

UNIVERSITY OF MUMBAI



**Syllabus for the S.Y.B.Sc.
Program: B.Sc.
Course : BOTANY**

(Credit Based Semester and Grading System with
effect from the academic year 2015–2016)

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

S.Y.B.Sc. Botany Syllabus
Restructured for Credit Based and Grading System
To be implemented from the Academic year 2015-2016

SEMESTER III

Course Code	UNIT	TOPICS	Credits	L / Week
USBO301	<u>PLANT DIVERSITY II</u>			
	I	Thallophyta- Algae	2	1
	II	Bryophyta		1
	III	Angiosperms		1
USBO302	<u>FORM AND FUNCTION II</u>			
	I	Instrumentation and Techniques	2	1
	II	Cell Biology		1
	III	Cytogenetics		1
USBO303	<u>CURRENT TRENDS IN PLANT SCIENCES I</u>			
	I	Pharmacognosy & Phytochemistry	2	1
	II	Forestry & Economic Botany		1
	III	Molecular Biology		1
USBOP3	Practical based on all the three courses in theory		3	9

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

SEMESTER IV

Course Code	UNIT	TOPICS	Credits	L / Week
USBO401	<u>PLANT DIVERSITY II</u>			
	I	Thallophyta: Fungi, Plant Pathology and Lichens	2	1
	II	Pteridophyta and Paleobotany		1
	III	Gymnosperms		1
USBO402	<u>FORM AND FUNCTION II</u>			
	I	Anatomy	2	1
	II	Physiology and Plant Biochemistry		1
	III	Ecology and Environmental Botany		1
USBO403	<u>CURRENT TRENDS IN BOTANY I</u>			
	I	Horticulture	2	1
	II	Biotechnology		1
	III	Biostatistics & Bioinformatics		1
USBOP4	Practical based on all the three courses in theory		3	9

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

SEMESTER III THEORY

Course Code	Title	Credits
USBO301	<u>PLANT DIVERSITY II</u>	2 Credits (45 lectures)
<p><u>Unit I : Thallophyta- Algae</u></p> <ul style="list-style-type: none"> • General Characters of Division Phaeophyta: Distribution, Cell structure, pigments, reserve food, range of thallus, reproduction: asexual and sexual, Alternation of Generations, Economic Importance. • Structure, life cycle and systematic position of <i>Dictyota</i> <i>Sargassum</i> • Pigments in Algae. 		15 Lectures
<p><u>Unit II : Bryophyta</u></p> <ul style="list-style-type: none"> • General Account of Class Anthocerotae and Musci • Structure, life cycle and systematic position of <ul style="list-style-type: none"> ○ <i>Anthoceros</i> ○ <i>Funaria</i> 		15 Lectures
<p><u>Unit III : Angiosperms</u> <u>Morphology of Flowering Plants</u></p> <ul style="list-style-type: none"> • Flower Morphology : <ul style="list-style-type: none"> ○ Parts of a flower, flower symmetry; ○ Flower as a modified shoot, ○ Thalamus, insertion of floral leaves on the thalamus ○ The accessory whorls : Calyx types and modifications, Corolla – forms; Aestivation, The Perianth; ○ The Essential whorls: Androecium parts of the androecium, Number and insertion of stamens, Union of stamens; Types of CoronaGynoecium: the carpel, style and stigma; Union of Carpel; ovary- placentation, types of ovules, evolution of placenta in Angiosperm. ○ Floral formula, floral diagram. • With the help of Bentham and Hooker’s system of classification for flowering plants study the vegetative, floral characters and economic importance of the following families: <ul style="list-style-type: none"> ○ Magnoliaceae ○ Myrtaceae ○ Asteraceae ○ Apocynaceae ○ Amaranthaceae ○ Palmae 		15 Lectures

