Savitribai Phule Pune University

(Formerly University of Pune)

Three Year B.Sc. Degree Program in Botany

(Faculty of Science & Technology)

T.Y.B. Sc Botany

Choice Based Credit System Syllabus

To be implemented from Academic Year 2021- 2022

Title of the Course: B. Sc Botany

1. Structure of Course:

Structure B.Sc. Botany syllabus					
Year	Semester	Course Type	Course code	Course Name	Credits
1	1	Compulsory Course	BO 111	Plant life and utilization I	2
			BO 112	Plant morphology and Anatomy	2
			BO 113	Practical based on BO 111 & BO 112	1.5
	2	Compulsory Course	BO 121	Plant life and utilization II	2
			BO 122	Principles of plant science	2
			BO 123	Practical based on BO 121 & BO 122	1.5
2	3	Compulsory Course	BO 231	Taxonomy of Angiosperms and Plant Ecology	2
			BO 232	Plant Physiology	2
			BO 233	Practical based on BO 231 & BO 232	2
	4	Compulsory Course	BO 241	Plant Anatomy and Embryology	2
			BO 242	Plant Biotechnology	2
			BO 243	Practical based on BO 241 & BO 242	2
3	5	Discipline Specific Elective Course	BO 351	**Algae and Fungi**	2
			BO 352	**Archegoniate**	2
			BO 353	**Spermatophyta and Paleobotany**	2
			BO 354	**Plant Ecology**	2
			BO 355	**Cell and Molecular Biology**	2
			BO 356	**Genetics**	2
			BO 357	**Practical based on BO 351 & BO 352**	2
			BO 358	**Practical based on BO 353 & BO 354**	2
			BO 359	**Practical based on BO 355 & BO 356**	2
		Skill Enhancement course	BO 3510	**Medicinal Botany**	2
			BO 3511	**Plant Diversity and Human Health**	2
3	6	Discipline Specific Elective Course	BO 361	**Plant Physiology**	2
			BO 362	**Biochemistry**	2
			BO 363	**Plant Pathology**	2
			BO 364	**Evolution and Population genetics**	2
			BO 365	**Advanced Plant Biotechnology**	2
			BO 366	**Plant Breeding and Seed Technology**	2
			BO 367	**Practical based on BO 361 & BO 362**	2

			BO 368	**Practical based on BO 363 & BO 364**	2
			BO 369	**Practical based on BO 365 & BO 366**	2
		Skill Enhancement course	BO 3610	**Nursery and Gardening Management**	2
			BO 3611	**Biofertilizers**	2

2. Equivalence of Previous Syllabus:

Old Course (2015 Pattern)	**New Course (2020 CBCS Pattern)**
Semester V	**Semester V**
BO. 331 Cryptogamic Botany	BO 351 Algae and Fungi
BO. 332 Cell and Molecular Biology	BO 352 Archegoniate
BO. 333 Genetics and Evolution	BO 353 Spermatophyta and Paleobotany
BO. 334 Spermatophyta and Palaeoboatny	BO 354 Plant Ecology
BO. 335 Horticulture and Floriculture	BO 355 Cell and Molecular Biology
BO. 336 Computational Botany	BO 356 Genetics
--	BO 3510 Medicinal Botany
--	BO 3511 Plant Diversity and Human Health
Semester VI	**Semester VI**
BO.341 Plant Physiology and Biochemistry	BO 361 Plant Physiology and Metabolism
BO.342 Plant Ecology and Biodiversity	BO 362 Biochemistry
BO.34 Plant Pathology	BO 363 Plant Pathology
BO.344 Medicinal and Economic Botany	BO 364 Evolution and population genetics
BO.345 Plant Biotechnology	BO 365 Advanced Plant Biotechnology
BO.346 Plant Breeding and Seed Technology	BO 366 Plant Breeding and Seed Technology
--	BO 3610 Nursery and Gardening Management
--	BO 3611 Biofertilizers

