and permanent slides		
3	Economic importance of algae: <i>Ulva</i> (Biofuel), <i>Spirulina</i> (Neutraceutical), <i>Gelidium</i> (Agar)		
4	Study of stages in the life cycle of <i>Rhizopus</i> from fresh/ preserved material and permanent slides		
5	Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material and permanent slides		
6	Economic importance of Fungi: Mushroom, yeast, wood rotting fungi (any bracket fungus)		
7	Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved material		
8	Study of stages in the life cycle of <i>Riccia</i> with the help of permanent slides		
9	Economic importance of Bryophytes: <i>Sphagnum</i>		

Course Code ASPCBP1 Semester I Practical Paper II– Form and Function 1

Sr.No.	Practicals	L	Cr
		30	01
1	Examining various stages of mitosis in root tip cells (<i>Allium</i>)		
2	Cell inclusions: Starch grains (<i>Solanum tuberosum</i> and <i>Oryza sativa</i>); Aleurone Layer (<i>Zea mays</i>); Cystolith (<i>Ficus</i>); Raphides (<i>Pistia</i>); Sphaeraphides (<i>Opuntia</i>)		
3	Identification of cell organelles with the help of photomicrograph: Plastids: Chloroplast, Amyloplast, Endoplasmic Reticulum and Nucleus		
4	Identification of plants adapted to different environmental conditions: Hydrophytes: Floating: Free floating (<i>Pistia/Eichornia</i>); Rooted floating (<i>Nymphaea</i>); Submerged (<i>Hydrilla</i>)		
5	Mesophytes (any common plant); Hygrophytes (<i>Typha/Cyperus</i>)		
6	Xerophytes : Succulent (<i>Opuntia</i>); Woody Xerophyte (<i>Nerium</i>); Halophyte (<i>Avicennia pneumatophore</i>) (No sections in ecology, only identification and description of specimens. Morphological adaptations only)		
7	Calculation of mean, median and mode		
8	Calculation of standard deviation		
9	Frequency distribution, graphical representation of data- frequency polygon, histogram, pie chart		
10	Study of Karyotypes: Human: Normal male and female, Plant: <i>Allium cepa</i>		

Semester II Theory Paper I

Learning Objectives:

The students will be able to understand-

- The morphology, structure and importance of the organisms.
- Differentiate between various groups of Pteridophyte, Gymnosperms and Angiosperms.
- The morphology, Structure and functions of various parts of plants.
- The taxonomical terminology and understand the meaning of the same.

Course Code	Title	Lectures	Credits
ASPBOT201			
Unit	Plant Diversity 1	45	02
Unit I Pteridophytes	1. Pteridophytes: General characters Classification of pteridophytes (G.M. Smith) 2. Pterophyta or Filicophyta: Distribution, range of thallus, reproduction and life cycle 3. <i>Nephrolepis</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Stellar evolution 5. Economic importance of pteridophytes	15	

Unit II Gymnosperms	1. Gymnosperms: General characters, Classification of gymnosperms (G.M. Smith) 2. Cycadopsida: Distribution, range of thallus, reproduction and life cycle 3. <i>Cycas</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Economic importance of gymnosperms	15	
Unit III Angiosperms	1. Taxonomy: Introduction, hierarchy in classification, binomial nomenclature 2. Root: Introduction, types (taproot and adventitious) 3. Stem: Introduction, modifications (stem tendril, runner and rhizome) 3. Leaf: Introduction, structure of typical leaf (<i>Hibiscus</i>), types of leaf apex and margin, phyllotaxy and venation. 4. Inflorescence: Introduction, structure of typical inflorescence, Types- racemose and cymose 5. Flower: Introduction, structure of a typical flower (<i>Hibiscus</i>), symmetry and types (hypogynous, epigynous, perigynous) 6. Study of following families: Malvaceae, Amaryllidaceae	15	

Semester II Theory Paper II

Learning Objectives:

The students will be able to understand-

- Anatomical structure and functions of various tissues and tissue system.
- The mechanism of Photosynthesis and it's significance
- Chemical constituents of plants and it's medicinal importance

Course Code	Title	Lectures	Credits
ASPBOT202			
Unit	Form and Function 1	45	02
Unit I Anatomy	1. Tissues: Introduction, types of tissues, simple tissues, complex tissues 2. Primary structure of dicot and monocot root, stem and leaf 3. Epidermal tissue system: types of hair, monocot and dicot stomata	15	
Unit II Physiology	1 Photosynthesis: Introduction, significance 2. Light reactions- photophosphorylation (cyclic and non- cyclic), photolysis of water 3 Dark reactions-carbon fixation phase (C3, C4 and CAM pathways)	15	
Unit III Medicinal Botany	1. Metabolites, introduction, concept of primary and secondary metabolites, Differences between primary and secondary metabolites 2 Grandma's pouch: Following plants have to be studied with respect to botanical source, part of the plant used, active constituents present and medicinal uses: Tulsi (<i>Ocimum sanctum</i>), Adulsa (<i>Adhatoda vasica</i>), Aadrak (<i>Zinziber officinale</i>), Haldi (<i>Curcuma longa</i>), Chandan (<i>Santalum</i>	15	

