Academic Council Meeting No. and Date :8 / September 04, 2023
Agenda Number : 2 Resolution Number : 34, 35 / 2.6, 2.27

Vidya Prasarak Mandal's
B. N. Bandodkar College of Science
(Autonomous), Thane

Syllabus for

Programme Code : BUBO
Programme : Bachelor of

Science Specific Programme :

Botany

(Major/Minor/Generic)

[F. Y.B.Sc. Botany]

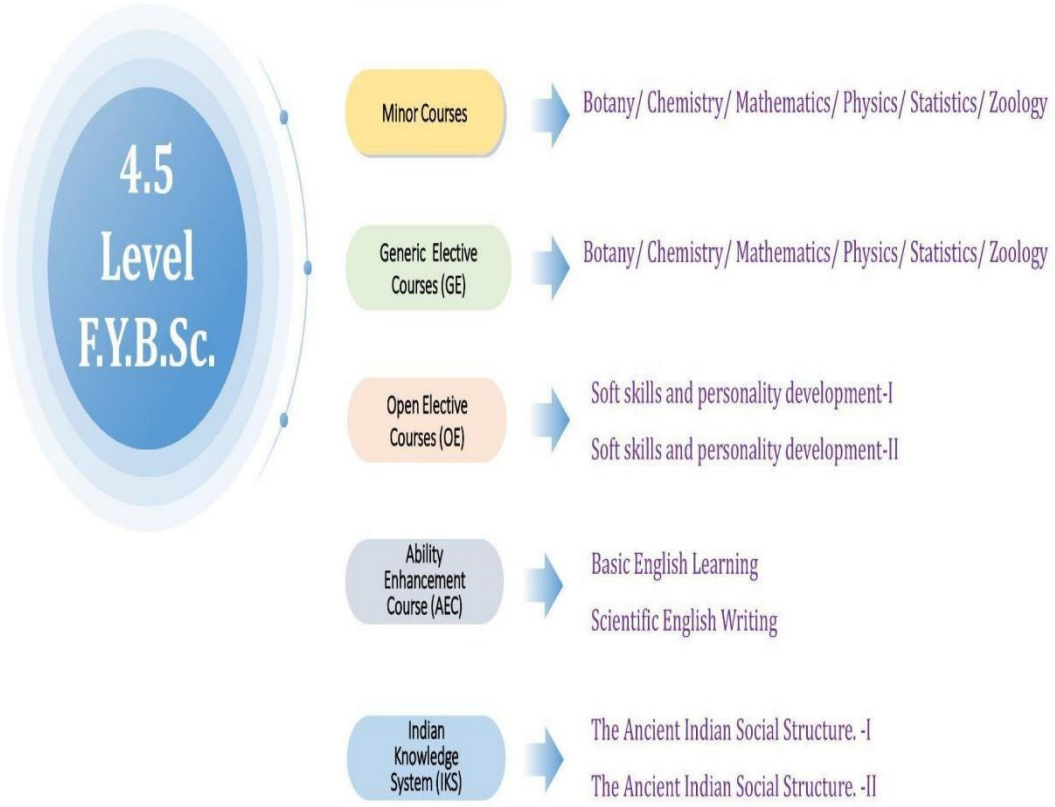
Level 4.5

CHOICE BASED GRADING SYSTEM

Revised under NEP

From academic year 2024 - 2025

Structure of B.Sc. for all Aided Programmes



Preamble

It gives me an immense pleasure to introduce this modified syllabus to the department of Botany to pursue wise and able aspects of the subject to be instilled in the students of semester I and semester II under the quest of National Education Policy (NEP) by the Govt. of India-2020 to our institution B. N. Bandodkar College of Science, Thane (Autonomous) affiliated to the University of Mumbai to be implemented from academic year 2023-24.

It is foresighted to involve experts from all the relevant sectors of the society to design this syllabus with their valued advice and suggestions. The syllabus has been finalized unanimously by prior appointment of the members of Board of Studies in Botany Subject which include the industrial technical advice from Reliable Analytical Laboratory known for practices of most advanced analytical techniques in biological sciences. The process involves meritorious alumni of the institution and a faculty from outside college.

