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		**PLANT DIVERSITY II**		
	I	Thallophyta- Algae	2	1
	II	Bryophyta		1
	III	Angiosperms		1
USBO302		**FORM AND FUNCTION II**		
	I	Instrumentation and Techniques	2	1
	II	Cell Biology		1
	III	Cytogenetics		1
USBO303		**CURRENT TRENDS IN PLANT SCIENCES I**		
	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

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SEMESTER IV

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

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SEMESTER III
THEORY

Course Code	Title	Credits
USBO301	PLANT DIVERSITTY II	2 Credits (45 lectures)
Unit I : Thallophyta- Algae • 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 *Dictyota* *Sargassum* • Pigments in Algae.		15 Lectures
Unit II : Bryophyta • General Account of Class Anthocerotae and Musci • Structure, life cycle and systematic position of o *Anthoceros* o *Funaria*		15 Lectures
Unit III : Angiosperms **Morphology of Flowering Plants** • **Flower Morphology :** o Parts of a flower, flower symmetry; o Flower as a modified shoot, o Thalamus, insertion of floral leaves on the thalamus o The accessory whorls : Calyx types and modifications, Corolla – forms; Aestivation, The Perianth; o 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. o 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: o Magnoliaceae o Myrtaceae o Asteraceae o Apocynaceae o Amaranthaceae o Palmae		15 Lectures

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Course Code	Title	Credits
USBO302	**FORM AND FUNCTION II**	**2 Credits (45 lectures)**
Unit I : Instrumentation and Techniques • Microscopy – Principle and working of Light, and electron microscope. • Chromatography- Principles and techniques in paper and thin layer chromatography. • Principles and techniquesof Horizontal and Vertical electrophoresis.		**15 Lectures**
Unit II : Cell Biology • Ultra Structure and functions of the following cell organelles: o Mitochondrion o Peroxisomes o Glyoxysomes o Ribosomes • Cell Division and its significance o Cell Cycle o Mitosis &Meiosis o Differences between Mitosis and Meiosis • Nucleic Acids: Types, structure and functions of o DNA o RNA		**15 Lectures**
Unit III : Cytogenetics • **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- o Chloroplast determines heredity -Plastid transmission in plants, Streptomycin resistance in *Chlamydomonas*. o Mitochondrion determined heredity- petite colonies in yeast		**15 Lectures**

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

Course Code	Title	Credits
USBO303	**CURRENT TRENDS IN PLANT SCIENCES I**	2 Credits (45 lectures)
Unit I : Pharmacognosy and Phytochemistry • Introduction to pharmacopoeia • Study of secondary metabolites (sources, properties and uses) with reference to o Alkaloids, o Glycosides, o Tannins, o Volatile oils and o Gums and resins (example of one plant for each category)		15 Lectures
Unit II : Forestry and Economic Botany • **Types of forests** – classification of forests, different types of forests in India • **Applications of forestry**- Social forestry, Reforestation, Aforestation, Deforestation. • **Economic Botany**: o Fibres: Types of fibres, fibre yielding plants o Paper: Types of paper, paper yielding plants, paper processing. o Spices and condiments: Nutmeg, Mace, Clove, Cardamom and Saffron		15 Lectures
Unit III : Molecular Biology • **DNA replication** : Replication(prokaryotic and eukaryotic) • **Protein Synthesis**: o Central dogma of Protein synthesis o 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
Algae 1. Study of stages in the life cycle of *Dictyota*from fresh/ preserved material and permanent slides. 2. Study of stages in the life cycle of *Sargassum* from fresh/ preserved material and permanent slides. 3. Economic importance and range of thallusinPhaeophyta **Bryophyta** 4. Study of stages in the life cycle of *Anthoceros*from fresh/ preserved material and permanent slides. 5. Study of stages in the life cycle of *Funaria*from fresh/ preserved material and permanent slides. **Angiosperms** 6. Study of Floral Morphology 7- Study of one plant from each family prescribed for theory: morphological 9. 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 PRACTICAL Paper II – FORM AND FUNCTION- II	Cr 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, DownSyndrome.	

