UNIVERSITY OF MUMBAI
No. UG/14 of 2018-19

CIRCULAR:-

Attention of the Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office Circular No. UG/95 of 2015-16, dated 5th October, 2015 relating to syllabus of the Bachelor of Science (B.Sc.) degree course.

They are hereby informed that the recommendations made by the Board of Studies in Botany at its meeting held on 9th April, 2018 have been accepted by the Academic Council at its meeting held on 5th May, 2018 **vide** item No. 4.25 and that in accordance therewith, the revised syllabus as per the (CBCS) for the T.Y.B.Sc. in Botany (Sem -V & VI), has been brought into force with effect from the academic year 2018-19, accordingly. (The same is available on the University's website www.mu.ac.in).

(Dr. Dinesh Kamble)
I/c REGISTRAR

MUMBAI – 400 032
14th June, 2018

To

The Principals of the affiliated Colleges & Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C/4.25/05/05/2018

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No. UG/14 -A of 2018 MUMBAI-400 032 14th June, 2018

Copy forwarded with Compliments for information to:-

1) The I/c Dean, Faculty of Science & Technology,
2) The Chairman, Board of Studies in Botany,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Co-Ordinator, University Computerization Centre,

(Dr. Dinesh Kamble)
I/c REGISTRAR

UNIVERSITY OF MUMBAI

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

(Credit Based Semester and Grading System with effect from the academic year 2018–2019)

T.Y.B.Sc. Botany Syllabus
Restructured for Credit Based and Grading System
To be implemented from the Academic year 2018-2019
SEMESTER V

Course Code	UNIT	TOPICS	Credit	L / Weeks
USBO501	PLANT DIVERSITY III			
	I	Microbiology	2.5	1
	II	Algae		1
	III	Fungi		1
	IV	Plant Pathology		1
USBO502	PLANT DIVERSITY IV			
	I	Paleobotany	2.5	1
	II	Angiosperms I		1
	III	Anatomy I		1
	IV	Palynology		1
USBO503	FORM AND FUNCTION III			
	I	Cytology and Molecular biology	2.5	1
	II	Physiology I		1
	III	Environmental Botany		1
	IV	Plant tissue culture		1
USBO504	CURRENT TRENDS IN PLANT SCIENCES II			
	I	Ethnobotany and Mushroom Industry	2.5	1
	II	Biotechnology I		1
	III	Instrumentation		1
	IV	Pharmacognosy and medicinal botany		1
USBOP5	Practicals based on all the four courses in theory		6	16

SEMESTER VI

Course Code	UNIT	TOPICS	Credit	L / Weeks
USBO601	**PLANT DIVERSITY III**			
	I	**Bryophyta**	**2.5**	**1**
	II	**Pteridophyta**		**1**
	III	**Bryophyta and Pteridophyta: Applied aspects**		**1**
	IV	**Gymnosperms**		**1**
USBO602	**PLANT DIVERSITY IV**			
	I	**Angiosperms II**	**2.5**	**1**
	II	**Anatomy II**		**1**
	III	**Embryology**		**1**
	IV	**Biostatistics**		**1**
USBO603	**FORM AND FUNCTION III**			
	I	**Plant Biochemistry**	**2.5**	**1**
	II	**Physiology II**		**1**
	III	**Genetics**		**1**
	IV	**Bioinformatics**		**1**
USBO604	**CURRENT TRENDS IN PLANT SCIENCES II**			
	I	**Plant biotechnology II**	**2.5**	**1**
	II	**Plant Geography**		**1**
	III	**Economic Botany**		**1**
	IV	**Post Harvest Technology**		**1**
USBOP6	**Practicals based on all the four courses in theory**		**6**	**16**

SEMESTER V
THEORY

Course Code	Title	Credits
USBO501	**PLANT DIVERSITY III**	**2.5 Credits (60 lectures)**
Unit I: Microbiology • Types of Microbes • Culturing: Sterilization, media, staining, colony characters • Pure cultures Role of microbes in fermentation: Alcohol and Antibiotics		**(15 lectures)**
Unit II : Algae • Division Rhodophyta Classification and General Characters: 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 *Polysiphonia Batrachospermum* • Classification and General Characters of Xanthophyta: 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 *Vaucheria* • Classification and General Characters of Bacillariophyta: 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 *Pinnularia*		**(15 lectures)**
Unit III : Fungi • Basidiomycetes: Classification and General characters • Life cycle of *Agaricus* • Life cycle of *Puccinia* • Deuteromycetae: Classification and General Characters • Life cycle of *Alternaria*		**(15 lectures)**
Unit IV : Plant Pathology • Study of plant diseases: Causative organism, symptoms, predisposing factors, disease cycle and control measures of the following. ➢ White Rust – *Albugo sp.* ➢ Tikka disease of ground nut: *Cercospora* ➢ Damping off disease: *Pythium* ➢ Citrus canker – *Xanthomonas* sp. ➢ Leaf curl – leaf curl virus • Study of Physical, chemical and biological control methods of plant diseases.		**(15 lectures)**

