

AC/04.08.2018/RS1



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 Autonomy - June 2018

Program: F. Y. B.Sc.

Course: Botany

Choice Based Credit System (CBCS)

with effect from the academic year 2018-19

PREAMBLE

The existing university syllabus of F.Y.B.Sc. Botany due for revision as per the CBCS pattern and will be implemented from the academic year 2018-2019 under autonomy.

In the revised autonomous syllabus, the committee has taken utmost care to maintain the continuity in the flow of information at F.Y.B.Sc level. Hence, some of the modules of the existing university syllabus have been upgraded with the new modules in order to make the learners aware about the recent developments in various branches of Botany (like Thallophyta, Spermatophyta, Genetics, Cytology, Plant physiology, Environmental botany, Medicinal botany, etc.). Various interdisciplinary courses such as Biostatistics & Bioinstrumentation are also introduced to make the students at par with the updated tools and techniques.

Two papers of theory and practicals (Semester - I & Semester-II together) are compulsory for the students.

Each theory period shall be of 48 minutes duration. Theory component shall have 180 instructional periods. Each practical will be of 3 periods of 48 minutes each.

MODALITY OF ASSESSMENT:**Theory Examination Pattern****A) Internal Assessment – 40M**

(20M Class Test + 15M Assignment/Case study/ ppt. + 05 Class participation)

B) External examination – 60M (Semester End Theory Assessment)

- i. Duration - These examinations shall be of two hours duration.
- ii. Theory question paper pattern: attached herewith.

Practical Examination Pattern:

- A. Internal Examination: There will not be any internal examination/ evaluation for practicals.
- B. External (Semester end practical examination).

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-ordinator of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern for Semester I

Course	PAPER I			PAPER II			Grand Total
	Internal	External	Total	Internal	External	Total	
Theory	40	60	100	40	60	100	200
Practicals	-	50	50	-	50	50	100

Overall Examination and Marks Distribution Pattern for Semester II

Course	PAPER I			PAPER II			Grand Total
	Internal	External	Total	Internal	External	Total	
Theory	40	60	100	40	60	100	200
Practicals	-	50	50	-	50	50	100

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 develop better 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.

F.Y.B.Sc. Botany Syllabus (Restructured for Choice-Based Credit System)**To be implemented from the Academic Year 2018-2019****SEMESTER I**

Course	Nomenclature	Credits	Topics
SIUSBOT11	Plant diversity I	02	1. Algae
			2. Fungi & Lichens
			3. Bryophyta & Pteridophyta
SIUSBOT12	Form and function I	02	1. Cell Biology
			2. Ecology
			3. Genetics & Biometry
SIUSBOTP11 SIUSBOTP12	Plant Diversity I (Practical I) Form and Function I (Practical II)	01 01	Practicals based on Theory Topics

SEMESTER II

Course	Nomenclature	Credits	Topics
SIUSBOT21	Plant diversity 1	02	1. Gymnosperms
			2. Angiosperms
			3. Systematic Botany
SIUSBOT22	Form and function I	02	1. Anatomy
			2. Physiology
			3. Medicinal Botany & Horticulture
SIUSBOTP21 SIUSBOTP22	Plant Diversity I (Practical I) Form and Function I (Practical II)	01 01	Practicals based on Theory Topics

SEMESTER-I Course: PLANT DIVERSITY- I

Semester I SIUSBOT11		L	Cr.
Paper I - Plant Diversity 1		45	02
<p>COURSE OUTCOMES: The students will be able to-</p> <ul style="list-style-type: none"> ❖ CO1: Differentiate between various groups of cryptogams. ❖ CO2: Understand the morphology, structure and importance of the lower plants. ❖ CO3: Learn the economic importance of Algae, Fungi, Lichens and Bryophyte. <p>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>			
UNIT I –ALGAE		15	
1	General characters of Chlorophyta: Range of thallus; types of Chloroplast.		
2	Structure, life cycle and systematic position of <i>Nostoc</i> and <i>Spirogyra</i> .		
3	Algae in biotechnology:		
	i) Algae- as Biofertilizers, Food & Nutraceuticals, Biofuel, Medicines.		
	ii) Phytochemicals, Secondary metabolites from algae & use of algae in industry.		
UNIT II - FUNGI AND LICHENS		15	
1	General characters of Phycomycetes: Occurrence; hyphal structure; modes of nutrition, reproduction; alternation of generations.		
2	Structure, life cycle and systematic position of <i>Rhizopus</i> .		
3	Applications of Fungi: in industry, agriculture & medicines.		
4	Lichens: Classification, Internal structure of thallus, Reproduction & fructification, Ecological significance & Economic importance.		
UNIT III - BRYOPHYTA & PTERIDOPHYTA		15	
1	General characters of Hepaticae: Occurrence, thallus structure, vegetative reproduction, sexual reproduction, sporophyte structure, alternation of generation.		
	Structure, life cycle and systematic position of <i>Riccia</i> .		
2	Structure, life cycle, systematic position and alternation of generations in <i>Nephrolepis</i> . Types of Stele found in Pteridophytes.		