7. Sharma, O.P.-Fungi Economic importance of fungi

8. Alexopoulus C. J , Mims C.W. and Blacwel M.I 1996. Introductory Mycology. John Wiley and Sons Inc.

T.Y.B.Sc. Botany CBCS Pattern
(Semester V, Paper II) 2020-2021
BO 352: Archegoniate- 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I Bryophytes	**15**
1.	Introduction to Archegoniate	**01**
2.	Introduction, general characters, distribution of Bryophytes to land habit, classification of Bryophytes according to G.M. Smith (1955) up to classes with reasons	**02**
3.	Range of thallus organisation, origin of Bryophytes - Pteridophytes and Algal hypothesis, evolution of sporophyte	**02**
4	Study of Life Cycle of Bryophytes with respect to Taxonomic position, Morphology, Anatomy, Reproduction, Gametophytes and sporophytes of *Marchantia, Anthoceros and Funaria*	**09**
5	Ecological and economic importance of Bryophyte	**01**
	Credit-II Pteridophytes	**15**
6	Introduction, Vascular Cryptogams, General characteristics, Classification according to K.R. Sporne (1975) up to classes with reasons, Diversity and Distribution of Pteridophytes.	**02**
7.	Resemblances of Pteridophytes with Bryophytes, Differences between Pteridophytes and Bryophytes, Origin of Pteridophytes -Algal and Bryophytes, Evolution of Pteridophytes- Telome Theory and Enation Theory.	**03**
8.	Study of Life Cycle of Pteridophytes with respect to Taxonomic position, Morphology, Anatomy, Reproduction, Sporophytes and Gametophytes of *Psilotum, Selaginella* and *Equisetum*	**09**
09	Ecological and Economical Importance of Pteridophytes	**01**

Note:development of sex organs and Sporophytes is not expected.)

Suggested readings:

1. Chopra G.L. and Yadav D.L. A Text book of Bryophytes.
2. Das, Datta and Gangulee-College Botany Vol I
3. Parihar, N.S. An introduction to Embryophyta: Bryophyte-I
4. Puri Prem. Brayophytes, Atmaram and Sons. Delhi.
5. Parihar N.S. 1991. Bryophyta. Central Book Depot, Allahabad.
6. Sporne K.R. 1991. The Morphology of Pteridophytes. B.I Publishing Pvt. LtdBombay.
7. Vashishta B.R. Botany for degree students Bryophytes- Vol-III
8. Vashishta B.R. Botany for degree students Pteridophytes.

T.Y.B.Sc. Botany CBCS Pattern
(Semester V, Paper III) 2020-2021
BO 353: Spermatophyta and Paleobotany - 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I ANGIOSPERMS	**15**
1.	**Origin of angiosperms:** with reference to time, place and ancestry- 1) Pseudanthial theory 2) Transitional-Combinational Theory	**02**
2.	**Speciation & Endemism** Species concept (Biological, Taxonomic & Phylogenetic Species Concept), Speciation (Allopatric, Sympatric & Parapatric), Endemism and its types (Palaeoendemism, Holoendemism and Neoendemism)	**04**
3.	**Classification:** Outline, Merit and Demerits of Cronquist's System and APG IV system of classification. Study of following families with reference to systematic position (As per Bentham & Hooker), Diagnostic characters, floral formula, floral diagram and any five examples with their economic importance – Nymphaeaceae, Oleaceae, Amaranthaceae, Cannaceae	**06**
4	**Herbaria and Botanical Gardens** Functions of Herbarium, Important herbaria (World: Kew herbarium; India: Central National Herbarium, Kolkata). Botanic gardens of the world (Royal Botanic Garden, Kew) and India	**03**
	Credit-II GYMNOSPERMS and PALEOBOTANY	**15**

6	Introduction, general characters, economic importance and classification according to Chamberlain (1934).	**02**
7.	Study of life cycle of Pinus and Gnetum with reference to distribution, morphology, anatomy, reproduction, gametophyte, sporophyte, seed structure and alternation of generations.	**10**
8.	Fossil- Definition, process of fossil formation, types of fossils.-Impression, Compression, Petrifaction, Pith cast and Coal ball.	**03**

Suggested readings:

1. Cronquist, A. 1968. The Evolution and Classification of Flowering Plants. Thomas Nel and Sons, Ltd. London.
2. Lawrence, G.H.M 1951. Taxonomy of Vascular Plants.
3. Singh V. and D.K Jain, 1981 Taxonomy of Angiosperms. Rastogi Publication, Meerut.
4. Swingle D.B. 1946. A Text book of Systematic Botany. Mc Graw Hill Book Co. New York.
5. Takhtajan A. 1969. Flowering Plants; Origin and Disposal.
6. Pande B.P 1997. Taxonomy of Angiosperms. S.Chand.
7. Gurucharan Singh 2005- Plant systematics
8. Naik V.N. - Taxonomy of Angiosperms.
9. Shivrajan V.V. -Introduction to Principles plant taxonomy
10. V. V. Sivarajan, N. K. P. Robson 1991. Introduction to the Principles of Plant Taxonomy IInd Edi.
11. Sharma O.P. Plant Taxonomy Tata McGraw-Hill
12. Botanical Journal of the Linnean Society, 2009, 161, 105–121.
13. http://www.mobot.org/MOBOT/research/APweb/

T.Y.B.Sc. Botany CBCS Pattern
(Semester V, Paper IV) 2020-2021
BO 354: Plant Ecology - 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15**
1.	Introduction, interrelationship between the living world and the environment, levels of organization, components and dynamism of ecosystem, homeostasis, niche concept, concept of limiting factors	**03**
2.	**Biogeography:** Floristic realms, speciation and its types, biogeographic regions of India,Plant indicators	**03**

3.	**Population ecology:**Definition, characteristics, population growth form, r and k selection	**03**
4.	**Community ecology:** Introduction and Definition, community structure, physiognomy, Raunkiaer's life form classification, keystone species, edge and ecotone	**04**
5.	**Biogeochemical cycles:** The carbon cycle, Nitrogen cycle, Phosphorus cycle, and Hydrologic cycle	**02**
	Credit-II	**15**
6.	**Ecological Impact Assessment (EIA)** Introduction, Historical Review of EIA, Objectives of EIA, Stages of EIA process: Screening; Scoping; Baseline study; Impact prediction and assessment; Mitigation; Producing Environmental Impact Statement (EIS); EIS review; Decision making; Monitoring, Compliance and Enforcement; Benefits of EIA.	**05**
7.	**Environmental Audit** Meaning and concept, need, objectives, benefits, types, audit protocol, process, certification, personnel environmental audit	**04**
8.	**Remote Sensing** Definition, basic principles, process of ecological data acquisition and interpretation, global positioning system,application of remote sensing in ecology.	**04**
9.	**Ecological management:** Concepts, sustainable development, sustainability indicators	**2**

References:

1. Current sciences special issue remote sensing for national development Volume 61 numbers 3 and 4 August 1991
2. DaubenmireR.F. 1974. Plants and Environment- A Text Book of Plant Ecology (3rd edition). John Wiley & Sons. New York.
3. E.P. Odum. 1996. Fundamentals of Ecology. Natraj Publishing, Dehradun.
4. G.J. Rau and C.D. Weeten, "Environmental Impact Analysis Hand book, McGraw Hill, 1980.
5. George Joseph Fundamentals of remote sensing (Second edition, 2005) by Universities press (India) Private Ltd., Hyderabad.
6. John R. Jensen (2000)Remote sensing of the environment, Dorling Kindersley India Pvt. Ltd,
7. KendeighS.C. 1980. Ecology with Special Reference to Animals and Man. Prentice Hall of India Pvt. Ltd., New Delhi.
8. KermondyF.J. 1996. Concepts of Ecology.Prentice Hall of India Pvt. Ltd. New Delhi.
9. Kumar H.D. 1996. Modern Concepts of Ecology (3rd edition). Vikas Publishing House Pvt., Ltd. Delhi.