Course Code	Title	Credits
USBO502	**PLANT DIVERSITY III**	**2.5 Credits (60 lectures)**
Unit I : Paleobotany • *Calamites* – All form genera Stem, leaf, male and female frutification • *Lepidodendron*–All form genera root, stem, bark, leaf, male and female fructification • *Lyginopteris* – All form genera root, stem, leaf, male and female fructification • *Pentoxylon* – All form genera • Contribution of Birbal Sahni, Birbal Sahni Institute of Paleobotany, Lucknow		**(15 lectures)**
Unit II : Angiosperms I • Morphology of flower and fruit • Complete classification of Bentham and Hooker (only for prescribed families), Merits and demerits • Bentham and Hooker's system of classification for flowering plants up to family with respect to the following prescribed families and economic and medicinal importance for members of the families • Capparidaceae • Umbelliferae • Cucurbitaceae • Rubiaceae • Solanaceae • Commelinaceae • Graminae		**(15 lectures)**
Unit III : Anatomy • Anomalous secondary growth in the Stems of *Bignonia*, *Salvadora*, *Achyranthes*, *Aristolochia*, *Dracaena*. Storage roots of Beet, Radish • Root stem transition • Types of Stomata – Anomocytic, Anisocytic, Diacytic, Paracytic, and Graminaceous		**(15 lectures)**
Unit IV : Palynology • Pollen Morphology • Pollen viability – storage • Germination and growth of pollen • Application of Palynology in honey industry, coal and oil exploration, Aerobiology and pollen allergies, forensic science		**(15 lectures)**

Course Code	Title	Credits
USBO503	**FORM AND FUNCTIONS- II**	**2.5 Credits (60 lectures)**
UNIT I : CYTOLOGY AND MOLECULAR BIOLOGY Structure and function of nucleus Structure and function of vacuole Structure and function of giant chromosomes The genetic code: Characteristics of the genetic code Transcription and Translation in Eukaryotes		**(15 lectures)**
UNIT II: PHYSIOLOGY **Water relations:** Potential, osmosis, transpiration, imbibition, Solute transport: Transport of ions across cell membranes, active and passive transport, carriers, channels and pumps. Translocation of solutes: Composition of phloem sap, girdling experiment, pressure flow model, phloem loading and unloading, anatomy of sieve tube elements, mechanisms of sieve tube translocation, Munch's hypothesis.		**(15 lectures)**
UNIT III ENVIRONMENTAL BOTANY **Bioremediation:** Principles, factors responsible and microbial population in bioremediation. **Phytoremediation**: Metals, Organic pollutants **Plant succession**: Hydrosere and Xerosere – Formation of barren space, succession on the land citing different seres leading upto the climax, succession in water, ecesis, poly and monoclimax theories		**(15 lectures)**
UNIT IV PLANT TISSUE CULTURE Aspects of micropropogation with reference to Floriculture: Detailed study of Orchid cultivation Plant cell suspension cultures for the production of secondary metabolites: with special reference to Shikonin production. Somatic embryogenesis and artificial seeds: Protoplast fusion and Somatic hybridization: i) Concept, definition, and various methods of protoplast fusion ii) Applications of somatic hybridization in agriculture		**(15 lectures)**