	SEMESTER I SIUSBOTP11	L	Cr
	PRACTICAL PAPER I – PLANT DIVERSITY 1	30	1
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>Spirulina</i> (Nutraceutical), <i>Ulva</i> (Biofuel), <i>Ascophyllum</i> (Alginates), <i>Gelidium</i> (Agar)		
4	Study of chloroplast in chlorophyta		
5	Study of range of thallus in chlorophyta		
6	Study of stages in the life cycle of <i>Rhizopus</i> from fresh/ preserved material and permanent slides.		
7	Study of Lichens: Morphological types, Internal structure of thallus.		
8	Economic importance of Fungi: Mushroom, Yeast, Wood rotting fungi, Mycorrhiza (AMF).		
9	Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved materials and permanent slides.		
10	Study of stages in the life cycle of <i>Nephrolepis</i> : Mounting of ramentum, hydathode, T.S. of rachis, T.S. of pinna of <i>Nephrolepis</i> passing through sorus, prothallus and sex organs.		
11	Types of stele found in pteridophytes with the help of permanent slides: Protostele: Haplostele, Actinostele, Plectostele, Mixed. Siphonostele: Ectophloic, Amphiphloic, Solenostele: Dictyostele.		

SEMESTER-I Course: Form and Function I

Semester I SIUSBOT12		L	Cr.
Paper II – Form and Function I		45	02
COURSE OUTCOMES:			
The students will be able to:			
❖ CO1: Understand the Structure and functions of various cell organelles of plants.			
❖ CO2: Learn the basic concepts in Ecosystem and understand the meaning of Biodiversity.			
❖ CO3: Understand the genic interactions and learn the basic methods of Biometry.			
CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)			
UNIT I - CELL BIOLOGY		15	
1	General structure of plant cell: Cell wall, Plasma membrane (fluid mosaic model)		
2	Ultrastructure and functions of the following cell organelles: Chloroplast & Endoplasmic reticulum.		
3	Ultrastructure of eukaryotic nucleus, chromosomes. Mitosis in plant cell.		
UNIT II - ECOLOGY		15	
1.	Energy pyramids, energy flow in an ecosystem.		
2.	Types of ecosystems: aquatic and terrestrial.		
3.	Biodiversity- definition, significance and major hotspots in India.		
UNIT III - GENETICS AND BIOMETRY		15	
1	Interaction of genes:-interaction between alleles; interaction involving two pair of genes: epistatic and non-epistatic interactions.		
2	Multiple alleles.		
3	Biometry: Mean, Median, Mode and Standard deviation		

PRACTICAL PAPER II SIUSBOTP12		L	Cr
FORM AND FUNCTION I			
		30	1
1	Study of various stages of mitosis in root tip cells (<i>Allium</i>)		
2	Study of Karyotypes: Human – Normal male and normal female		
3	Study of Karyotypes: <i>Allium cepa</i> .		
4	Identification of parts of cell and cell organelles with the help of photomicrographs: Plasma membrane, Chloroplast, Endoplasmic reticulum, Eukaryotic nucleus.		
5	Identification of plants adapted to different environmental conditions: Hydrophytes: Free floating (<i>Pistia/Eichornia</i>); Rooted floating (<i>Nymphaea</i>); Submerged (<i>Hydrilla</i>), Mesophytes (any common plant); Hygrophytes (<i>Typha/Cyperus</i>), Xerophytes: Succulent (<i>Opuntia</i>); Woody Xerophyte (<i>Nerium</i>); Halophyte (<i>Avicennia pneumatophore</i>).		
6	Study of biodiversity hot spots in India.		
7	Study of ABO blood groups and Genetics problems on multiple alleles		
8	Frequency distribution, graphical representation of data: frequency polygon, histogram, pie chart.		
9	Calculation of mean, median and mode.		
10	Calculation of standard deviation.		