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Course Code	Title	Credits
USBO302	<u>FORM AND FUNCTION II</u>	2 Credits (45 lectures)
<u>Unit I : Instrumentation and Techniques</u> <ul style="list-style-type: none"> ● Microscopy – Principle and working of Light, and electron microscope. ● Chromatography- Principles and techniques in paper and thin layer chromatography. ● Principles and techniques of Horizontal and Vertical electrophoresis. 		15 Lectures
<u>Unit II : Cell Biology</u> <ul style="list-style-type: none"> ● Ultra Structure and functions of the following cell organelles: <ul style="list-style-type: none"> ○ Mitochondrion ○ Peroxisomes ○ Glyoxysomes ○ Ribosomes ● Cell Division and its significance <ul style="list-style-type: none"> ○ Cell Cycle ○ Mitosis & Meiosis ○ Differences between Mitosis and Meiosis ● Nucleic Acids: Types, structure and functions of <ul style="list-style-type: none"> ○ DNA ○ RNA 		15 Lectures
<u>Unit III : Cytogenetics</u> <ul style="list-style-type: none"> ● Variation in Chromosome structure (Chromosomal Aberrations) Definition, Origin, Cytological and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations. ● Variation in Chromosome Number Origin and production, morphological and cytological features, applications in crop improvement and evolution of Aneuploids and Euploids (Monoploids, Autopolyploids and allopolyploids) ● Extranuclear Genetics Organelle heredity- <ul style="list-style-type: none"> ○ Chloroplast determines heredity -Plastid transmission in plants, Streptomycin resistance in <i>Chlamydomonas</i>. ○ Mitochondrion determined heredity- petite colonies in yeast 		15 Lectures

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Course Code	Title	Credits
USBO303	<u>CURRENT TRENDS IN PLANT SCIENCES I</u>	2 Credits (45 lectures)
<u>Unit I : Pharmacognosy and Phytochemistry</u> <ul style="list-style-type: none"> • Introduction to pharmacopoeia • Study of secondary metabolites (sources, properties and uses) with reference to <ul style="list-style-type: none"> ○ Alkaloids, ○ Glycosides, ○ Tannins, ○ Volatile oils and ○ Gums and resins (example of one plant for each category) 		15 Lectures
<u>Unit II : Forestry and Economic Botany</u> <ul style="list-style-type: none"> • Types of forests – classification of forests, different types of forests in India • Applications of forestry- Social forestry, Reforestation, Aforestation, Deforestation. • Economic Botany: <ul style="list-style-type: none"> ○ Fibres: Types of fibres, fibre yielding plants ○ Paper: Types of paper, paper yielding plants, paper processing. ○ Spices and condiments: Nutmeg, Mace, Clove, Cardamom and Saffron 		15 Lectures
<u>Unit III : Molecular Biology</u> <ul style="list-style-type: none"> • DNA replication : Replication(prokaryotic and eukaryotic) • Protein Synthesis: <ul style="list-style-type: none"> ○ Central dogma of Protein synthesis ○ Transcription: The transcription process in prokaryotes and eukaryotes, RNA synthesis, RNA processing, Adenylation& Capping. 		15 Lectures

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

SEMESTER III

PRACTICAL

Semester III USBOP3 PRACTICAL Paper I – Plant Diversity II	Cr 1
<p>Algae</p> <ol style="list-style-type: none">1. Study of stages in the life cycle of <i>Dictyota</i> from fresh/ preserved material and permanent slides.2. Study of stages in the life cycle of <i>Sargassum</i> from fresh/ preserved material and permanent slides.3. Economic importance and range of thallus in Phaeophyta <p>Bryophyta</p> <ol style="list-style-type: none">4. Study of stages in the life cycle of <i>Anthoceros</i> from fresh/ preserved material and permanent slides.5. Study of stages in the life cycle of <i>Funaria</i> from fresh/ preserved material and permanent slides. <p>Angiosperms</p> <ol style="list-style-type: none">6. Study of Floral Morphology7- Study of one plant from each family prescribed for theory: morphological9. peculiarities and economic importance of the members of these families.	

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

Semester III USBOP3	Cr
PRACTICAL Paper II – FORM AND FUNCTION- II	1
Instrumentation and Techniques	
1 Preparation of herbarium and wet preservation technique	
2 Chromatography: Separation of amino by circular paper chromatography	
3 Separation of Carotenoids by thin layer chromatography	
4 Horizontal and Vertical Gel Electrophoresis – Demonstration	
Cell Biology	
5 Study of the ultra-structure of cell organelles prescribed for theory from Photomicrographs	
6 Estimation of DNA from plant material (one Std& one Unknown, No Std Graph)	
7 Estimation of RNA from plant material (one Std& one Unknown, No Std Graph)	
Cytogenetics	
8 Study of inheritance pattern with reference to Plastid Inheritance	
9 Aberrations --- karyotypes - Cri – du- chat, Philadelphia, D-G translocation, Down Syndrome.	

