

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 2022-23**

B. Sc. General (Semester Pattern) B. Sc. First Year**BOTANY – CURRICULUM**

Semester	Paper Code	Paper	Lectures /Practicals	Marks			Credits
				External	Internal	Total	
Semester I	USBOT11	Theory Paper I - Plant Diversity 1	45	70	30	100	02
	USBOT12	Theory Paper II – Form and Function 2	45	70	30	100	02
	USBOP13	Practical Paper I – Plant Diversity 1	09	35	15	50	01
	USBOP14	Practical Paper II – Form and Function 2	10	35	15	50	01
Semester II	USBOT21	Theory Paper I - Plant Diversity 1	45	70	30	100	02
	USBOT22	Theory Paper II – Form and Function 2	45	70	30	100	02
	USBOP23	Practical Paper I – Plant Diversity 1	11	35	15	50	01
	USBOP24	Practical Paper II – Form and Function 2	09	35	15	50	01

Name of the Programme: **B.Sc.**

Programme Outcomes:

After Completing the Programme, Students will be able to,

PO1	Demonstrate comprehensive knowledge and understanding of science that form a part of an undergraduate programme of study.	Disciplinary knowledge
PO2	Express scientific knowledge, concepts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.	Communication Skills
PO3	Apply analytical thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.	Critical thinking
PO4	Extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.	Problem solving
PO5	Evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesise data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.	Analytical reasoning
PO6	Enquire, ask appropriate questions, to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; Plan, execute and report the results of an experiment or investigation.	Research-related skills
PO7	Work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.	Cooperation/Team work
PO8	Analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.	Scientific reasoning
PO9	Criticize sensibility to lived experiences, with self-awareness and reflexivity of both self and society.	Reflective thinking

PO10	Use of ICT in a variety of learning situations, demonstrate, access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.	Information/digital literacy
PO11	Work independently, identify appropriate resources required for a project, and manage a project through to completion.	Self-directed learning
PO12	Retain knowledge of the values and beliefs of multiple cultures and a global perspective; Engage in a multicultural society and interact respectfully with diverse groups.	Multicultural competence
PO13	Embrace moral/ethical values in life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. identify ethical issues, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciate environmental and sustainability issues; adopt objective, unbiased and truthful actions in all aspects of work.	Moral and ethical awareness/reasoning
PO14	Map the tasks of a team or an organization, and set direction, formulate an inspiring vision, build a team who can help achieve the vision, motivate and inspire team members to engage with that vision, use management skills to guide people to the right destination, in a smooth and efficient way.	Leadership readiness/qualities
PO15	Acquire knowledge and skills, including 'learning how to learn', that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, adapt to changing trades and demands of work place through knowledge/skill development/reskilling.	Lifelong learning

Name of the Programme: **B.Sc. Botany**

Programme Specific Outcomes

After Completing the Programme in Botany, Students will be able to

PSO1	Explain how Plant perform various functions at the level of the gene, cell, tissue, organ and organism as collective.
PSO2	Compare and contrast the characteristics of plant groups, Identify and classify plants of various division upto class level on basis of basic knowledge of plant morphology, anatomy etc. in real life observations.
PSO3	Apply scientific methods to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analysing those data to assess the degree to which their scientific work supports their hypotheses.
PSO4	Demonstrate proficiency in the experimental techniques and analytical methods for various areas and current trends in plant science.

Course Outcomes

Program: **B.Sc. Botany**

Class: **F.Y. B.Sc.**

Sem: **I**

Course: **Plant Diversity I**

After Completing the course, Student will be able to

CO1	Explain Occurrence, structure, reproduction of <i>Nostoc</i> , <i>Spirogyra</i> , <i>Rhizopus</i> , <i>Aspergillus</i> and <i>Riccia</i>
CO2	Identify and classify Algae, Fungi and bryophytes on basis of general characters and principles of taxonomy
CO3	Differentiate modes of nutrition in fungi
CO4	Evaluate economic importance of algae, fungi and bryophytes
CO5	Justify different stages in the life cycle of <i>Nostoc</i> , <i>Spirogyra</i> , <i>Rhizopus</i> , <i>Aspergillus</i> and <i>Riccia</i>