Course Code	Title	Credits
USBO504	**CURRENT TRENDS IN PLANT SCIENCES I**	**2.5 Credits (60 lectures)**
UNIT I ETHNOBOTANY AND MUSHROOM INDUSTRY **Ethnobotany** - Definition, history, sources of data and methods of study. **Applications of ethnobotany** 1) Ethnomedicines 2) Agriculture 3) Edible plants 4) Famine related plants, 5) Toxic plants and Antidotes. **Traditional medicines** as used by tribal in Maharashtra towards i) Skin ailments: *Rubia cordfolia*, Sandalwood ii) Liver ailments : *Phyllanthus , Andrographis* iii) Wound healing and ageing: *Centella, Typha, Terminalia, Tridax* iv) Fever : *Vitex negundo, Tinospora cordifolia* leaves v) Diabetis: *Momordica charantia, Syzygium cuminii* **Mushroom industry:** i)Detail general account of production of mushrooms with respect to methods of Composting, spawning, casing, harvesting of mushroom. Cultivation of *Pleurotus, Agaricus, Volvariella* Mushroom to be studied in detail. ii)General account of mushrooms: Nutritional value, picking and packaging, economic importance.		**(15 lectures)**
Unit II BIOTECHNOLOGY I • Construction of genomic DNA libraries, Chromosome libraries and c- DNA libraries. • Identification of specific cloned sequences in cDNA libraries and Genomic libraries • Analysis of genes and gene transcripts – Restriction enzyme, analysis of cloned DNA sequences. Hybridization (Southern Hybridization)		**(15 lectures)**
UNIT III INSTRUMENTATION Colorimetry and Spectrophotometry (Visible, UV and IR)- Instrumentation, working, principle and applications. Chromatography: General account of Column chromatography. Principle and bedding material involved in adsorbtion and partition chromatography, ion exchange chromatography, molecular sieve chromatography.		**(15 lectures)**
UNIT IV PHARMACOGNOSY AND MEDICINAL BOTANY Monographs of drugs with reference to biological sources, geographical distribution, common varieties, macro and microscopic characters, chemical constituents, therapeutic uses, adulterants- *Strychnos* seeds, Senna leaves, Clove buds, *Allium sativum, Acorus calamus* and *Curcuma longa*		**(15 lectures)**

SEMESTER V
PRACTICAL

Semester V USBOP5	**Cr**
PRACTICAL Paper I – PLANT DIVERSITY III	**1.5**
Microbiology • Study of aeromicrobiota by petri plate exposed method Fungal culture; Bacterial culture • Determination of Minimum Inhibitory Concentration (MIC) of sucrose against selected micro organism • Study of antimicrobial activity by the disc diffusion method	
Algae Study of stages in the life cycle of the following Algae from fresh / preserved material and permanent slides • *Polysiphonia* • *Batrachospermum* • *Vaucheria* • *Pinnularia*	
Fungi Study of stages in the life cycle of the following Fungi from fresh / preserved material and permanent slides • *Agaricus* • *Puccinia* • *Alternaria*	
Plant Pathology Study of the following fungal diseases: • White rust • Tikka disease in Groundnut • Damping off disease • Citrus canker • Leaf curl	
PRACTICAL Paper II – PLANT DIVERSITY IV	
Paleobotany Study of the following form genera with the help of permanent slides/ photomicrographs. • *Calamites* • *Lepidodendron* • *Lyginopteris* • *Pentoxylon*	

Angiosperms
• Morphology of Flower
• Morphology of fruit
• Study of one plant from each of the following Angiosperm families
  • Capparidaceae
  • Umbelliferae
  • Cucurbitaceae
  • Rubiaceae
  • Solanaceae
  • Commelinaceae
  • Graminae
  • Morphological peculiarities and economic importance of the members of the above-mentioned Angiosperm families
  • Identifying the genus and species of a plant with the help of Flora	

Anatomy I Study of anomalous secondary growth in the stems of the following plants using double staining technique: • *Bignonia* • *Salvadora* • *Achyranthes* • *Aristolochia* • *Dracaena* Study of anomalous secondary growth in the roots of • Beet • Radish Types of Stomata • Anomocytic • Anisocytic • Diacytic • Paracytic • Graminaceous	
Palynology Study of pollen morphology (NPC Analysis) of the following by Chitale's Method • *Hibiscus* • *Datura* • *Ocimum* • *Crinum* • *Pancratium* • *Canna* Determination of pollen viability Pollen analysis from honey sample – unifloral and multifloral honey Effect of varying concentration of sucrose on *In vitro* Pollen germination	