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 *Strychnos*(seeds) and*Holarrhena*(bark) B. Tests for glycosides from *Glycyrrhiza*rhizome/ *Aloe* leaf/ Senna 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)	

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

SEMESTER IV
THEORY

Course Code	Title	Credits
USBO401	PLANT DIVERSITY II	2 Credits (45 lectures)
Unit II : Thallophyta: Fungi, Plant Pathology and Lichens **Fungi-** • General characters of Ascomycetae • Structure, life cycle and systematic position of *Erysiphe and Xylaria* **Plant Pathology-** • Symptoms, causative organism, disease cycle and control measures of o Powdery mildew and o Late blight of potato **Lichens-** • Classification, Structure, Method of Reproduction, Economic Importance and Ecological Significance of Lichens.		15 Lectures
Unit II : Pteridophyta and Paleobotany **Pteridophyta-** • 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 *Selaginella* **Paleobotany-** • The geological time scale; • Formation and types of fossils; • Structure and systematic position of form genus *Rhynia*		15 Lectures
Unit III : Gymnosperms • 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 *Pinus* • Structure and systematic position of the form genus *Cordaites*		15 Lectures

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

Course Code	Title	Credits
USBO402	**FORM AND FUNCTION II**	**2 Credits (45 lectures)**

Unit I : Anatomy
• Normal Secondary Growth in Dicotyledonous stem and root.
• Secondary growth in Monocot stem – *Dracaena.*
• Mechanical Tissue system
  o Tissues providing mechanical strength and support and their disposition
  o I-girders in aerial and underground organs
• Conducting tissue system :
  o Xylem and its elements,
  o Phloem and its elements
  o Types of Vascular Bundles.
		15 Lectures

Unit II : Plant Physiology and Plant Biochemistry • **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-Pfrinterconversion, role of phytochrome in flowering of SDPs and LDPs; • **Vernalization** mechanisms and applications.		**15 Lectures**
Unit III : Ecology and Environmental Botany • 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

Course Code	Title	Credits
USBO403	**CURRENT TRENDS IN PLANT SCIENCES I**	2 Credits (45 lectures)
Unit I : Horticulture and Gardening • **Introduction to Horticulture**:Branches of Horticulture • **Gardening:** o Locations in the garden- edges, hedges, lawn, flower beds, avenue, water garden (with names of two plants for eachcategory). Focal point. • **Types of gardens** o Formal and informal gardens, o National Park: Sanjay Gandhi National Park. o Botanical Garden: Veer Mata JijabaiUdyan (Victoria Garden).		15 Lectures
Unit II : Biotechnology • **Introduction to plant tissue culture** o Laboratory organization and techniques in plant tissue culture o Totipotency o Organogenesis o Organ culture – root cultures, meristem cultures, anther and pollen culture, embryo culture. • **R-DNA technology-** o Gene cloning o Enzymes involved in Gene cloning o Vectors used for Gene cloning.		15 Lectures
Unit III : Biostatistics and Bioinformatics • **Biostatistics:** o The chi square test. o Correlation – Calculation of coefficient of correlation. • **Bioinformatics** o Information technology: History and tools of IT, Internet and its uses. o Introduction to Bioinformatics- goal, need, scope and limitation o Aims of Bioinformatics: Data organization, Tools of Bioinformatics- tools for web search, Data retrieval tools- Entrez, o BLAST o 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 1 Study of stages in the life cycle of *Erysiphe*from fresh/ preserved material and permanent slides. 2 Study of stages in the life cycle ofXylaria from fresh/ preserved material and permanent slides. 3 Study of fungal diseases as prescribed for theory. 4 Study ofLichens (crustose, foliose, &fruiticose). **Pteridophyta and Palaeobotany** 5-6 Study of stages in the life cycle of *Selaginella*from fresh/ preserved material and permanent slides. 7 Study of form genera *Rhynia*with the help of permanent slides/ photomicrographs. **Gymnosperms** 8-9 Study of stages in the life cycle of *Pinus*from fresh/ preserved material and permanent slides. 10 Study of the form genus *Cordaites*with the help of permanent slide/ photomicrographs.	

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 Study of secondary growth in monocot stem (*Dracena*). 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 redindicator 7 NR activity – *in-vivo* 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	

	Cr
SEMESTER IV USBOP4	
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

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 Diagramand 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 / Sargasum*

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.

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, DownSyndrome

D. Electrophoresis

E. *Dry* or wet preservation

F. Cell organelles / Plastid inheritance.

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-RNAstrand **'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.

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 bundies / phloem/xXylem.

F. – Ecological Instrument.

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.