SEMESTER-II Course: Plant Diversity I

Semester II SIUSBOT21		Hrs	Cr.
Paper I - Plant Diversity I		45	02
<p>COURSE OUTCOMES:</p> <p>The students will be able to:</p> <ul style="list-style-type: none"> ❖ CO1: Study life cycle and economic importance of gymnospermic plants. ❖ CO2: Study morphology of leaf and inflorescence and acquire knowledge about wonders of plants. ❖ CO3: Learn systematic botany by studying different families. <p>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>			
UNIT I - GYMNOSPERMS		15	
1	Structure, life cycle, systematic position and alternation of generations in <i>Cycas</i>		
2	Affinities of gymnosperms with pteridophytes and angiosperms		
3	Economic importance of Gymnosperms		
UNIT II - ANGIOSPERMS: MORPHOLOGY & WONDERS OF PLANTS		15	
1	Morphology of leaf: simple leaf, types of compound leaves, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf shapes, venation. Modifications of leaf: spine, tendril, hooks, phyllode,		
2	Inflorescence: Racemose: simple raceme, spike, catkin, spadix, panicle. Cymose: monochasial, dichasial, polychasial. Compound: corymb, umbel, capitulum Special Types: Cyathium, Verticillaster, Hypanthodium.		
3	Wonders of plants: <i>Rafflesia</i> , <i>Victoria regia</i> , carnivorous plants- pitcher, Venus Flytrap, <i>Dionea</i> . Sundew, Bladderwort, <i>Adansonia</i> , <i>Sequoia</i> , Strangler Fig, plant mimicry – orchids.		
Unit III – SYSTEMATIC BOTANY			
1.	Systems of classification: natural (Bentham & Hooker), artificial (Linnaeus) & phylogenetic (Hutchinson).		

2	Study of following families: Annonaceae, Cruciferae, Malvaceae, Solanaceae, Euphorbiaceae, Amaryllidaceae.		
	SEMESTER II SIUSBOTP21	L	Cr
	PRACTICAL PAPER I – PLANT DIVERSITY I	30	01
1	Study of stages in the life cycle of <i>Cycas</i> : T.S of leaflet (<i>Cycas</i> pinna – section cutting), coralloid root, microsporophyll, microspore, Megasporophyll, Ovule (Specimens or slides to be shown).		
2	Economic importance of Gymnosperms: <i>Pinus</i> (turpentine, wood, seeds)		
3	Leaf morphology: As per theory		
4	Types of inflorescence: As per theory		
5	Study of Family: Annonaceae, Cruciferae.		
6	Study of Family: Malvaceae, Solanaceae.		
7	Study of Family: Euphorbiaceae, Amaryllidaceae.		
8	Wonders of plants: Carnivorous plants- Pitcher, Venus Flytrap, <i>Dionaea</i> . Sundew, Bladderwort & Plant mimicry – orchids		

SEMESTER-II Course: Form and Function I

Semester II SIUSBOT22		L	Cr.
Paper II – Form and Function I		45	02
COURSE OUTCOMES:			
The students will be able to:			
❖ CO1: Learn basic types of plant tissues & anatomy of stem, root & leaves.			
❖ CO2: Study various enzymes, their mode of actions and basics photosynthesis in plants.			
❖ CO3: Understand basic horticulture & applications of Aromatherapy.			
CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)			
UNIT I - ANATOMY		15	
1	Simple tissues - Parenchyma, Collenchyma, Sclerenchyma. Complex tissues – Xylem and Phloem.		
2	Cell Inclusions – Starch, protein, Calcium oxalate and calcium carbonate crystals		
3	Primary structure of dicot and monocot root, stem and leaf.		
UNIT II - PHYSIOLOGY		15	
1.	Enzymes: Nomenclature, Classification, Properties, lock & key theory & induced fit theory of enzyme action.		
2.	Photosynthesis: light reaction- photolysis of water, photophosphorylation: cyclic, noncyclic. Dark reaction- C ₃ cycle, C ₄ cycle & CAM.		
UNIT III - MEDICINAL BOTANY AND HORTICULTURE		15	
1	Applications of Aromatherapy: Sandal wood oil, Lavender oil, Geranium oil		
2	Herbal cosmetics in skin and hair care.		
3	Introduction to Horticulture and various Garden locations: Fence, Avenue, Hedge, Edge, Lawn, Arches and Pergolas.		