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

Semester III USBOP3	Cr
PRACTICAL - Paper III CURRENT TRENDS IN PLANT SCIENCES I	1
Pharmacognosy	
1 A. Tests for alkaloids from <i>Strychnos</i> (seeds) and <i>Holarrhena</i> (bark) B. Tests for glycosides from <i>Glycyrrhiza</i> rhizome/ <i>Aloe</i> leaf/ <i>Senna</i> leaf.	
2 Preparation of any herbal cosmetic.(Demonstration)	
3 Stomatal Index	
4 Palisade Ratio, Vein islet number	
Forestry and Economic Botany	
5 Study of Biodiversity Composition of different types of forests in India (tropical, subtropical & temperate)	
6 Sources, properties and uses of : fibres & paper	
7 Sources , properties and uses of spices and condiments	
Molecular Biology	
8 DNA sequencing- Sanger's method	
9 Determining the sequence of amino acids in the protein molecule synthesised from the given m-RNA strand (prokaryotic and eukaryotic)	

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SEMESTER IV THEORY

Course Code	Title	Credits
USBO401	<u>PLANT DIVERSITY II</u>	2 Credits (45 lectures)
<p><u>Unit II : Thallophyta: Fungi, Plant Pathology and Lichens</u></p> <p><u>Fungi-</u></p> <ul style="list-style-type: none"> • General characters of Ascomycetae • Structure, life cycle and systematic position of <i>Erysiphe and Xylaria</i> <p><u>Plant Pathology-</u></p> <ul style="list-style-type: none"> • Symptoms, causative organism, disease cycle and control measures of <ul style="list-style-type: none"> ○ Powdery mildew and ○ Late blight of potato <p><u>Lichens-</u></p> <ul style="list-style-type: none"> • Classification, Structure, Method of Reproduction, Economic Importance and Ecological Significance of Lichens. 		15 Lectures
<p><u>Unit II : Pteridophyta and Paleobotany</u></p> <p><u>Pteridophyta-</u></p> <ul style="list-style-type: none"> • Salient features and classification upto orders (with examples of each) of Psilophyta and Lepidophyta (G M Smith's system of classification to be followed), • Structure, life cycle and systematic position of <i>Selaginella</i> <p><u>Paleobotany-</u></p> <ul style="list-style-type: none"> • The geological time scale; • Formation and types of fossils; • Structure and systematic position of form genus <i>Rhynia</i> 		15 Lectures
<p><u>Unit III : Gymnosperms</u></p> <ul style="list-style-type: none"> • Salient features, classification up to orders (with examples of each) and economic importance of Coniferophyta (Chamberlain's system of classification to be followed) • Structure life cycle and systematic position of <i>Pinus</i> • Structure and systematic position of the form genus <i>Cordaites</i> 		15 Lectures

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Course Code	Title	Credits
USBO402	<u>FORM AND FUNCTION II</u>	2 Credits (45 lectures)
<u>Unit I : Anatomy</u> <ul style="list-style-type: none"> • Normal Secondary Growth in Dicotyledonous stem and root. • Secondary growth in Monocot stem – <i>Dracaena</i>. • Mechanical Tissue system <ul style="list-style-type: none"> ○ Tissues providing mechanical strength and support and their disposition ○ I-girders in aerial and underground organs • Conducting tissue system : <ul style="list-style-type: none"> ○ Xylem and its elements, ○ Phloem and its elements ○ Types of Vascular Bundles. 		15 Lectures
<u>Unit II : Plant Physiology and Plant Biochemistry</u> <ul style="list-style-type: none"> • Respiration: Aerobic: Glycolysis, TCA Cycle, ETS & Energetic of respiration; Anaerobic respiration. • Photorespiration • Photoperiodism: Phytochrome Response and Vernalization with reference to flowering in higher plants, Physico-chemical properties of phytochrome, Pr-Pfr interconversion, role of phytochrome in flowering of SDPs and LDPs; • Vernalization mechanisms and applications. 		15 Lectures
<u>Unit III : Ecology and Environmental Botany</u> <ul style="list-style-type: none"> • Biogeochemical Cycles- Carbon, Nitrogen and Water. • Ecological factors: Concept of environmental factors. Soil as an edaphic factor, Soil composition, types of soil, soil formation, soil profile. • Community ecology- Characters of community - Quantitative characters and qualitative characters 		15 Lectures