	<i>album</i>), Korphad (<i>Aloe vera</i>)		
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Course Code ASPBOTP2 Semester II Practical Paper I – Plant Diversity 1

Sr.No.	Practicals	L	Cr
		30	01
1	Study of stages in the life cycle of <i>Nephrolepis</i> : Mounting of ramentum, hydathode, T.S. of rachis		
2	T.S. of pinna of <i>Nephrolepis</i> passing through sorus		
3	Stelar evolution with the help of permanent slides: Protostele: haplostele, actinostele, plectostele, mixed protostele, siphonostele: ectophloic, amphiphloic, dictyostele, eustele and atactostele		
4	Economic importance of pteridophytes: <i>Azolla</i> , <i>Nephrolepis</i> , <i>Selaginella</i>		
5	<i>Cycas</i> : T.S of leaflet (pinna)		
6	Megasporophyll, microsporophyll, coralloid root, microspore, L.S. of ovule of <i>Cycas</i> – all specimens to be shown		
7	Economic importance of gymnosperms: <i>Pinus</i> (turpentine, wood, seeds)		
8	Plant morphology (Root, Stem, Leaf) : as per theory		
9	Types of inflorescence and flower: as per theory		
10	Malvaceae		
11	Amaryllidaceae		

Course Code ASPBOTP2 Semester II Practical Paper II – Form and Function 1

Sr.No.	Practicals	L	Cr
		30	01
1	Primary structure of dicot and monocot root		
2	Primary structure of dicot and monocot stem		
3	Study of dicot and monocot stomata		
4	Epidermal outgrowths: with the help of mountings Unicellular: Cotton/Radish Multicellular: <i>Lantana</i> /Sunflower Glandular: <i>Drosera</i> and Stinging: <i>Urtica</i> – only identification with the help of permanent slides. Peltate: <i>Thespesia</i> Stellate: <i>Erythrina</i> / <i>Sida acuta</i> / <i>Solanum</i> / <i>Helicteres</i> T-shaped: <i>Avicennia</i>		
5	Separation of chlorophyll pigments by strip paper chromatography		
6	Separation of amino acids by paper chromatography		
7	Change in colour because of change in pH: Anthocyanin: black grapes/Purple cabbage		
8	Test for tannins: tea powder/catechu		
9	Identification of plants or plant parts for grandma's pouch as per theory		

Reference Books

1. College Botany Volume I and II by Gangulee, Das and Dutta. Central Education enterprises
2. Cryptogamic Botany Volume I and II by G M Smith, McGraw Hill.
3. Text book of Fungi by O.P. Sharma, Tata McGraw
4. Morphology and Evolution of Vascular Plants by Gifford, E. M. and Foster, A. S.,
W.H. Freeman & Co., New York.
5. Cryptogamic Botany Vol. I & II (2nd Edition) by Gilbert, M. S., Tata McGraw Hill
Publishing Co., Ltd New Delhi.
6. Introductory Phycology by Kumar, H. D. 1988,. Affiliated East-West Press Ltd.,New
York.
7. Comparative Morphology of Vascular Plants by Foster, A. S. and Gifford, A.E.M. jr.
Vakils, Peffer & Simons Pvt., Ltd.
8. The Morphology of Angiosperms by Sporne, K.R. B.I. Publication, Bombay.
9. Taxonomy of Vascular Plants by Lawrance. G.H.M. 1951. MacMillan, NewYork.
10. Environmental Science: A Global Concern by Cunningham.W.P. and Saifo S.W. 1997.
WCB. McGraw Hill.
11. Biochemistry and Molecular Biology of Plants. by Buchanan. B.B. Grussem. W. and
Jones. R.L. 2000. American Society of Plant Physiologists, Maryland, USA.
12. Plant Metabolism (2nd Edition) by Collins. H.A. and Edwards D.H. Lefebvre. D.D. and
Layzell. D.B. (eds) 1997. Longman, Essex, England
13. Genetics by Russel. Wesley Longman inc publishers. (5th edition)
14. Plant Physiology by Taiz and Zeiger Sinauer Associates inc. publishers
15. Fundamentals of Ecology by E P Odum and G W Barrett. Thompson Asia Pvt Ltd.
Singapore.
16. Cell Biology by De Robertis
17. A Text Book of Systematic Botany by Sutaria R N
18. Taxonomy of Angiosperms by Pandey S N and Mishra S D
19. A text book of Plant Ecology by Ambasht R.S.