	Semester II SIUSBOTP22	L	Cr.
	PRACTICAL Paper II – Forms & Function I	30	01
1	Primary structure of dicot and monocot root.		
2	Primary structure of dicot and monocot stem.		
3	Primary structure of dicot and monocot leaf.		
4	Study of cell inclusions: Starch grains, Aleurone layer, Raphides, Sphaeraphides, Cystolith.		
5	Test for tannins		
6	Change in colour because of change in pH: Anthocyanin: black grapes/Purple cabbage		
7	Effect of variation in substrate concentration on Amylase activity.		
8	Applications of Aromatherapy: Sandal wood oil, Lavender oil, Geranium oil		
9	Plants used in skin care herbal cosmetics.		
10	Plants used in hair care herbal cosmetics.		
11	Study of different garden locations and suitable plants: Avenue, Hedge, Edge, Lawn, Arches and Pergolas and Fence. (As per theory).		

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- Chapman V.J. (1941). An Introduction to the Study of Algae. New York Macmillan Cambridge at the University Press
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- Verma P.S., Agarwal V.K. (2000) Principles of Ecology. S.Chand Publ.

First/Second Semester

Class: F.Y.B.Sc

Sub: Botany

Paper: I/II

Day:

Date:

Time:

Marks: 60

N.B.:

- 1) All questions are Compulsory.
- 2) Figures to the right indicate marks.
- 3) Draw neat labelled diagrams wherever necessary.

Q.1	a)	Unit I: Long answer question	(10)
		OR	
	a)	Unit I: Long answer question	
	b)	Unit I: Short answer question	(05)
		OR	
	b)	Unit I: Short answer question	
Q.2	a)	Unit II: Long answer question	(10)
		OR	
	a)	Unit II: Long answer question	
	b)	Unit II: Short answer question	(05)
		OR	
	b)	Unit II: Short answer question	
Q.3	a)	Unit III: Long answer question	(10)
		OR	
	a)	Unit III: Long answer question	
	b)	Unit III: Short answer question	(05)
		OR	
	b)	Unit III: Short answer question	
Q. 4		Write notes on the following:	(15)
	i)	Unit I	
		OR	
	i)	Unit I	
	ii)	Unit II	
		OR	
	ii)	Unit II	
	iii)	Unit III	
		OR	
	iii)	Unit III	

Practical Examination Paper Pattern for Practical I & II
(50 marks per semester)

SEMESTER I		
TIME: 2 HRS 15MIN	PRACTICAL I	MARKS: 50
ALGAE, FUNGI, LICHENS, BRYOPHYTES AND PTERIDOPHYTES		
Q. 1	Identify, classify and describe the specimens A, B, C and D. Sketch & label the parts observed.	(24)
Q. 2	Identify and give economic importance of the specimens E and F.	(04)
Q. 3	Identify and describe specimens/slides G, H, I and J.	(12)
Q. 4	Journal	(05)
Q. 5	Viva-voce	(05)
	<p>Key:</p> <ul style="list-style-type: none"> • A: Algae (<i>Nostoc/ Spirogyra</i>) • B: Fungi (<i>Rhizopus</i>) • C: Bryophyte (<i>Riccia</i>) • D: Pteridophyte (<i>Nephrolepis</i> – Leaflet or Rachis) • E: Economic importance of Algae • F: Economic importance of Fungi • G: Type of Chloroplast in Chlorophyta • H: Range of Thallus in Algae • I: Lichen • J: Types of stele 	