PRACTICAL - Paper III FORM AND FUNCTION II	
CYTOLOGY AND MOLECULAR BIOLOGY • Mounting of Giant chromosomes from Chironomous larva • Smear preparation from *Tradescantia* buds • Predicting the sequence of amino acids in the polypeptide chain that will be formed following translation (Eukaryotic)	
PHYSIOLOGY • Estimation of Phosphate phosphorus (Plant acid extract) • Estimation of Iron (Plant acid extract) Note: Preparation of a standard graph and determination of the multiplication factor for Phosphate / Iron estimation using a given standard phosphate / Standard Iron solution should be done in regular practical as this will also be put as a question in practical exam	
ENVIRONMENTAL BOTANY Estimation of the following in given water sample • Dissolved oxygen demand • Biological oxygen demand • Hardness • Salinity and Chlorinity	
MICROPROPOGATION Plant Tissue culture: • Identification – Multiple shoot culture, hairy root culture, somatic embryogenesis • Preparation of stock solutions for preparation of MS medium (Note: Concept of preparation of specified molar solutions should be taught and problems based on preparation of stock solutions for tissue culture media will be given).	
PAPER IV CURRENT TRENDS IN PLANT SCIENCES II	
ETHNOBOTANY AND MUSHROOM INDUSTRY • Study of plants mentioned in theory for Ethnobotany • Mushroom cultivation (To be demonstrated) • Identification of various stages involved in mushroom cultivation – spawn, pin head stage, mature/ harvest stage of *Agaricus, Pleurotus, Volvariella*	
BIOTECHNOLOGY I • Growth curve of E. coli • Plasmid DNA isolation and Separation of DNA using AGE • Restriction mapping (problems), Southern blotting	
INSTRUMENTATION • Demonstration of Beer Lambert's Law • Experiment based on ion exchange chromatography for demonstration • Experiment based on separation of dyes/ plant pigments using silica gel column.	
UNIT IV PHARMACOGNOSY Macroscopic/ Microscopic characters and Chemical tests for active constituents of the following plants • *Allium sativum*	

• *Acorus calamus* • *Curcuma longa* • *Senna angustifolia* • *Strychnos nux-vomica* • *Eugenia caryophyllata*	

SEMESTER VI

Course Code	Title	Credits
USBO601	**PLANT DIVERSITY III**	**2.5 Credits (60 lectures)**
Unit I : Bryophyta • Life cycle of *Marchantia* • Life cycle of *Pelia* • Life cycle of *Sphagnum*		**(15 lectures)**
Unit II : Pteridophyta • Lepidophyta – Classification, general characters; Life cycle of *Lycopodium* • Calamophyta – Classification, general characters; Life cycle of *Equisetum* • Pterophyta – Classification and general characters, Life cycle of *Adiantum* and *Marselia*		**(15 lectures)**
Unit III : Bryophytes and Pteridophytes: Applied aspects • Ecology of Bryophytes • Economic importance of Bryophytes • Bryophytes as indicators • Evolution of Sporophyte and Gametophyte • Economic importance of Pteridophytes • Diversity and distribution of Indian Pteridophytes • Types of sori and evolution of sori		**(15 lectures)**
Unit IV : Gymnosperms • Life cycle of *Biota (Thuja*), Classification • Life cycle of *Gnetum*, Classification • Life cycle of *Ephedra*, Classification • Economic importance of Gymnosperms		**(15 lectures)**

Course Code	Title	Credits
USBO602	**PLANT DIVERSITY IV**	**2.5 Credits (60 lectures)**
Unit I : Angiosperms II • Major Botanic gardens of India – Indian Botanic Garden, Howrah; National Botanic Garden (NBRI) Lucknow; Lloyd Botanic Garden, Darjeeling; Lalbaugh or Mysore State Botanic Garden Banglore • Botanical survey of India and regional branches of India • Study of following plant families ➢ Rhamnaceae ➢ Combretaceae ➢ Asclepiadaceae ➢ Labiatae ➢ Euphorbiaceae ➢ Cannaceae • Hutchinson's classification – merits and demerits		**(15 lectures)**
Unit II : Anatomy II Ecological anatomy • Hydrophytes – submerged, floating, rooted • Hygrophytes - *Typha* • Mesophytes • Sciophytes • Halophytes • Epiphytes • Xerophytes		**(15 lectures)**
Unit III : Embryology • Microsporogenesis • Megasporogenesis - Development of monosporic type, examples of all embryo sacs • Types of ovules • Double fertilization • Development of embryo – *Capsella*		**(15 lectures)**
Unit IV : Biostatistics • Test of significance student's *t*-test (paired and unpaired) • Regression • ANOVA (one way)		**(15 lectures)**