Semester - I

Course: **Form and Function I**

After Completing the course, Student will be able to

CO1	Define the Ecology, Ecosystem, multiple alleles
CO2	Explain the type of cells with their differences, ultrastructure and function of Cell wall, plasma membrane, endoplasmic reticulum and chloroplast, Mendelian Genetics
CO3	Describe terrestrial and aquatic ecosystems, the basic principles of Genetics, epistatic and non-epistatic gene interactions
CO4	Differentiate prokaryotic and eukaryotic cell, types of gene interaction, ecosystems
CO5	Justify the Mendelian ratios, prokaryotic and eukaryotic cell, ecosystems

Sem: II

Course: **Plant Diversity I**

After Completing the course, Student will be able to

CO1	Explain Occurrence, structure, reproduction of <i>Nephrolepis</i> and <i>Cycas</i>
CO2	Identify and classify Pteridophytes and gymnosperms on basis of general characters and principles of taxonomy
CO3	Differentiate types of steles, inflorescences
CO4	Evaluate economic importance of pteridophytes, gymnosperms and some families of angiosperms
CO5	Justify different stages in the life cycle of <i>Nephrolepis</i> and <i>Cycas</i>
CO6	Describe morphological features of root, stem, leaf, inflorescence, flower
CO7	Discuss salient features of Malvaceae and Amarylidaceae family

Semester - II

Course: **Form and Function I**

After Completing the course, Student will be able to

CO1	Define tissue, photosynthesis, metabolites
CO2	Explain different types of tissues in plants with their functions, concept of Primary and secondary metabolites with their differences in plants
CO3	Describe primary structure of dicot and monocot root, stem and leaf, light and dark reactions of photosynthesis
CO4	Identify and describe epidermal tissue systems, plants used in Grandma's Pouch
CO5	Justify the primary structure of dicot and monocot root, stem, leaf, primary and secondary metabolites

Semester I Theory Paper I			
Course Code USBOT11	Title	Lectures	Credits
Unit	Plant Diversity 1	45	02
Unit I Viruses, Bacteria and Algae	1. Viruses: Discovery, Physiochemical and biological characteristics, Classification 2. Bacteria: Discovery, general characteristics, Types 3. Algae: General characters Classification of algae (G.M. Smith) Chlorophyta: General Characters 4. <i>Nostoc</i> and <i>Spirogyra</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Economic importance of algae: <i>Ulva</i> (Biofuel), <i>Spirulina</i> (Neutraceutical), <i>Gelidium</i> (Agar)	15	
Unit II Fungi	1. Fungi: General characters Classification of fungi (G.M. Smith) 2. Phycomycetes: General Characters 3. <i>Rhizopus</i> and <i>Aspergillus</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Modes of nutrition in fungi (Saprophytism and Parasitism) 5. Economic importance of fungi: Mushroom, yeast, wood rotting fungi (any bracket fungus)	15	
Unit III Bryophyta	1. Bryophyta: General characters Classification of bryophyte (G.M. Smith) 2. Hepaticae :General characters 3. <i>Riccia</i> . Occurrence, structure, systematic position reproduction and life cycle 4. Economic importance of bryophytes: <i>Sphagnum</i>	15	

Semester I Theory Paper II			
Course Code USBOT12	Title	Lectures	Credits
Unit	Form and Function 1	45	02
Unit I Cell Biology	1. Cell as a unit of structure and function, 2. Characteristics of prokaryotic and eukaryotic cells 3. Origin of eukaryotic cell, 4. General structure of plant cell: cell wall, plasma membrane (bilayer lipid structure, fluid mosaic model) 5. Cell organelles: Ultra structure and functions: endoplasmic reticulum and chloroplast	15	
Unit II Ecology	1. Ecology: Introduction 2. Food chains and Food webs; 3. Ecological pyramids. 4. Energy flow in an ecosystem, 5. Ecosystem: Introduction, types of ecosystems: aquatic and terrestrial	15	
Unit III Genetics	1. Genetics: Introduction, Principles of inheritance, genotype and phenotype 2. Mendelian Genetics- monohybrid, dihybrid; test cross; back cross ratios 3. Incomplete dominance and codominance 4. multiple alleles. 5. Epistatic and non-epistatic interactions;	15	