The syllabus has been designed referring to numerous national and international syllabus of the Botany subject; combination of certain topics to retain exact nature of Botany along with preserving the interest of NEP, stringently. The F.Y.B.Sc Botany course is divided into two for semester I and semester II. Each semester will contain a separate syllabus for 'major', 'minor' and 'generic' components and shall be taught accordingly. Major component will quench the demand of high interest on the pupils for pursuing the subject up to higher levels of the program. The learning of various Botanical skills is also incorporated in the generic and elective components.

Although, due to the guidelines of UGC, use of animals is excluded from the practicals, substituting the same with audiovisual instruction, simulations aids and use of ICT to make syllabus more interesting and interactive. Pedagogy will guide our teachers to know content and objectives along with desired outcome of every topic. The syllabus will include a question bank and answer keys for students in addition to the questionnaires, which will be an integral part of the syllabus. It is expected that the teaching process with exciting results of the curriculum will be boosted by further improvements and the enthusiasm of the teachers.

Prof.Dr. V.M.Jamdhade
Chairperson, Bos Botany
VPM's B.N.Bandodkar College
of Science (Autonomous), Thane

PROGRAMME OUTCOMES (POs) OF BACHELOR OF SCIENCE (B.Sc.)

The Undergraduate Programmes of Science are intended to cater quality education and attain holistic development of learners through the following programme outcomes:

PO1 - Disciplinary Knowledge

Lay a strong foundation of conceptual learning in science. Instil ability to apply science in professional, social and personal life.

PO2 - Inculcation of Research Aptitude

Ignite spirit of inquiry, critical thinking, analytical skills and problem-solving approach which will help learners to grasp concepts related to research methodology and execute budding research ideas.

PO3 - Digital Literacy

Enhance ability to access, select and use a variety of relevant information e-resources for curricular, co-curricular and extracurricular learning processes.

PO4 - Sensitization towards Environment

Build a cohesive bond with nature by respecting natural resources, encouraging eco-friendly practices and creating awareness about sustainable development.

PO5 - Individuality and Teamwork

Encourage learners to work independently or in collaboration for achieving effective results through practical experiments, project work and research activities.

PO6 - Social and Ethical Awareness

Foster ethical principles which will help in developing rational thinking and becoming socially aware citizens. Build an attitude of unbiased, truthful actions and avoid unethical behaviour in all aspects of life.

Eligibility: 12th Science Pass

Duration: 3 years (Syllabus for Second Year semester I & II)

Mode of Conduct: Offline lectures/ Online lectures

Discipline/Subject: Botany

Specific Programme: B.Sc. BOTANY

Qualification Title: UG certificate

Discipline/Subject: BOTANY

Program Specific outcomes

1.	To illustrate skills of identification and classification of different plants and gain a comprehensive understanding about their diversity, structure, function, ecology and economic or therapeutic importance.	L1
2.	To apply botanical knowledge and techniques to solve practical problems in areas such as plant identification, cultivation, conservation, and ecosystem management.	L2
3.	To develop laboratory techniques, critical thinking, scientific reasoning, and analytical and entrepreneur skills through practical sessions.	L3
4.	To critically assess plant-related data and research findings to address challenges in agriculture, forestry, pharmaceutical industry and environmental conservation.	L4

5.	To design and conduct experiments in plant sciences, including tissue culture, genetic studies, and ecological surveys, to generate innovative solutions.	L5
6.	To build a strong foundation to pursue higher studies in botany and related disciplines or enter professional fields such as teaching, research, horticulture, environmental management or industry.	L6
Specific Programme: F.Y.B.Sc. (Botany -Major/ Minor)		

Assessment: Weightage for assessments (in percentage) For Major and Minor

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	40%	60%

Curriculum Structure for the Undergraduate degree
Programme F.Y.B.Sc Botany

	SEMESTER – I		
Course Code	**Major Course Title**	**No. of Lectures in hrs**	**Credits**
23BUBO1T01	**Plant Diversity - I**	**30**	**02**
23BUBO1T02	**Forms and Function - I**	**30**	**02**
23BUBO1P01	**Botany Practicals based on23BUBO1T01 and 23BUBO1T02**	**60**	**02**
23BU1SEC01	**Horticulture and Gardening**	**45**	**02**
	Total	**165**	**08**
Course Code	**Minor Course Title**	**No. of Lectures in hrs**	**Credits**
23BUBO1T03	**Plant Diversity - I**	**30**	**02**
23BUBO1T04	**Form and Function - I**	**30**	**02**
23BUBO1P02	**Botany Practicals based on 23BUBO1T03 and 23BUBO1T04**	**60**	**02**
	Total	**120**	**06**
Course Code	**Generic - Course Title**	**No. of Lectures in hrs**	**Credits**
23BUBO1T05	**Thallophyta and Economic Botany**	**30**	**02**
	Total	**30**	**02**