Course Code	Title	Credits
USBO603	**FORM AND FUNCTION III**	**2.5 Credits (60 lectures)**
UNIT I PLANT BIOCHEMISTRY • Structure of biomolecules: Carbohydrates (sugars, starch, cellulose, pectin, lipids (fatty acids and glycerol), proteins (amino acids) • Enzymes: Nomenclature, classification, mode of action, Enzyme kinetics, Michaelis Menten equation, competitive non-competitive, and uncompetitive inhibitors.		**15 Lectures**
UNIT II PLANT PHYSIOLOGY II • NITROGEN METABOLISM: Nitrogen cycle, root nodule formation, and leg haemoglobin, nitrogenase activity, assimilation of nitrates, (NR, NiR activity), assimilation of ammonia, (amination and transamination reactions), nitrogen assimilation and carbohydrate utilisation. • Physiological effects and commercial applications of Auxins, Gibberillins, Cytokinins and Abscisic acid		**15 Lectures**
UNIT III : GENETICS • Genetic mapping in eukaryotes: discovery of genetic linkage, gene recombination, construction of genetic maps, three-point crosses and mapping chromosomes, problems based on the same • Gene mutations: definition, types of mutations, causes of mutations, induced mutations, the Ame's test • Metabolic disorders – enzymatic and non-enzymatic: Gene control of enzyme structure Garrod's hypothesis of inborn errors of metabolism, Phenyl ketone urea, albinism, sickle cell anaemia		**15 Lectures**
UNIT IV: BIOINFORMATICS • Organization of biological data, databases • Exploration of data bases, retrieval of desired data, BLAST. • Protein structure analysis and application • Multiple sequence analysis and phylogenetic analysis		**15 Lectures**

Course Code	Title	Credits
USBO604	**CURRENT TRENDS IN PLANT SCIENCES II**	**2.5 Credits (60 lectures)**
Unit I PLANT BIOTECHNOLOGY II • DNA sequence analysis – Maxam – Gilbert Method and Sanger's method • Polymerase Chain reaction • DNA barcoding: Basic features, nuclear genome sequence, chloroplast genome sequence, *rbc*L gene sequence, *mat*K gene sequence, present status of barcoding in plants		**15 Lectures**
Unit II: Plant Geography **Phytogeographical regions of India**. **Biodiversity**: • Definition, diversity of flora found in various forest types of India • Evolution of biodiversity with one example of an evolutionary tree • Levels of biodiversity • Importance and status of biodiversity • Loss of biodiversity • Conservation of biodiversity • Genetic diversity- Molecular characteristics		**15 Lectures**
Unit III: Economic Botany • **Essential Oils:** Extraction, perfumes, perfume oils, oil of rose, sandalwood, patchouli, champaca, grass oils: *Citronella*, vetiver. • **Fatty oils:** Drying oil (linseed and soyabean oil), semidrying oils (cotton seed, sesame oil) and non-drying oils (olive oil and peanut oil), • **Vegetable Fats**: Coconut and Palm oil		**15 Lectures**
Unit IV : Post Harvest Technology • **Storage of Plant Produce- Preservation of Fruits and Vegetables** • Drying (Dehydration)- (Natural conditions – Sun drying; Artificial drying- hot air drying, Vacuum drying, Osmotically dried fruits, Crystallized or Candied fruits, Fruit Leather, Freeze Drying) • Freezing (Cold air blast system, Liquid immersion method, Plate freezers, Cryogenic Freezing, Dehydrofreezing, Freeze drying), • Canning • Pickling (in brine, in vinegar, Indian pickles) • Sugar Concentrates (Jams, Jellies, Fruit juices) • Food preservatives • **Use of antioxidants in preservation**		**15 Lectures**

SEMESTER VI
PRACTICAL

Semester VI USBOP	**Cr**
PRACTICAL PAPER I – PLANT DIVERSITY III	**1.5**
Bryophyta Study of stages in the life cycle of the following Bryophyta from fresh / preserved material and permanent slides • *Marchantia* • *Pelia* • *Sphagnum*	
Pteridophyta Study of stages in the life cycles of the following Pteridophytes from fresh / preserved material and permanent slides • *Lycopodium* • *Equisetum* • *Adiantum* • *Marselia*	
Bryophytes and Pteridophytes: Applied aspects • Economic importance of Byrophyta • Economic importance of Pteridophyta • Types of sporophytes in Bryophyta (from Permanent slides) • Types of sori and soral arrangement in Pteridophytes	
Gymnosperms Study of stages in the life cycles of the following Gymnosperms from fresh / preserved material and permanent slides • *Thuja/ Biota* • *Gnetum* • *Ephedra* Economic importance of Gymnosperms	
PRACTICAL PAPER II – PLANT DIVERSITY IV	**1.5**
Angiosperms Study of one plant from each of the following Angiosperm families • Rhamnaceae • Combretaceae • Asclepiadaceae • Labiatae • Euphorbiaceae • Cannaceae Morphological peculiarities and economic importance of the members of the above-mentioned Angiosperm families Identify the genus and species with the help of flora	