SEMESTER I		
TIME: 2 HRS 15MIN	PRACTICAL II	MARKS: 50
CELL BIOLOGY, ECOLOGY, BIOMETRY AND GENETICS		
Q. 1	Determine frequency distribution & graphical representation / mean, median, mode / standard deviation from the given specimen A. ➤ Frequency Distribution & Graph ➤ Mean, Median, Mode ➤ Standard Deviation	(10)
Q. 2	Prepare a squash of the given root 'B' to show various stages of mitosis. Draw neat labelled diagrams of all the four stages of mitosis.	(10)
Q. 3	Analyze the given karyotype 'C' and comment upon it.	(05)
Q. 4	Identify and comment upon the highlighted biodiversity hot spots in Indian Map 'D'.	(05)
Q. 5	Identify the blood group A, B or O from the given sample 'E' OR Solve the given genetic problem 'E'.	(06)
Q. 6	Identify and describe specimens / slides / photomicrograph F, G and H.	(09)
Q. 7	Journal	(05)
	<p>Key:</p> <ul style="list-style-type: none"> • A:Biometry – Frequency distribution & graphical representation / Mean, median, mode / Standard deviation • B:Mitosis – Hydrolyzed Onion root • C: Karyotype analysis – <i>Allium cepa</i>. • D: Biodiversity Hotspots in Indian map • E: Blood sample interaction photo / Genetic problem • F: Photomicrograph of any one cell organelle (Plasma membrane/Chloroplast/Mitochondria/Eukaryotic Nucleus) • G: Hydrophyte(<i>Eichornia/Nymphaea/Hydrilla</i>) / Xerophyte (<i>Opuntia / Nerium</i>) / Mesophyte (<i>Vinca</i>) / Halophyte (<i>Avicennia</i>) / Hygrophyte (<i>Typha / Cyperus</i>) • H:Idiogram study – Normal male / Normal female 	

SEMESTER II

TIME: 2 HRS 15MIN	PRACTICAL I	MARKS: 50
GYMNOSPERMS, ANGIOSPERMS AND SYSTEMATIC BOTANY		
Q. 1	Identify, classify, describe, sketch and label specimen A.	(08)
Q. 2	Classify specimen B up to their families giving reasons. Give the floral formula. Sketch labelled diagrams of L.S of flower and T.S of ovary.	(08)
Q. 3	Identify and give economic importance of the specimen C.	(04)
Q. 4	Identify and describe slides/specimens/photomicrograph D, E, F, G and H.	(15)
Q. 5	Field Report	(05)
Q. 6	Journal	(05)
Q. 7	<i>Viva-voce</i>	(05)
	<p>Key:</p> <ul style="list-style-type: none"> • A: <i>Cycas</i>: Pinna • B: Systematic Botany: Annonaceae/ Cruciferae/Malvaceae/ Solanaceae/ Euphorbiaceae/Amarylidaceae. • C: Economic importance of <i>Pinus</i> • D: <i>Cycas</i>: Coralloid roots/ Microsporophylls/ Microspore/ Megasporophylls/ L.S. of Ovule • E: Leaf morphology • F: Inflorescence morphology • G: Wonders of plants • H: Wonders of plants 	

SEMESTER II		
TIME: 2 HRS 15MIN	PRACTICAL II	MARKS: 50
ANATOMY, PHYSIOLOGY, MEDICINAL BOTANY AND HORTICULTURE		
Q. 1	Make a temporary stained preparation of T.S of specimen A. Sketch a labelled diagram and describe its internal structure.	(06)
Q. 2	Mount and comment on the cell inclusions B and C. Draw neat labelled diagrams.	(08)
Q. 3	Perform the physiology experiment D. Give the requirements, principle and flow chart. Record the observations and result.	(08)
Q. 4	Perform two positive chemical tests to detect the presence of tannins in specimen E.	(06)
Q. 5	Identify and give uses of specimens F, G and H.	(06)
Q. 5	Give the botanical name and common name of two plants suitable for the given garden locations I, J and K.	(06)
Q. 6	Journal	(05)
Q. 7	Viva-voce	(05)
	<p>Key:</p> <ul style="list-style-type: none"> • A: Dicot Root (Gram Seed) /Dicot stem (Sunflower)/ Monocot root (maize)/ Monocot stem (maize)/ Dicot leaf (Sunflower leaf)/ Moncot leaf (Maize leaf). • B: Starch (Potato/Rice) /Proteins (Maize) • C: Raphides (<i>Pistia</i>)/ Sphaeraphides (<i>Opuntia</i>) / Cystoliths (<i>Ficus</i>) • D: Physiology Experiment – Effect of pH on colour of Anthocyanin / Amylase activity • E: Test for Tannins • F: Aromatherapy oils • G: Plants used in Skin care • H: Plants used in Hair care • I, J and K: Garden locations –Avenue/ Hedge/ Edge/ Lawn/Arches and Pergolas/ Fence 	