T.Y.B.Sc. Botany CBCS Pattern
Practical (Semester V Paper VIII) 2020-2021
BO 358: Practical based on BO353 and BO354 (2 Credits)

Sr. No.	Title	No. of Practical
1.	Study of following families with reference to systematic position (following Bentham & Hooker), Diagnostic characters, floral formula, floral diagram of Nymphaeaceae, Oleaceae, Amaranthaceae, Cannaceae	**04**
2	Preparation of Botanical keys: Indented and bracketed keys by using vegetative and reproductive characters	**01**
3	Study of internal and external morphology of Gnetum	**01**
4.	Study of internal and external morphology of Pinus	**01**
5.	Study of the following with the help of slides and/ or specimens. i) Impression ii) Compression iii) Petrifaction	**01**
6	Study of polluted water body with ref. to BOD (D zero day and D fifth day).	**02**
7	Study of physicochemical properties of water body by using Sacchi disc, pH meter and electric conductivity meter	**02**
8	Acquisition of ecological data of particular locality by using GPS/ altimeter/geographicloa maps etc	**02**
9	Study of suitable ecosystem by line/belt transect method/ nested quadrate method	**02**

Note: Excursion tours of long and short duration are compulsory

T.Y.B.Sc. Botany CBCS Pattern
Practical (Semester V Paper IX) 2020-2021
BO 359: Practical based on BO355 and BO356 (2 Credits)

Sr. No.	Title	No. of Practical

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15**
1.	**Medicinal Plants**: History, Scope and Importance	**01**
2	**Indigenous Medicinal Sciences**; Definition and Scope	**01**
3.	**Ayurveda**: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments	**04**
4.	**Siddha**: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.	**02**
5	**Unani**: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations.	**02**
6	**Conservation of endangered and endemic medicinal plants:** Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens.	**05**
	Credit-II	**15**
5	**Propagation of Medicinal Plants:** Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.	**05**
6.	**Ethnobotany and Folk medicines**: Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany.	**05**
7.	**Folk medicines** of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	**05**

Suggested Readings

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.

2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.

Skill Enhancement course

T.Y.B.Sc. Botany CBCS Pattern
(Semester V, Paper XI) 2020-2021
BO 3511: Plant Diversity and Human Health - 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15**
1.	**Plant diversity** and its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level,	**03**
2	**Agrobiodiversity** and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.	**05**
3.	**Loss of Biodiversity**: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss,	**04**
4.	Management of Plant Biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations.	**03**
	Credit-II	**15**
5	**Conservation of Biodiversity:** Conservation of genetic diversity, species diversity and ecosystem diversity, In situ and ex situ conservation, Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.	**08**
6.	Role of plants in relation to Human Welfare; a) Importance of forestry their utilization and commercial aspects b) Avenue trees, c) Ornamental plants of India. d) Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.	**07**

Suggested Readings

Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.

T.Y.B.Sc. Botany CBCS Pattern
(Semester VI, Paper I) 2020-2021
BO 361: Plant Physiology and Metabolism - 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15**
1.	**Mineral nutrition**: Classification of mineral elements, macro and micronutrients; Role of essential elements; Transport of ions across cell membrane, Ionophores , Carriers and Channels	**03**
3.	**Photosynthesis**: Mechanism of photosynthesis- Electromagnetic spectrum Ultra-Structure of Chloroplast, Organization of Light-Absorbing Antenna Systems, Light Reaction: (Cyclic and Non-cyclic photophosphorylation), Dark Reaction: Calvin–Benson Cycle, Photorespiration, C4 cycle and CAM pathway of carbon fixation).	**07**
4.	**Respiration:** Types of respiration (Aerobic and anaerobic), Mechanism of aerobic respiration (Glycolysis, TCA cycle, Terminal oxidation and phosphorylation in respiratory chain); Pentose Phosphate Pathway.	**05**
	Credit-II	**15**
5	**Stomatal Biology:** Light-dependent Stomatal Opening, Mediation of Blue-light Photoreception in Guard Cells by Zeaxanthin, Reversal of Blue Light–Stimulated Opening by Green Light, The Resolving Power of Photophysiology (Overview).	**04**
6.	**Translocation in phloem**: Composition of phloem sap, girdling experiment; Pressure flow model.	**03**
7.	**Plant growth regulators**: Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene.	**05**
8	**Photomorphogenesis**: Red and far red light responses on photomorphogenesis; Phytochrome (discovery and mode of action).	**03**

Suggested Readings:

1. Lincoln Taiz, Eduardo Zeiger, Ian Max Moller and Angus Murphy 2015. Plant Physiology and Development (Sixth Edition) Sinauer Associates, Inc Publishers Sunderland, Massachusetts U.S.A.