	SEMESTER – II		
Course Code	**Major Course Title**	**No of Lectures in hrs**	**Credits**
23BUBO2T01	**Plant Diversity - II**	**30**	**02**
23BUBO2T02	**Forms and Function - II**	**30**	**02**
23BUBO2P01	**Botany Practicals based on23BUBO2T01 and 23BUBO2T02**	**60**	**02**
23BU2SEC01	**Floriculture (Flower Arrangement)**	**45**	**02**
	Total	**165**	**08**
Course Code	**Minor Course Title**	**No. of Lectures in hrs**	**Credits**
23BUBO2T03	**Plant Diversity - II**	**30**	**02**
23BUBO2T04	**Forms and Function - II**	**30**	**02**
23BUBO2P02	**Botany Practicals based on23BUBO2T03 and 23BUBO2T04**	**60**	**02**
	Total	**120**	**06**
Course Code	**Generic Course Title**	**No. of Lectures in hrs**	**Credits**
23BUBO2T05	**Ayurveda and Medicinal Botany**	**30**	**02**
Total		**30**	**02**

Semester - I

MAJOR COURSE CODE: 23BUBO1T01	(02 Credits)	No of lecture in Hrs. 30
MINOR COURSE CODE: 23BUBO1T03	(02 Credits)	No of lecture in Hrs. 30

Plant Diversity - I

COURSE OUTCOME		
Students will be wanted to learn OR on completion of this course, students will be able to learn:		
CO1	Explain career opportunities in Botany, its importance in industries and government sector also Illustrate the structure, life cycle and systematic position of *Nostoc,Rhizopus.*	L2
CO2	Outline the general characters, scope and economic importance of Algae and Fungi and contributions of research workers.	L2
CO3	Explain the aim, objectives, scope, general characters of Bryophyta and Hepaticopsida and various stages of the life cycle of *Riccia.*	L2
CO4	Elaborate the general characters, scope and economic importance of Bryophytes.	L6

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	0	0	1	0	0
CO 2	0	0	0	1	0	0
CO 3	2	0	0	1	0	0
CO4	0	0	0	1	0	0

Unit	Description	No. of Hours.
I	**Algae-Phycology and Fungi (Mycology)** 1.1 Introduction to Botany Career Opportunities. Importance of Botany in various industries and government sectors. Introduction, objective and Scope and general characters of Algae and Fungi. Mycorrhiza Magic. Algae in Space Missions (foods). 1.2 Structure, life cycle, and systematic position of *Nostoc* and *Rhizopus.* **1.3** Economic importance of algae [*Ulva* (Biofuel), *Spirulina* (Nutraceutical), *Gelidium*(Agar)]. Contributions made by Prof. Mandayam Osuri ParthasarathyIntroduction, objectives, and Importance of Applied Botany. Various Disciplines of Botany and applications to human welfare. Agharkar Research Institute (ARI)-Pune.Father of Mycology E.J. Butler.Mycological Society of India.	**15**

II	**Bryophyta (Bryology)** 1.1 Introduction, objective, and scope and general characters of Bryophyta.General Characters of Hepaticopsida.Seven interesting things about moss 1.2 Structure, life cycle, and systematic position of *Riccia*. 1.3 Economic importance of Bryophytes (*Marchantia*, Riccia, and Peat moss). Moss gardening- Kokedama (moss ball) for hanging plants, use of moss in Hanging Moss Sticks for climbers, use of Moss for Bottle garden.Bird and Bryophytes intersect.	**15**
	Contemporary Issues: Expert lectures, YouTube Videos, Animations, NPTEL, MOOCvideos, and online seminars –webinars for strengthening the subject matters **Pedagogy:** Seminar, Quiz, Debate, collection of and identification and preservationarea bryophytes and report on it. Collection study of fresh and marine Algae availablelocal area. Observation and collection of plant diseases and report on them.	