Anatomy Study of Ecological Anatomy of • Hydrophytes: *Hydrilla* stem, *Nymphaea* petiole, *Eichhornia* offset • Epiphytes: Orchid • Sciophytes: *Peperomia* leaf • Xerophytes: *Nerium* leaf, *Opuntia* phylloclade • Halophytes: *Avicennia* leaf and pneumatophore, *Sesuvium* / *Sueda* leaf • Mesophytes: *Vinca* leaf	
Embryology • Study of various stages of Microsporogenesis, Megasporogenesis and Embryo Development with the help of permanent slides / photomicrographs • Mounting of Monocot (Maize) and Dicot (Castor and Gram) embryo • *In vivo* growth of pollen tube in *Portulaca/Vinca*	
Biostatistics • *t*-test (paired and unpaired) • Problems based on regression analysis • ANOVA	
PRACTICAL PAPER III – Form and function III	**1.5**
PLANT BIOCHEMISTRY • Estimation of proteins by Biuret method • Effect of temperature on the activity of amylase • Effect of pH on the activity of amylase • Effect of substrate variation on the activity of amylase	
PLANT PHYSIOLOGY • Determination of alpha-amino nitrogen • Effect of GA on seed germination • Estimation of reducing sugars by DNSA method	
GENETICS • Problems based on three-point crosses, construction of chromosome maps • Identification of types of mutations from given DNA sequences • Study of mitosis using pre-treated root tips of *Allium*	
BIOINFORMATICS • BLAST: nBLAST, pBLAST • Multiple sequence alignment • Phylogenetic analysis • RASMOL/ SPDBV	

PRACTICAL PAPER IV **CURRENT TRENDS IN PLANT SCIENCES**	**1.5**
PLANT BIOTECHNOLOGY II • DNA sequencing (Sanger's Method) • DNA barcoding of plant material by using suitable data	
Plant Geography • Study of phytogeographic regions of India • Preparation of vegetation map using Garmin's GPS Instrument • Problems based on Simpson's diversity Index	
Economic Botany • Demonstration: Extraction of essential oil using Clevenger • Thin layer chromatography of essential oil of patchouli and *Citronella* • Saponification value of palm oil	
Post-Harvest Technology Preparation of • Squash • Jam • Jelly • Pickle	

Scheme of Examinations:

Students offering Double major will study Paper II and III.

Theory Course:	**Term end Assessment**	100 Marks
Practical Course		50 marks

Note:

1. A minimum of four field excursions (with at least one beyond the limits of Mumbai) for habitat studies are compulsory. Field work of not less than eight hours duration is equivalent to one period per week for a batch of fifteen students.

2. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal of TYBSc Botany and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of TYBSc Botany as per the minimum requirements. In case of loss of journal, a candidate must produce a certificate from the Head of the Department/ Institute that the practical for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER V
PLANT DIVERSITY III
PRACTICAL I

Duration: 3 hours **Max. Marks : 50**

Q. 1 Perform the given Microbiological experiment '**A'**. **12M**

Q. 2 Identify, classify and describe specimen **B, C** and **D**. Sketch neat and labeled diagrams of morphological/microscopical structures seen in the specimens. **24M**

Q. 3 Identify and describe slides/ specimens **E**, **F** and **G**. **09M**

Q. 4 Journal. **05M**

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Key-

A- Any one experiment out of four as prescribed in syllabus

B & C- Algae

D- Fungi

E, F & G – (Plant Pathology, Algae or Fungi not asked above) in random order

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER V
PLANT DIVERSITY IV
PRACTICAL II

Duration: 3 hours **Max. Marks: 50**

Q. 1 A. Classify specimen '**A'** up to their families giving reasons. Give floral formula. Sketch and labelled L.S. of flower and T.S. ovary. **10M**

Q. 1.B. Identify genus and species of specimen '**B'** using flora. **05M**

Q. 2 Make a temporary double stained preparation of T.S. specimen '**C'** and comment on the type of secondary growth. **08M**

