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

SEMESTER III

THEORY

Course Code	Title	Credits
USBO301	**PLANT DIVERSITY**	**2 Credits (45 lectures)**
Unit I : Thallophyta (Algae) & Bryophyta • General Characters of Division Phaeophyta: Distribution, Cell structure, range of thallus, Economic Importance. • Structure, life cycle and systematic position of •***Sargassum*** • General Account of Class Anthocerotae and Musci • Structure, life cycle and systematic position of o ***Anthoceros*** o ***Funaria***		**15 Lectures**
Unit II: Angiosperms Systematics: Objectives and Goals of Plant systematic • Plant Nomenclature • Taxonomy in relation to Anatomy Palynology Chemical constituents Embryology Cytology Ecology o 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 Leguminosae o Asterace o Amaranthaceae o Palmae		**15 Lectures**
Unit III :Modern Techniques to Study Plant Diversity Preservation methods :Dry and Wet method • 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**

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 & Bryophyta

1. Study of stages in the life cycle of *Sargassum* from fresh/ preserved material and permanent slides.
2. Economic importance and range of thallus in Phaeophyta
3. Study of stages in the life cycle of *Anthoceros* from fresh/ preserved material and permanent slides.
4. Study of stages in the life cycle of *Funaria* from fresh/ preserved material and permanent slides.

Angiosperms

5. Study of plants for anatomy in relation to taxonomy
6. Study of plants for Phenols and Flavanoids (chemotaxonomy)
7. Study of one plant from each family prescribed for theory: morphological peculiarities and economic importance of the members of these families.

Techniques to study Plant Diversity

8. Preparation of herbarium and wet preservation technique
9. Chromatography: Separation of amino by circular paper chromatography
10. Separation of Carotenoids by thin layer chromatography
11. Horizontal and Vertical Gel Electrophoresis – Demonstration

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

Course Code	Title	Credits
USBO401	**PLANT DIVERSITY**	**2 Credits (45 lectures)**
Unit I : 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 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

SEMESTER IV
PRACTICAL

Semester III USBOP4	Cr
PRACTICAL Paper I – Plant Diversity II	**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 of *Xylaria* 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

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- Study of stages in the life cycle of *Pinus* from fresh/ preserved material and permanent slides.
9- Study of the form genus *Cordaites* with the help of permanent slide/ photomicrographs.

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

Course Code	SEM III- Title	Credits
USBO302	FORM AND FUNCTION II	2 Credits (45 lectures)
Unit II : Cell Biology • Ultra Structure and functions of the following cell organelles: o Mitochondrion(membranes, cristae, F1 particles and matrix) o Peroxisomes and Glyoxysomes o Ribosomes (prokaryotic, eukaryotic and subunits) • Cell Division and its significance o Cell Cycle, structure of Interphase Nucleus(nuclear envelop, chromatin network, nucleolus and nucleoplasm) o Mitosis & Meiosis o Differences between Mitosis and Meiosis • Nucleic Acids: Types, structure and functions of DNA and 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. • **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 Drosophila, Lyon's Hypothesis of X chromosome inactivation. **Sex linked-** eye colour in *Drosophila*, Haemophilia, colour blindness **Sex influenced-** baldness in man • **Extranuclear Genetics** Organelle heredity- o Chloroplast determines heredity - Plastid transmission in plants, Streptomycin resistance in *Chlamydomonas*. o Male sterility in maize		**15 Lectures**
Unit III : Molecular Biology • **DNA replication** : Modes of Replication, Messelson and Stahl Experment, **DNA replication in prokaryotes and eukaryotes**- enzymes involved and molecular mechanism of replication. • **Protein Synthesis**: o Central dogma of Protein synthesis o Transcription in prokaryotes and eukaryotes: promoter sites, initiation, elongation and termination. o RNA processing: Adenylation & Capping.		**15 Lectures**

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

Course Code	SEM IV-Title	Credits

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

USBO402	FORM AND FUNCTION II	2 Credits (45 lectures)
Unit I : Anatomy • Normal Secondary Growth in Dicotyledonous stem and root. • Growth rings, periderm, lenticels, tyloses, heart wood and sap wood. • Mechanical Tissue system o Tissues providing mechanical strength and support and their disposition o I-girders in aerial and underground organs • 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-Pfr interconversion, 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

Semester III USBOP3 PRACTICAL Paper II – FORM AND FUNCTION- II	Cr 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 Q10 – germinating seeds using Phenol red indicator 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	

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

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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. – Q_{10} - germinating seeds using Phenol red indicator
NR activity – *in-vivo*
Estimation of proteins by Lowry's method
Mechanical analysis of soil by the sieve method & pH of soil

C-
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)

Unit1: Pharmacognosy and phytochemistry — **15 Lectures**

- 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: *Saraca asoca, Polyalthia longifolia*
  Terminalia arjuna, Terminalia tomentosa
  Bacopa monnieri, Centella asiatica
  Abrus, Glycyrrhiza
  Phyllanthus amarus (Bhuiamla)

Unit 2: Forestry and Economic Botany — **15 Lectures**

- 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

Unit 3: Industry based on plant products — **15 Lectures**

- Aromatherapy- Introduction, Uses with few examples. Jojoba, lemon, jasmin
- Botanical and nutraceuticals -*Spirulina, Vanillin, Garcinia indica/ Garcinia cambogia, Chlorella,* and *Kale.*
- Enzymes industry: Cellulases, Papain, Bromelain
- Biofuels.

	Semester III USBOP3 **PRACTICAL - Paper III CURRENT TRENDS IN PLANT SCIENCES I**	**Cr 1**
1	Study of *Phyllanthus amarus* *Saraca asoka* *Bacopa monieri*	
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 2 Credits (45 lectures)
USBO403	CURRENT TRENDS IN PLANT SCIENCES I	**15 Lectures**

Unit I : Horticulture and Gardening Introduction to

Horticulture: Branches of Horticulture **Gardening:**

- 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**
  - o Formal and informal gardens
  - o National Park: Sanjay Gandhi National Park.
  - o Botanical Garden: Veer Mata JijabaiUdyan (Victoria Garden).

Unit II : Biotechnology **15 Lectures**

- **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.

Unit III : Biostatistics and Bioinformatics **15 Lectures**

- **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.	

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