2. Epstein, E., and Bloom, A. J. (2005) Mineral Nutrition of Plants: Principles and Perspectives, 2nd ed. Sinauer Asso ciates, Sunderland, MA.
3. Salisbury F.B and Ross C.W (1992). Plant physiology (Fourth Edition) Wadsworth Publishing Company, California,USA.
4. V. K. Jain (2017) Fundamentals of Plant Physiology S. Chand Publications.

T.Y.B.Sc. Botany CBCS Pattern
(Semester VI, Paper II) 2020-2021
BO 362: Biochemistry - 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15**
1.	**Foundation of Biochemistry:** From molecules to the first cell (origin of a cell), Miller and Urey experiment. Biomolecules of a cell, functional groups in biomolecules, conformations and configurations of biomolecules.	**03**
2	**Water: The solvent of life:** Physical properties of water, structure of water molecule, polarity of water molecule, weak interactions in aqueous solutions.	**02**
3.	**Amino acids and proteins:** Structure, classification, properties and functions of amino acids. Structure (primary, secondary, tertiary and quaternary), properties and functions of proteins. Biological disorders of amino acid metabolism. Commercial applications.	**05**
4.	**Enzymes:** Definition, nature of enzymes and co-factors, classification and properties of enzymes, active site. Mechanism of enzyme action: free energy, activation energy, binding energy, transition state, lock and key hypothesis, induced fit theory. Factors affecting enzyme activity: pH, temperature, substrate concentration, enzyme concentration. Enzyme inhibition: Competitive, uncompetitive, non-competitive.Reversible and irreversible inhibition, feedback inhibition.	**05**
	Credit-II	**15**
5	Carbohydrates: Definition, classification of carbohydrates- Monosaccharides: aldoses and ketoses, configurations, linear to ring structure; Oligosaccharides: glycosidic bond, reducing and non-reducing sugars; Polysaccharides: homopolysaccharides, heteropolysaccharides,	**08**

	Introduction, Traditional and modern Biotechnology. Impact of Biotechnology on Health care, Agriculture, and Environment	
2	**Plant Tissue Culture:** Concepts of Cell theory & Cellular totipotency, Landmarks in plant tissue culture. Pluripotency, Differentiation, dedifferentiation, redifferentiation, Hormones used in PTC, 'Explant' for plant tissue culture and Response of explants in vitro– callus formation, organogenesis (direct and indirect) and embryogenesis (direct and indirect)**.** Micro propagation of Banana (in detail from Selection of explant to hardening and marketing)	**06**
3.	**Techniques of Genetic Engineering and Methods of gene transfer in Plants-** Introduction to Molecular tools: Definition and role of Nucleases, Polymerases, Ligases, Polynucleotide kinases, Alkaline Phosphatases. Types of vectors- Definition and characters (2-4) of Plasmids, Phages, Cosmids, BAC, YAC, Plant viruses, Animal viruses. Methods of gene transfer in Plants – Direct gene transfer – Definition and concept of Electroporation, Microinjection, and Gene gun Indirect gene transfer- Agrobacterium mediated gene transfer method, Ti-plasmid: structure and functions, T-DNA Gene amplification technique -Polymerase chain reaction DNA finger printing	**07**
	Credit-II	**15**
4	**Cryopreservation and Germplasm Conservation** Definition and concept, techniques of cryopreservation, cold storage, long term and short term storage, applications. **Germplasm Conservation:** Preservation of Cell, tissue, organ, whole organism. Concept of Gene Bank, DNA Bank, Seed Bank, Pollen Bank etc.	**03**
5.	**Biotechnology and Society**	**05**