MAJOR COURSE CODE: 3BUBO1T02	**(02 Credits)**	**No of lecture in Hrs. 30**
MINOR COURSE CODE: 23BUBO1T04	**(02 Credits)**	**No of lecture in Hrs. 30**

Forms and Function - I

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO1	Explain the objective and scope and general characters of plant cell biology, general structure of prokaryotic, eukaryotic cell. .structure and function of a plasma membrane, cell wall.	L2
CO2	Compare the types of plastids, structure and functions of chloroplast and vacuole, Heterotrophs and autotrophs and Leaves Change Color in Autumn. Also explain contribution of research institute.	L5
CO3	Appraise the objective, scope and general characters of plant genetics and biostatistics and also solve the problem based on biostatistics.	L2
CO4	Analyze the pedigree chart and ratios in Mendelian genetics and problems based on it. Also explain the role of plant model organisms-*Arabidopsis* and contribution of scientist.	L4

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO 1	2	0	0	0	0	0
CO 2	0	0	0	1	0	0
CO 3	2	0	0	0	0	0
CO 4	0	0	0	1	0	0

Unit	Description	No. of Hours
I	**Plant Cell Biology** 1.1 Introduction, objective and scope and general characters of plant cell biology. 1.2 The general structure of Prokaryotic and Eukaryotic cells. The general structure of plant cell: Cell wall, Plasma membrane (bilayer lipid structure, fluid mosaic model). 1.3 Types of Plastids: Chromoplasts (Chloroplast) and types of Leucoplast, Ultra-structure and functions of the following cell organelle: Chloroplast, Vacuole. The Centre for Cellular & Molecular Biology (CCMB)-Hyderabad.Heterotrophs and autotrophs.Leaves Change Color in Autumn.	15
II	**Genetics and Biostatistics** 2.1 Introduction, objective and scope and general characters of plant genetics and Biostatistics. 2.2 Phenotype/Genotype, Mendelian Genetics- monohybrid, dihybrid; test cross; back cross ratios, Pedigree chart. Biostatistics: Mean, Median, and Mode, Standard deviation. 2.3 ICAR-NBPGR RS, Akola-Maharashtra. Plant model organism – Introduction to *Arabidopsis.* Contribution of P.C. Mahalanobis Indian statistician. Indian Statistical Institute-Kolkata. Introduction, Definition of plant breeding. Aims and objectives scopes research journal in plant breeding. Introduction to plant genetics and biotechnology for the advancement of agriculture. Bird pollination. **Contemporary Issues:** Expert lectures, YouTube Videos, Animations, NPTEL, MOOC videos, and online seminars– webinars for strengthening the subject matters.	15

MAJOR COURSE CODE: 23BUBO1P01	**(02 Credits)**	**No of lecture in Hrs. 60**
Practical based on 23BUBO1T01and 23BUBO1T02		
MINOR COURSE CODE: 23BUBO1P02	**(02 Credits)**	**No of lecture in Hrs. 60**
Practical based on 23BUBO1T03and 23BUBO1T04		

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO 1	Explain plant forms such as algae, fungi and bryophytes and their economic importance.	L2
CO 2	Demonstrate various stages of life cycle of algae, fungi and bryophytes.	L2

CO 3	Identify prokaryotic cell, eukaryotic cell, different cell organelle and cell inclusions.	L3
CO 4	Solve problems based upon Mendelian Genetics and Biostatistics.	L6

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	0	0	0	0	0
CO 2	1	0	0	0	0	0
CO 3	0	1	0	0	0	0
CO 4	0	2	0	0	0	0