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Course Code	Title	Credits
USBO403	<u>CURRENT TRENDS IN PLANT SCIENCES I</u>	2 Credits (45 lectures)
<u>Unit I : Horticulture and Gardening</u> <ul style="list-style-type: none"> • Introduction to Horticulture: Branches of Horticulture • Gardening: <ul style="list-style-type: none"> ○ Locations in the garden- edges, hedges, lawn, flower beds, avenue, water garden (with names of two plants for each category). Focal point. • Types of gardens <ul style="list-style-type: none"> ○ Formal and informal gardens, ○ National Park: Sanjay Gandhi National Park. ○ Botanical Garden: Veer Mata Jijabai Udyan (Victoria Garden). 		15 Lectures
<u>Unit II : Biotechnology</u> <ul style="list-style-type: none"> • Introduction to plant tissue culture <ul style="list-style-type: none"> ○ Laboratory organization and techniques in plant tissue culture ○ Totipotency ○ Organogenesis ○ Organ culture – root cultures, meristem cultures, anther and pollen culture, embryo culture. • R-DNA technology- <ul style="list-style-type: none"> ○ Gene cloning ○ Enzymes involved in Gene cloning ○ Vectors used for Gene cloning. 		15 Lectures
<u>Unit III : Biostatistics and Bioinformatics</u> <ul style="list-style-type: none"> • Biostatistics: <ul style="list-style-type: none"> ○ The chi square test. ○ Correlation – Calculation of coefficient of correlation. • Bioinformatics <ul style="list-style-type: none"> ○ Information technology: History and tools of IT, Internet and its uses. ○ Introduction to Bioinformatics- goal, need, scope and limitation ○ Aims of Bioinformatics: Data organization, Tools of Bioinformatics- tools for web search, Data retrieval tools- Entrez, ○ BLAST ○ Bioinformatics programme in India. 		15 Lectures

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SEMESTER IV PRACTICAL

Semester IV USBOTP4 PRACTICAL Paper I – Plant Diversity	Cr 1
Fungi and Plant Pathology <ol style="list-style-type: none">1 Study of stages in the life cycle of <i>Erysiphe</i> from fresh/ preserved material and permanent slides.2 Study of stages in the life cycle of <i>Xylaria</i> from fresh/ preserved material and permanent slides.3 Study of fungal diseases as prescribed for theory.4 Study of Lichens (crustose, foliose, & fruiticose).	
Pteridophyta and Palaeobotany <ol style="list-style-type: none">5-6 Study of stages in the life cycle of <i>Selaginella</i> from fresh/ preserved material and permanent slides.7 Study of form genera <i>Rhynia</i> with the help of permanent slides/ photomicrographs.	
Gymnosperms <ol style="list-style-type: none">8- Study of stages in the life cycle of <i>Pinus</i> from fresh/ preserved material and permanent slides.910 Study of the form genus <i>Cordaites</i> with the help of permanent slide/ photomicrographs.	

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SEMESTER IV USBOT P4	Cr
PRACTICALS Paper II – FORM AND FUNCTION- II	1
Anatomy	
1 Study of normal secondary growth in the stem and root of a Dicotyledonous plant	
2 Study of secondary growth in monocot stem (<i>Dracena</i>).	
3 Types of mechanical tissues, mechanical tissue system in aerial, underground organs.	
4 Study of conducting tissues- Xylem and phloem elements in Gymnosperms and Angiosperms as seen in LS and through maceration technique.	
5 Study of different types of vascular bundles.	
Plant Physiology and Plant Biochemistry	
6 Q_{10} – germinating seeds using Phenol red indicator	
7 NR activity – <i>in-vivo</i>	
8 Estimation of proteins by Lowry’s method (Prepare standard graph).	
Ecology and Environmental Botany	
9 Study of the working of the following Ecological Instruments- Soil thermometer, Soil testing kit, Soil pH, Wind anemometer.	
10 Mechanical analysis of soil by the sieve method & pH of soil.	
11 Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method.	
12 Study of vegetation by the list quadrat method	

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SEMESTER IV USBOP4		Cr
PRACTICALS - Paper III – CURRENT TRENTS IN PLANT SCIENCES		1
Horticulture		
1	Study of five examples of plants for each of the garden locations as prescribed for theory	
2	Preparation of garden plans – formal and informal gardens	
3	Bottle and dish garden preparation.	
Biotechnology		
4	Various sterilization techniques	
5	Preparation of Stock solutions, Preparation of MS medium.	
6	Seed sterilization, callus induction	
7	Regeneration of plantlet from callus	
8	Identification of the cloning vectors – pBR322, pUC 18, Ti plasmid.	
Biostatistics and Bioinformatics		
9	Chi square test	
10	Calculation of coefficient of correlation	
11	Web Search – Google, Entrez.	
12	BLAST	



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SEMESTER - III, , S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER (PROPOSED)

TIME - 2 hours 15 min

PAPER – I

Total Marks – 50

- Q.1. Identify, Classify and describe specimen 'A' . Sketch neat and labeled diagram. (10)
- Q.2. Identify, Classify and describe specimen 'B' . Sketch neat and labeled diagram. (10)
- Q.3. Assign the specimen 'C' to its family giving reasons. Give the distinguishing characters, floral Diagram and floral formula. Sketch the L.S. of flower and T.S. of ovary. (10)
- Q.4. Identify and describe the specimen/ slide/ photograph - 'D', 'E', 'F', 'G' and 'H'. (15)
- Q.5. Journal. (05)