	Biotechnology- Benefits, GM foods and its safety, Recombinant foods and religious beliefs, Recombinant therapeutic product for human health care. Patenting of biotechnological inventions and Intellectual property rights.	
5.	**Microbial Biotechnology:** Biochemistry of fermentation, Microorganism used in fermentation, fermentable substrate, Ethanol fermentation methods, Distilleries producing alcohols. Commercial production: Alcoholic beverages, organic acids, citric acids. Advantages of fermentation. **Transgenic Plants as Bioreactors:** Metabolic engineering of starch, cyclodextrins, fructans, Bioplastics, Genetically engineered plants as protein factories, Production of therapeutic proteins from plants.	**06**
6	**Nano-biotechnology** Definition and concept, Applications of nanotechnology in agriculture (fertilizers and pesticides).	**01**

Suggested readings:

1. R. C. Dube (2008) - A Text Book of Biotechnology, S. Chand

2. P.K. Gupta-Elements of Biotechnology

3. Satyanarayana-Biotechnology

4. Kalyan Kumar De-Plant tissue culture

5. Pal J.K. and Ghaskadabi S.S. (2008) Fundamentals of Molecular Biology.

6. Verma and Agrawal- Molecular Biology

7. Devi P.2008-Principle and Methods of plant Molecular Biology, Biochemistry and Genetics Agrobios, Jodhpur, India.

8. Glick B.R. and Tompson J.E. 1993 Methods in Plant Molecular Biology and Biotechnology CRC Press Boca Raton, Florida.

9. Hall R.D. (Ed.) 1999 Plant cell culture Protocol human press Inc., New Jersey, USA

10. Kumar H.D. 2002 A Text Book of Biotechnology 2nd Edn. Affiliated Easyt West Press Private Ltd New Delhi.

11. Ramawat K.G. 2003 Plant Biotechnology, S. Chand & Co. Ltd . Ramnagar New Delhi. 110055

12. Trivedi P.C.2000 Plant Biotechnology, Panima Publishing Carpation, New Delhi.

13. Rajdan- Plant tissue culture.

13. Kalyan Kumar De-Plant tissue culture

14. Pal J.K. and Ghaskadabi S.S. (2008) Fundamentals of Molecular Biology.

15. .Razdan M.K. - Introduction to Plant Tissue culture (Oxford & IBH Publ, New Delhi)

T.Y.B.Sc. Botany CBCS Pattern
(Semester VI, Paper VI) 2020-2021
BO 366: Plant Breeding and Seed Technology - 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I –Plant Breeding	**15**
1	**Introduction:** Definition, Scope and objectives and History of Plant breeding in India	**01**
2	**Techniques and practices of plant breeding** **A. Plant Introduction** • Definition • Types (Primary and Secondary) • Procedure • Merits and Demerits • Important Achievements	**02**
	B. Selection methods • Concept, • Types of selections –mass selection, pure line selection and clonal selection. • Advantage and disadvantages of selection • Achievements of selection breeding	**03**
	C. Hybridization • Definition, Concept and Objectives • Precaution to be taken during hybridization • Types: Intervarietal and Distant • General procedure of hybridization • Methods of hybridization: Pdigree and bulk • Hybrid vigour and heterosis	**04**
3	**Advanced techniques in Plant breeding** **A. Mutation breeding**	**03**

	• Definition and concept • Mutagens (Physical and Chemical) • Mutants • Types of mutation (Spontaneous and Induced) • Application of mutation breeding • Limitations of mutation breeding	
	B. Tissue Culture • Definition and concept • Totipotency • Application of tissue, embryo and anther culture in seed production	**02**
	Credit-II - SEED TECHNOLOGY	**15**
4	**Introduction to Seed Technology** • Seed as a basic input in agriculture • Classes of seed 1. Nucleus 2. Breeder 3. Foundation 4. Certified Role of seed technology	**02**
5.	**Seed legislation** • Introduction • Seed legislation in India (Seed Act)	**01**
6	**Seed Production** • Introduction • National Seed Corporation (NSC) and its objectives • State Seed Corporation (SSC) and its objectives • General procedure for Seed Production ○ Location and Season ○ Land requirement ○ Importance of soil and water testing ○ Cultural practices ○ Isolation distance ○ Plant protection ○ Weed Control ○ Rouging ○ Harvesting ○ Threshing ○ Seed Processing	**03**
7	**Seed Certification** • Definition, Objectives and Concept • Phases of Seed Certification • General procedure of seed certification • Field inspection • Duties of seed inspector	**02**
8	**Seed Testing**	**03**