Q. 3 Perform the Palynology experiment **'D'** allotted to you. **07M**

Q. 4 Identify and describe slide/ specimen '**E', 'F', 'G' &'H'**. **12M**

Q. 5 Field report **03M**
Q. 6 Viva voce (based on Paper I and Paper II). **05M**

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A – Families of T.Y.B.Sc only
B – Plants from F.Y & S.Y. B. Sc Families to be included
C- Anatomy- Anomalous Secondary Growth
D- As per slip
E, F, G & H
Fossils, Types of Stomata, Morphology of flower & Fruits – in random order

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER V
FORM AND FUNCTION III
PRACTICAL III

Duration: 3 hours **Max. Marks : 50**

Q. 1 Make a smear preparation of material **'A'** and show the slide to the Examiner. Comment on your observation/ Expose the giant Chromosomes from the salivary glands of Chironomous larva. **08**

Q. 2 Perform the experiment **'B'** allotted to you (physiology). **12**

Q. 3 Perform the experiment **'C'** allotted to you (ecology). **12**

Q. 4. Calculate the _____ of the given solution **'D'** to prepare the required solution. **07**

Q. 5. Identify and describe slide/specimen **'E'** & **'F'** **06**

Q.6. Journal **05**

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B: Physiology experiment

C: Ecology experiment

D: Plant tissue culture

E & F: Multiple shoot culture, hairy root culture, somatic embryogenesis, amino acid sequencing.

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER V
CURRENT TRENDS IN PLANT SCIENCE II
PRACTICAL IV

Duration: 3 hours **Max. Marks: 50**

Q. 1. Perform the experiment A – growth curve of *E-coli*/ Isolate plasmid DNA and separate using AGE. **12**

Q. 2. Perform the experiment **'B'** allotted to you. **10**

Q. 3. Describe macroscopical/microscopical character with the help of neat and labelled sketches of specimens **'C'** and **'D'**. Perform the chemical test/ TLC to identify the active constituents **14**

Q. 4 Identify and explain the specimens/ photographs **'E'**, **'F' and 'G'.** **09**
Q. 5. Journal **05**

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Key-
B – experiment based on Beer- Lambert's Law
Experiment on separation of dyes/pigments using silica gel column chromatography
C & **D**- *Allium sativum*
Acorus calamus
Curcuma longa
Senna angustifolia
Strychnos nux-vomica
Eugenia caryophyllata
E, **F** & **G** - any stage of mushroom cultivation, any Plant from ethnobotany, problems on restriction mapping

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER VI
PLANT DIVERSITY III
PRACTICAL I

Duration: 3 hours **Max. Marks : 50**

Q. 1 Identify, classify and describe specimen **A** and **B**. Sketch neat and labelled diagrams of morphological/microscopical structures seen in the specimens. **10M**

Q. 2. Identify, classify and describe specimen **C** and **D**. Sketch neat and labeled diagrams of morphological/microscopical structures seen in the specimens. **10M**

Q.3 Identify, classify and describe specimen '**E**'. Sketch neat and labeled diagrams of morphological/microscopical structures seen in the specimens. **07M**

Q. 4. Identify and describe slides/specimen **'F'**, **'G' 'H', 'I' & 'J'.** **15M**
Q. 5. Journal. **05M**
Q. 6. Field report **03M**

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A & B- *Marchantia, Pellia & Sphagnum*
C & D- *Lycopodium, Equisetum, Adiantum* & *Marsilea*
E-Gymnosperm- *Thuja, Gnetum & Ephedra*
F, G & H , **I & J**- [In random order]
Economic importance of Bryophytes
Economic importance of Pteridophytes
Types of sporophytes in Bryophyta
Types of Sori in Pteridophytes
Soral arrangement in Pteridophytes
Economic importance of Gymnosperms

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER VI
PLANT DIVERSITY IV
PRACTICAL II

Duration: 3 hours **Max. Marks: 50**

Q. 1. From the given data/ material **A** determine test of significance using students t-test/ Regression Analysis/ ANOVA **10M**

Q. 2 A. Classify specimen '**B'** up to their families giving reasons. Give floral formula. Sketch and labelled L.S. of flower and T.S. ovary. **10M**

Q. 2.B. Identify genus and species of specimen '**C'** using flora. **05M**

Q. 3 Make a stained preparation of specimen '**D'** and comment on its ecological anatomy. **08M**

Q. 4 Identify and describe slide/specimen '**E', 'F', 'G'** and '**H'**. **12M**

Q. 5 Viva voce (based on Paper III and paper IV) **05M**

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Key- Paper-II

A- Problem on biostats
B- Families of T.Y.B.Sc only
C-Plants from F.Y., S.Y. & T.Y. B. Sc SEM V Families to be included
D-Ecological anatomy
E, F, G & H [In random order]
, Economic importance of specimen from prescribe families (sem VI only) & Embryology