KEY :

- A. – *Dictyota / Sargassum*
B. – *Anthoceros / Funaria*
C. Any Angiospermic Family as per syllabus.
D. Algae – economic importance / range of thallus in Phaeophyta
E. *Anthoceros / Funaria*
F. Calyx / Corolla (any one type)
G. Androecium / Gynoecium (any one type)
H. Economic importance or morphological peculiarity of any one family.
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SEMESTER - III, , S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER (PROPOSED)

TIME - 2 hours 15 min

PAPER – II

Total Marks – 50

- Q.1. To Separate given material 'A' by any appropriate chromatography technique . (10)
- Q.2. To estimate DNA/ RNA from the given sample 'B'. (10)
- Q.3. Make an Idiogram from the given Karyotype 'C'. Identify and enlist the symptoms of the chromosomal abberation. (10)
- Q.4. Identify and describe the specimen/ photograph - 'D' (05), 'E' (05) and 'F' (05 or 03 + 02). (15)
- Q.5. Field Report. (05)

KEY :

- A. – Carotenoids/amino acids
B. Cauliflower
C. Cri-du-chat; Philadelphia; D-G translocation, Down Syndrome
D. Electrophoresis
E. Dry or wet preservation
F. Cell organelles / Plastid inheritance.

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SEMESTER - III, , S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER (PROPOSED)

TIME - 2 hours 15 min

PAPER – III

Total Marks – 50

- Q.1. a). Identify the active constituents present in specimen 'A' by performing suitable chemical tests. (08)
- Q.1. b). Calculate the stomatal index / palisade ratio / vein – islet numbers from the given specimen 'B'. (07)
- Q.2. Describe the ecological factors, enlist the dominant flora and mark the area on the map of a forest type 'C' . (10)
- Q.3. Determine the sequence of bases in a DNA strand by Sanger's method from the given data 'D' or Determine the sequence of amino acids in the polypeptide synthesized from the given m-RNA strand 'D' (08)
- Q.4. Identify and describe the specimen/ slide/ photograph - 'E', 'F', and 'G'. (12)
- Q.5. Viva - Voce. (05)

KEY :

- A. Alkaloids / Glycosides.
B. Betel leaf / *Vinca* leaf.
E. Importance of _____ in herbal cosmetics.
F. Fibres / Paper.
G. Spices / Condiments.

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SEMESTER - IV, , S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER (PROPOSED)

TIME - 2hours 15 min	PAPER – I	Total Marks – 50
Q.1. Identify, Classify and describe specimen 'A' . Sketch neat and labeled diagram.		(10)
Q.2. Identify, Classify and describe specimen 'B' . Sketch neat and labeled diagram.		(10)
Q.3. Identify, Classify and describe specimen 'C' .Sketch neat and labeled diagram.		(10)
Q.4. Identify and describe the specimen/ slide/ photograph -'D', 'E' and 'F' .		(15)
Q.5. Journal.		(05)

KEY :

A. – *Xylaria / Erysiphe*

B. –*Selaginella – Stem / strobilus*

C. *Pinus – needle / stem / male cone.*

D. Fungal disease – Powdery mildew / any other disease as per syllabus.

E. Lichen.

F. *Rhynia / Cordaites.*

SEMESTER - IV, ,S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER (PROPOSED)

TIME - 2hours 15 min	PAPER – II	Total Marks – 50
Q.1. a). Make a temporary stained preparation of T.S. of specimen 'A' and comment on the secondary growth .		(10)
Q.1. b). Make a temporary stained preparation of T.S. of specimen 'B' and comment on the mechanical tissue system .		
OR		
	Macerate the given material 'B' and describe the conducting tissue seen.	(05)
Q.2.	Perform the Physiological experiment 'C' allotted to you .	(12)
Q.3.	Perform the Ecological experiment 'D' allotted to you .	(12)
Q.4.	Identify and describe the specimen/ slide/ photograph - 'E', and 'F' .	(06)
Q.5.	Viva - Voce.	(05)

KEY :

A. – Dicot stem/ dicot root / monocot stem.

B. –Mechanical Tissue (*Coleus stem, Typha leaf, Maize stem and Maize root /Annona / Magnolia*formaceration).

E. – Vascular bundles / phloem/xXylem.

F. – Ecological Instrument.

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SEMESTER - IV, , S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER (PROPOSED)