9	Demonstration of Hybridization Techniques (Emasculation, Hand Pollination, Bagging and Tagging) in cotton and tomato.	01
9	Effect of chemical mutagens on seed germination and seedling growth.	01
10	Study of pollen viability and floral morphology of crops	01
11	To test seed moisture by hot air oven method	01
12	To study germination methods (Paper, Sand and Soil)	01
13	Physical purity analysis of seed sample	01
14	Visual examination of dry seeds for disease symptoms	01
15	To study any one common seed insect pest w.r.t to their life cycle, way of infestation/damage, symptoms and control measures.	01
16	Visit to a Plant Breeding Research Centre/ Seed Industry and report submission	01

Note: Submission of minimum 10 seed samples along with their botanical names, family, variety etc. to the department at the time of final practical examination

Skill Enhancement course

T.Y.B.Sc. Botany CBCS Pattern
(Semester VI, Paper X) 2020-2021
BO 3610: Nursery and Gardening Management- 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I Nursery Managment	**15**
1	**Nursery:** definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.	**03**
2	**Seed:** Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion –Seed production technology - seed testing and certification.	**03**
3.	**Vegetative propagation**: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants– greenhouse - mist chamber, shed root, shade house and glass house.	**09**

	Credit-II Gardening Management	**15**
4	Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design -computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.	**08**
5.	Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes,and carrots - Storage and marketing procedures.	**07**

Suggested Readings

1. Bose T.K. & Mukherjee, D., Gardening in India, Oxford & IBH Publishing Co., New Delhi.1972.
2. Sandhu, M.K., Plant Propagation, Wile Eastern Ltd., Bangalore, Madras. 1989.
3. Kumar, N., Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. 1997.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K. Hand Book of Seed Technology, Dept. of Agriculture and Cooperation,National Seed Corporation Ltd., New Delhi. 1993.
6. Janick Jules. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.1979.

T.Y.B.Sc. Botany CBCS Pattern
(Semester VI, Paper X) 2020-2021
BO 3611: Biofertilizers- 2 Credits (30 Lectures)

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15**
1	**Introduction**: 1.1 Introduction, Scope and importance of Biofertilizers 1.2 General account of the microbes used as Biofertilizers	**02**
2	**Bacterial Biofertilizers** 2.1.Isolation of Rhizobium, Identification, Mass multiplication, Carrier based inoculants. 2.2.Azospirillum isolation and mass multiplication, carrier based	**09**

	inoculants and associative effect of different organisms 2.3. Azotobacter, classification and characteristics 2.4. Crop response to Azotobacter inoculums, Mass multiplication of Azotobacter 2.5. Applications of Azospirillum 2.6. Phosphate solubilizing Bacteria	
3.	**Algal Biofertilizers** 3:1. Cyanobacteria (Blue Green Algae): Isolation of Anabaena from Azolla, Mass Multiplication of Anabaena 3.2. Azolla - Anabaena relationship 3.3. Biological Nitrogen fixation 3.4. Blue Green algae in a rice cultivation. 3.5. Applications of BGA	**04**
	Credit-II	**15**
4	**Fungal Biofertilizers** 4.1. Introduction, Occurrence and Distribution of Mycorrhizal association. 4:2. Types of Mycorrhizal association, growth and yield - colonization of VAM - Vesicular Arbuscular Mycorrhiza 4.3. Mycorrhizal applications in agriculture	**09**
5.	**Compost and Manure** 5.1. Organic Farming, green manuring, organic manures and their uses 5.2. Recycling by composting method of biodegradable, municipal, agricultural and industrial wastes 5.3. Biocompost making methods, Types and methods of vermicomposting 5.4. Benefits of vermicompost, field applications	**06**

Suggested readings