Course Code USBOP13 Semester I Practical Paper I – Plant Diversity 1			
Sr.No.	Practicals	L	Cr
		30	01
1	Electron micrographs/Models of viruses – T-Phage and TMV		
2	Gram staining of bacteria		
3	Study of stages in the life cycle of <i>Nostoc</i> from fresh/ preserved material and permanent slides		
4	Study of stages in the life cycle of <i>Spirogyra</i> from fresh/ preserved material and permanent slides		
5	Economic importance of algae: <i>Ulva</i> (Biofuel), <i>Spirulina</i> (Neutraceutical), <i>Gelidium</i> (Agar)		
6	Study of stages in the life cycle of <i>Rhizopus</i> from fresh/ preserved material and permanent slides		
7	Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material and permanent slides		
8	Economic importance of Fungi: Mushroom, yeast, wood rotting fungi (any bracket fungus)		
9	Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved material and permanent slides		
10	Economic importance of Bryophytes: <i>Sphagnum</i>		

Course Code USBOP14 Semester I Practical Paper II– Form and Function 1			
Sr.No.	Practicals	L	Cr
		30	01
1	Identification of cell organelles with the help of photomicrograph: Plastids: Chloroplast, Amyloplast, Endoplasmic Reticulum and Nucleus		
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	Examining various stages of mitosis in root tip cells (<i>Allium</i>)		
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			
Course Code USBOT21	Title	Lectures	Credits
Unit	Plant Diversity 1	45	02
Unit I Pteridophytes	1. Pteridophytes: General characters Classification of pteridophytes (G.M. Smith) 2. Pterophyta or Filicophyta: General characters 3. <i>Nephrolepis</i> : Occurrence, structure, systematic position reproduction and life cycle 4. Stelar evolution 5. Economic importance of pteridophytes	15	
Unit II Gymnosperms	1. Gymnosperms: General characters, Classification of gymnosperms (Chamberlin) 2. Cycadopsida: General characters 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. Plant Morphology: Root, Stem, Leaf -Structure, types 3. Inflorescence: Introduction, structure of typical inflorescence, Types- racemose and cymose 4. Flower: Introduction, structure of a typical flower (<i>Hibiscus</i>), symmetry and types (hypogynous, epigynous, perigynous) 5. Study of following families: Malvaceae, Amaryllidaceae	15	

Semester II Theory Paper II			
Course Code USBOT22	Title	Lectures	Credits
Unit	Form and Function 1	45	02
Unit I Anatomy	1. Classification of tissues; 2. Simple tissues – Parenchyma, Collenchyma, sclerenchyma 3. Complex tissues- Xylem and Phloem 4. Primary structure of dicot and monocot root, stem and leaf 5. 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 to various metabolites 2. Concept of primary and secondary metabolites, 3. Differences between primary and secondary metabolites 4. 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 album</i>), Korphad (<i>Aloe vera</i>)	15	

Course Code USBOP23 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	Salient features and economic importance of Malvaceae		
11	Salient features and economic importance of Amaryllidaceae		

Course Code USBOP24 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, New York.
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 Melabolism (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. Taxonoy 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.
23. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, McGraw Hill, India. 6th edition.
24. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

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	Answer any two. (based on Unit I) a) Long Answer Question b) Long Answer Question c) Long Answer Question d) Two short notes	20
Q.3	Answer any two. (based on Unit II) a) Long Answer Question b) Long Answer Question c) Long Answer Question d) Two short notes	20
Q.4	Answer any two. (based on Unit III) a) Long Answer Question b) Long Answer Question c) Long Answer Question d) Two short notes	20
Total		70

Theory:-Internal evaluation (30 Marks)

Description	Marks
Test	10
Project/Presentation/Report	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	07
Q.2	Identify, Classify and Describe the given Specimen B	07
Q.3	Identify, Classify and Describe the given Specimen C	07
Q.4	Identify and describe given Spot D, E and F	09
Q.5	Viva-voce	05
Total		35

Practical: - Internal evaluation (15 Marks)

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