TIME - 2hours 15 min

PAPER – III

Total Marks – 50

- Q.1. Prepare a garden plan 'A' . Mention any three garden locations with suitable plants (Botanical names). (10)
- Q.2. Prepare MS medium **OR** Perform seed sterilization technique 'B' . (08)
- Q.3. a). Perform Chi- square test **OR** Coefficient of Correlation using the given data 'C' and analyse the results . (12)
- Q.3.b). Perform the experiment 'D' related to Web search. (06)
- Q.4.a). Identify and describe the specimen/ photograph -'E' (05)
- Q.4.b).** Identify and describe the specimen/ photograph - 'F', 'G' and 'H' . (09)

KEY :

- E. Bottle or dish garden.
- F. Sterilization Technique.
- G. Cloning Vectors.
- H. Bioinformatics.

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

Course Code	SEM III- Title	Credits
USBO302	<u>FORM AND FUNCTION II</u>	2 Credits (45 lectures)
<p><u>Unit II : Cell Biology</u></p> <ul style="list-style-type: none"> • Ultra Structure and functions of the following cell organelles: <ul style="list-style-type: none"> ○ Mitochondrion(membranes, cristae, F1 particles and matrix) ○ Peroxisomes and Glyoxysomes ○ Ribosomes (prokaryotic, eukaryotic and subunits) • Cell Division and its significance <ul style="list-style-type: none"> ○ Cell Cycle, structure of Interphase Nucleus(nuclear envelop, chromatin network, nucleolus and nucleoplasm) ○ Mitosis & Meiosis ○ Differences between Mitosis and Meiosis • Nucleic Acids: Types, structure and functions of DNA and RNA 		15 Lectures
<p><u>Unit III : Cytogenetics</u></p> <ul style="list-style-type: none"> • Variation in Chromosome structure (Chromosomal Aberrations) Definition, Origin, Cytological and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations. • Sex determination, Sex linked, sex influenced and sex limited traits : Sex determination- Chromosomal Methods: heterogametic males and heterogametic females. Sex determination in monoecious and dioecious plants. Genic Balance Theory of sex determination in <i>Drosophila</i>, Lyon's Hypothesis of X chromosome inactivation. Sex linked- eye colour in <i>Drosophila</i>, Haemophilia, colour blindness Sex influenced- baldness in man • Extranuclear Genetics Organelle heredity- <ul style="list-style-type: none"> ○ Chloroplast determines heredity - Plastid transmission in plants, Streptomycin resistance in <i>Chlamydomonas</i>. ○ Male sterility in maize 		15 Lectures
<p><u>Unit III : Molecular Biology</u></p> <ul style="list-style-type: none"> • DNA replication : Modes of Replication, Messelson and Stahl Experiment, DNA replication in prokaryotes and eukaryotes- enzymes involved and molecular mechanism of replication. • Protein Synthesis: <ul style="list-style-type: none"> ○ Central dogma of Protein synthesis ○ Transcription in prokaryotes and eukaryotes: promoter sites, initiation, elongation and termination. ○ RNA processing: Adenylation & Capping. 		15 Lectures

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Course Code	SEM IV-Title	Credits
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Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

USBO402	<u>FORM AND FUNCTION II</u>	2 Credits (45 lectures)
<p><u>Unit I : Anatomy</u></p> <ul style="list-style-type: none"> • Normal Secondary Growth in Dicotyledonous stem and root. • Growth rings, periderm, lenticels, tyloses, heart wood and sap wood. • Mechanical Tissue system <ul style="list-style-type: none"> ○ Tissues providing mechanical strength and support and their disposition ○ I-girders in aerial and underground organs • Types of Vascular Bundles. 		15 Lectures
<p><u>Unit II : Plant Physiology and Plant Biochemistry</u></p> <ul style="list-style-type: none"> • Respiration: Aerobic: Glycolysis, TCA Cycle, ETS & Energetic of respiration; Anaerobic respiration. • Photorespiration • Photoperiodism: Phytochrome Response and Vernalization with reference to flowering in higher plants, Physico-chemical properties of phytochrome, Pr-Pfr interconversion, role of phytochrome in flowering of SDPs and LDPs; • Vernalization mechanisms and applications. 		15 Lectures
<p><u>Unit III : Ecology and Environmental Botany</u></p> <ul style="list-style-type: none"> • Biogeochemical Cycles- Carbon, Nitrogen and Water. • Ecological factors: Concept of environmental factors. Soil as an edaphic factor, Soil composition, types of soil, soil formation, soil profile. • Community ecology- Characters of community - Quantitative characters and qualitative characters 		15 Lectures