20. Fundamentals of Cytology by L. W. Sharp.

21. Taxonomy of Angiosperms by V.N. Naik, Tata McGraw Hill

22. Plant Systematics: An integrated Approach by Gurcharan Singh, Science Publ.

Evaluation Pattern

External evaluation: Internal evaluation (70:30)

Theory:-External evaluation (70 Marks) Question Paper Pattern

Time: 2.5 hours

No.	Question Pattern	Marks
Q.1	a) Fill in the blanks by choosing appropriate options (5 MCQs)	05
	b) Answer in one /two sentences	05
Q.2	a) Long Answer Question (based on Unit I)	10
	OR	
	a) Long Answer Question/ Two short notes (based on Unit I)	10
	b) Long Answer Question (based on Unit I)	10
Q.3	OR	
	b) Long Answer Question/ Two short notes (based on Unit I)	10
	a) Long Answer Question (based on Unit II)	10
	OR	
Q.4	a) Long Answer Question/ Two short notes (based on Unit II)	10
	b) Long Answer Question (based on Unit II)	10
	OR	
	b) Long Answer Question/ Two short notes (based on Unit II)	10
Q.4	a) Long Answer Question (based on Unit III)	10
	OR	
	a) Long Answer Question/ Two short notes (based on Unit III)	10
	b) Long Answer Question (based on Unit III)	10
Q.4	OR	
	b) Long Answer Question/ Two short notes (based on Unit III)	10
Total		70

Theory:-Internal evaluation (30 Marks)

Description	Marks
Test	10
Project	10
Overall Conductance	10
Total	30

Practical:- External evaluation (35 Marks) Question Paper Pattern

No.	Question Pattern	Marks
Q.1	Identify, Classify and Describe the given Specimen A	06
Q.2	Identify, Classify and Describe the given Specimen B	06
Q.3	Identify, Classify and Describe the given Specimen C	06
Q.4	Identify and describe given Spot D, E and F	09
Q.5	Certified Journal	04
Q.6	Viva-voce	04
Total		35

Practical:- Internal evaluation (15 Marks)

Description	Marks
Performance in Regular Practicals	10
Active participation in Botanical Excursion	05
Total	15

Expected Learning Outcomes

(Programme Outcomes, Programme Specific Outcomes, Course Outcomes)

B.Sc. Botany**Programme Outcomes**

PO1. Knowledge and understanding of: 1. The range of plant diversity in terms of structure, function and environmental relationships. 2. Plant classification. 3. Plant pathology and physiology. 4. Genetics and biotechnology 5. The role of plants in the functioning of the global ecosystem. 6. Statistics as applied to biological data. 7. Modern techniques to study plants 8. Current trends in plant sciences

PO2. Intellectual skills Students able to: 1. Think logically and organize tasks into a structured form. 2. Assimilate knowledge and ideas based on wide reading and through the internet. 3. Transfer of appropriate knowledge and methods from one topic to another within the subject. 4. Understand the evolving state of knowledge in a rapidly developing field. 5. Construct and test hypothesis. 6. Plan, conduct and write a report on an independent term project.

PO3. Practical skills: Students learn to carry out practical work, in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain greater proficiency in a selection of them depending on their choice

of optional modules. 1. Interpreting plant morphology and anatomy. 2. Plant identification. 3. Vegetation analysis techniques. 4. A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry. 5. Analyze data using appropriate statistical methods. 6. Plant pathology to be added for sharing of field and lab data obtained.

PO4. Transferable skills: 1. Use of IT (word-processing, use of internet, statistical packages and databases). 2. Communication of scientific ideas in writing and orally. 3. Ability to work as part of a team. 4. Ability to use library resources. 5. Time management. 6. Career planning.

PO5. Scientific Knowledge: Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form.

PO6. Problem analysis: Identify the taxonomic position of plants, formulate the research literature, and analyze non reported plants with substantiated conclusions using first principles and methods of nomenclature and classification in Botany.

PO7. Design/development of solutions: Design solutions from medicinal plants for health problems, disorders and disease of human beings and estimate the phytochemical content of plants which meet the specified needs to appropriate consideration for the public health.

PO8. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.

PO9. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.

PO10. The Botanist and society, Effective Citizenship: Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

PO11. Environment and sustainability: Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO12. Ethics: Apply ethical principles and commit to environmental ethics and responsibilities and norms of the biodiversity conservation.

PO13. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO14. Communication: Communicate effectively on complex forms and functions of plants with Botanists community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO15. Self-directed and Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of plant study.

Programme Specific Outcomes: (PSO)s of B.Sc. Botany:

PSO 1. Critically evaluation of ideas and arguments by collection relevant information about the plants, so as recognize the position of plant in the broad classification and phylogenetic level.

PSO 2. Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.

PSO 3. Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy.

PSO 4. Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.

PSO 5. Students will be able to present scientific hypotheses and data both orally and in writing in the formats that recommended for research.

PSO 6. Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

PSO 7. Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

PSO 8. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plant groups, and differentiate them from each other and from other forms of life.

PSO 9. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.

PSO 10. Students will be able to explain how Plants function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to

give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants.

PSO 11. Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

PSO 12. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

Course Outcomes of B.Sc. Botany

After completion of course following learning outcomes are expected.

Students will learn and understand the syllabus.