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER VI
FORM AND FUNCTION III
PRACTICAL III

Duration: 3 hours **Max. Marks : 50**

Q. 1. Perform the experiment **'A'** allotted to you. **10**

Q. 2. Perform the experiment **'B'** allotted to you. **10**

Q.3. Make a squash preparation to show the stage of mitosis from the pre-treated root tips B. **06**

Q. 4. Construct a chromosome map from the given data C/ Identify the type of mutation and comment on them (any two types of mutations) **12**

Q. 5. Perform the given analysis of data D using computer (Bioinformatics). **07**

Q. 5. Journal. **05**

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A: Plant Biochemistry Experiment
B: Plant Physiology Experiment

T.Y.B.Sc. Botany Practical Paper Pattern **Credit System**

UNIVERSITY OF MUMBAI
T.Y.B.Sc. BOTANY SEMESTER VI
CURRENT TRENDS IN PLANT SCIENCE II
PRACTICAL IV

Duration: 3 hours **Max. Marks: 50**

Q. 1. Perform the DNA barcoding of plant material using given data **'A'** **10**

OR

Perform DNA sequencing by Sanger's method of the given sequence **'A'**. **10**

Q. 2. Calculate Simpson's Diversity Index from the given data 'B'. **08**

Q.3. Mark the _____ phytogeographic region **'C'** in the map of India and Comment on the same. **05**

Q. 3 Perform the experiment **'C'** allotted to you **10**

Q. 4 Prepare the squash/Jam/jelly/pickle from the given material **'D'**. **12**

Q. 5. Viva voce. **05**

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C- TLC of Patchauli or *Citronella* / saponification value

Reference Books

1. A handbook of Ethnobotany by S.K. Jain, V. Mudgal
2. Plants in folk religion and mythology (Contribution to Ethnobotany by S.K.Jain 3rd Rev. Ed.).
3. Introduction to Plant Physiology by Noggle and Fritz, Prentice Hall Publishers (2002)
4. Plant Physiology by Salisbury and Ross CBS Publishers
5. Plant Physiology by Taiz and Zeiger Sinauer Associates Inc. Publishers, 2002
6. Genetics by Russel Peter Adison Wesley Longman Inc. (5th edition)
7. An introduction to Genetic analysis Griffith Freeman and Company (2000)
8. Fundamentals of Biostatics by Rastogi, Ane Books Pvt. Ltd. (2009).
9. College Botany Vol I and II by Gangulee Das and Dutta Central Education enterprises.
10. Cryptogamic Botany Vol I and II by G M Smith, Mcg raw Hill
11. Industrial Microbiology by Cassida, New Age International, New Delhi
12. Industrial Microbiology Mac Millan Publications, New Delhi
13. Physiological Plant Anatomy by Haberlandt, Mac Millan and Company
14. Ayurveda Ahar by P H Kulkarni
15. Pharmacognosy by Kokate, Purohit and Gokhale, Nirali Publications
16. Bioinformatics by Sunder Rajan
17. Instant Notes on Bioinformatics by Westhead (2002), Taylor Francis Publications.
18. Bioinformatics by Ignasimuthu
19. DNA barcoding plants: taxonomy in a new perspective 2010. K Vijayan and C H Tsou, Current Science, 1530 – 1541.
20. Introduction to Biostatistics by P K Banerjee, Chand Publication.
21. Plant Biotechnology by K. Ramawat
22. Practical Biochemistry by David Plummer, McGraw Hill Publ.
23. Economic Botany by A F Hill, TATA McGRAW-HILL Publishing Co. Ltd.
24. Post-Harvest Technology by Verma and Joshi, Indus Publication
25. Embryology of Plants by Bhojwani and Bhatnagar
26. Pollen Morphology and Plant Taxonomy by G. Erdtman, Hafner Publ. Co., N.Y.
27. A text Book of Palynology by K Bhattacharya, New Central Book Agency Pvt. Ltd., London
28. An introduction to Embryology of Angiosperms by P Maheshwari, McGraw Hill Book Co.
29. Plant Systamatics by Gurucharan Singh, Oxford and IBH Publ.
30. Taxonomy of Vascular Plants by Lawrence George, H M, Oxford and IBH Publ.