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

Semester III USBOP3		Cr
PRACTICAL Paper II – FORM AND FUNCTION- II		1
Cell Biology		
1	Study of the ultra-structure of cell organelles prescribed for theory from Photomicrographs	
2	Estimation of DNA from plant material (one Std & one Unknown, No Std Graph)	
3	Estimation of RNA from plant material (one Std & one Unknown, No Std Graph)	
Cytogenetics		
4	Study of inheritance pattern with reference to Plastid Inheritance	
5	Study of cytological consequences of chromosomal aberrations (Laggards, Chromosomal Bridge, Ring chromosome, Chromosomal ring) from permanent slides or photomicrographs.	
6	Study of mitosis and meiosis from suitable plant material	
Molecular Biology		
7	DNA sequencing- Sanger's method	
8	Determining the sequence of amino acids in the protein molecule synthesised from the given m-RNA strand (prokaryotic and eukaryotic)	

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

SEMESTER IV USBOT P4 PRACTICALS Paper II – FORM AND FUNCTION- II	Cr 1
Anatomy	
1 Study of normal secondary growth in the stem and root of a Dicotyledonous plant	
2 Types of mechanical tissues, mechanical tissue system in aerial, underground organs.	
3 Study of conducting tissues- Xylem and phloem elements in Gymnosperms and Angiosperms as seen in LS and through maceration technique.	
4 Study of different types of vascular bundles.	
5 Growth rings, periderm, lenticels, tyloses, heart wood and sap wood	
Plant Physiology and Plant Biochemistry	
6 Q_{10} - germinating seeds using Phenol red indicator	
7 NR activity – <i>in-vivo</i>	
8 Estimation of proteins by Lowry's method (Prepare standard graph).	
Ecology and Environmental Botany	
9 Study of the working of the following Ecological Instruments- Soil thermometer, Soil testing kit, Soil pH, Wind anemometer.	
10 Mechanical analysis of soil by the sieve method & pH of soil.	
11 Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method.	
12 Study of vegetation by the list quadrat method	

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER SEMESTER - III
TIME - 3 hours PAPER – II Total Marks – 50

Q.1. Make a squash/ smear preparation of specimen 'A'. Draw and comment on your observations and show the slides to examiners. (10)

Q.2. To estimate DNA/ RNA from the given sample 'B'. (10)

Q.3. Determine the sequence of bases in a DNA strand by Sanger's method from the given data 'C'

OR

Determine the sequence of amino acids in the polypeptide synthesized from the given m-RNAstrand 'C' (10)

Q.4. Identify and describe the specimen/ photograph - D, E and F (15)

Q.5. Journal/Field Report. (05)

KEY :

- A. – Mitosis/ Meiosis
- B. Germinating seeds/Onion
- C. DNA seq/AA seq.
- D. Cell organelles
- E. Plastid inheritance
- F. Chromosomal aberrations

Syllabus for the S.Y.B.Sc. Program: B.Sc.Course : BOTANY

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S.Y.B.Sc. BOTANY PRACTICAL SKELETON PAPER SEMESTER - IV
TIME - 2 hours 15 min PAPER – II Total Marks – 50

- Q.1. a). Make a temporary stained preparation of T.S. of specimen 'A' and comment on the secondary growth/ mechanical tissue system/ Macerate the given material 'A' and describe the conducting tissue seen. (10)
- Q.2. Perform the Physiological experiment 'B' allotted to you. (13)
- Q.3. Perform the Ecological experiment 'C' allotted to you. (13)
- Q.4. Identify and describe the specimen/ slide/ photograph - 'D' 'E' and 'F' . (06)
- Q.5. Viva - Voce. (05)

KEY:

A. – Dicot stem/ dicot root / Mechanical Tissue (*Coleus stem, Typha leaf, Maize stem and Maize root /Annona / Magnolia* for maceration).

B. – Q₁₀ - germinating seeds using Phenol red indicator

NR activity – *in-vivo*

Estimation of proteins by Lowry's method

C- Mechanical analysis of soil by the sieve method & pH of soil

Estimation of organic matter of the soil

Study of vegetation by the list quadrat method

D - Vascular bundles

E. – Growth rings, periderm, lenticels, tyloses, heart wood and sap wood

F. – Ecological Instrument

PROPOSED SYBSC SYLLABUS FOR ACADEMIC YEAR 2017-18

Course Code	Title	Credits
USBO303	CURRENT TRENDS IN PLANT SCIENCES I	2 Credits (45 lectures)
<p>Unit1: Pharmacognosy and phytochemistry</p> <ul style="list-style-type: none"> • Introduction to pharmacopoeia • Indian pharmacopoeia, Indian Herbal Pharmacopoeia and Ayurvedic Pharmacopoeia • Study of Monograph from pharmacopoeia • Secondary Metabolites: Sources, properties, uses and adulterants, regional and seasonal variations • Adulterants: <i>Saraca asoca, Polyalthia longifolia Terminalia arjuna, Terminalia tomentosa Bacopa monnieri, Centella asiatica Abrus, Glycyrrhiza Phyllanthus amarus (Bhuiamla)</i> 		15 Lectures
<p>Unit 2: Forestry and Economic Botany</p> <ul style="list-style-type: none"> • Forestry: Outline of types of forest in India • Forestry: Agro-forestry, Urban forestry, organic farming, Silviculture • Economic Botany: • Types of fibers: Jute and cotton, • Current trends in Fiber industries • Spices and condiments: Saffron and cardamom • Commercial market of spices 		15 Lectures
<p>Unit 3: Industry based on plant products</p> <ul style="list-style-type: none"> • Aromatherapy- Introduction, Uses with few examples. Jojoba, lemon, jasmin • Botanical and nutraceuticals -<i>Spirulina, Vanillin, Garcinia indica/ Garcinia cambogia, Chlorella, and Kale.</i> • Enzymes industry: Cellulases, Papain, Bromelain • Biofuels. 		15 Lectures

	Semester III USBOP3	Cr 1
PRACTICAL - Paper III CURRENT TRENDS IN PLANT SCIENCES I		
1	Study of <i>Phyllanthus amarus</i> <i>Saraca asoka</i> <i>Bacopa monieri</i>	
2	Study of biodiversity (Visit to National Park/ Botanical Garden) Sources of : Fibres & Paper Spices & condiments Preparation of herbal cosmetics (Face pack/ De-tanning cream)	
3	Estimation of crude fibre in cereals & their products	
4	Preparation & evaluation of probiotic foods	
5	Evaluation of nutraceutical value of mushroom/ wheat germ	

Course Code	Title	Credits
USBO403	CURRENT TRENDS IN PLANT SCIENCES I	2 Credits (45 lectures)
<p><u>Unit I : Horticulture and Gardening Introduction to Horticulture:</u> Branches of Horticulture <u>Gardening:</u></p> <ul style="list-style-type: none"> • Locations in the garden- edges, hedges, lawn, flower beds, avenue, water garden (with names of two plants for each category). Focal point. • Types of garden <ul style="list-style-type: none"> ○ Formal and informal gardens ○ National Park: Sanjay Gandhi National Park. ○ Botanical Garden: Veer Mata JijabaiUdyan (Victoria Garden). 		15 Lectures
<p><u>Unit II : Biotechnology</u></p> <ul style="list-style-type: none"> • Introduction to plant tissue culture <ul style="list-style-type: none"> ○ Laboratory organization and techniques in plant tissue culture ○ Totipotency ○ Organogenesis ○ Organ culture – root cultures, meristem cultures, anther and pollen culture, embryo culture. • R-DNA technology- <ul style="list-style-type: none"> ○ Gene cloning ○ Enzymes involved in Gene cloning ○ Vectors used for Gene cloning. 		15 Lectures
<p><u>Unit III : Biostatistics and Bioinformatics</u></p> <ul style="list-style-type: none"> • Biostatistics: <ul style="list-style-type: none"> ○ The chi square test. ○ Correlation – Calculation of coefficient of correlation. • Bioinformatics ○ Information technology: History and tools of IT, Internet and its uses. 		15 Lectures

- Introduction to Bioinformatics- goal, need, scope and limitation
- Aims of Bioinformatics: Data organization, Tools of Bioinformatics- tools for web search, Data retrieval tools- Entrez,
- BLAST
- Bioinformatics programme in India.

Semester III USBOP3		Cr 1
PRACTICAL - Paper III CURRENT TRENDS IN PLANT SCIENCES I		
Horticulture		
1	Study of five examples of plants for each of the garden locations as prescribed for theory	
2	Preparation of garden plans – formal and informal gardens	
3	Bottle and dish garden preparation.	
Biotechnology		
4	Various sterilization techniques	
5	Preparation of Stock solutions, Preparation of MS medium.	
6	Seed sterilization, callus induction	
7	Regeneration of plantlet from callus.	
8	Identification of the cloning vectors – pBR322, pUC 18, Ti plasmid.	
Biostatistics and Bioinformatics		
9	Chi square test	
10	Calculation of coefficient of correlation	
11	Web Search – Google, Entrez.	
12	BLAST	