23BUBO1P01	
1.	Study of stages in the life cycle of *Nostoc* & *Spirogyra* from fresh/ preserved material and permanent slides
2.	Economic importance of algae: *Ulva* (Biofuel), *Spirulina* (Nutraceutical), *Gelidium* (Agar)
3.	Study of stages in the life cycle of *Rhizopus* & *Aspergillus* from fresh/ preserved material and permanent slides.
4.	Economic importance of Fungi: Mushroom, Yeast, wood rotting fungi (*Ganoderma*)
5.	Study of stages in the life cycle of *Riccia* from fresh/ preserved material.
6.	Economic importance of Bryophytes: Medicinal (*Marchantia* sp., *Riccia*, and Peat moss.),
23BUBO1P02	
1	Identification of Prokaryotic and Eukaryotic cells with the help of photomicrograph.
2	Identification of plant cell -Cell wall, Plasma membrane (bilayer lipid structure, fluid mosaicmodel) with the help of photomicrograph.
3	Identification of cell organelles with the help of photomicrograph: Plastids: Chromoplasts (Chloroplast), Vacuole and types of Leucoplast.
4	Starch grains of Potato and Rice.
5	Study of Karyotype s: *Aloe Vera, Allium cepa.*
6	Phenotype/Genotype, Mendelian Genetics- monohybrid, dihybrid; test cross; back cross.
7	Calculation of mean, median, and mode.
8	Calculation of standard deviation.
9	Graph preparation using simple data from experiments.

MAJOR COURSE CODE: 23BU1SEC01	(02 Credits)	No of lecture in Hrs. 15

Horticulture and Gardening

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO 1	Explain the objective, scope, importance, branches of horticulture and propagation techniques.	L2
CO 2	Demonstrate different propagation techniques, Potting-repotting, green manure and chemicals.	L2
CO 3	Examine nursery techniques by visiting a nursery.	L4
CO 4	Appraise the importance of different grafting and layering methods, garden tools and elements.	L5

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	0	0	2	0	0
CO 2	0	2	0	2	0	0
CO 3	0	0	0	2	2	0
CO 4	1	0	0	2	0	0

Unit	Description	No. of Hours
I	**Introduction to Horticulture:** Definition, importance and objectives of Horticulture, branches of Horticulture. Important Horticulture Research Institutes in India, Horticulture Consultancy.	05
II	**Propagation of Horticultural plants:** Definition, scope, and importance of plant propagation. By Seeds Advantages and disadvantages, method of seed propagation Production of seeds, Handling, Collection and Storage Sowing, transplanting of seedlings and Hardening Seed treatment to control diseases Seedling diseases and their control. By specialized Vegetative structures: Bulbs, Tubers, Corms, Rhizomes, Rootstock, runners, Offsets and suckers. Hydroponics	05
III	**Layering and grafting:** Layering – Definition, Types: Simple, compound, (Serpentine) Tip, Trench, Mound, Air Layering. Grafting-Definition, advantages, and disadvantages. Types: Splice, Whip/ Tongue, side, veneer, cleft, bark, epicotyls, approach, repair grafting – inarching, bridge and bracing. Stock- Scion relationships and Incompatibility	05

SEC- PRACTICAL	
1	Identification of different chemical fertilizers. Identification of organic manures- farm yard manure, Vermicomposting, cakes, bone meal
2	Preparation of the following Natural insecticides- Neem Arka and Tobacco Extract.
3	Propagation of horticultural crops through cuttings, buddings, grafting, layering, runners and suckers,and seeds.
4	Study garden tools and implements.
5	Study of pots, potting, De-potting, and Repotting.
6	Preparation of potting mixtures and poly-bags.
7	Field visit to the nursery.

	Generic 1	**Credits 02**
Course code 23BUBO1T05:	**Course title - Thallophyta and Economic Botany**	**No of lectures in hrs 30**
COURSE OUTCOME		
Students will be wanted to learn OR on completion of this course, students will be able to learn:		

CO 1	Outline objective, scope and economic importance of algae, fungi, bryophytes and contribution of scientist,ARI-Pune and explain the career opportunities in the private and government sector.	L2
CO 2	Explain the morphological features of *Riccia* and demonstrate Moss in indoor gardening,Green dating.	L2
CO 3	Summarize objectives and scope of economic botany, health hazards of tobacco and Organic vs. GM Crops	L2
CO 4	Categorize spices, beverages, oil, timber, rubber and drug yielding plants on the basis of their morphology and some expensive plants.	L4

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO 1	1	0	0	2	0	0
CO 2	1	0	0	2	0	0
CO 3	2	0	0	2	0	0
CO 4	2	0	0	2	0	0

	Course: Generic – I	
Unit I	**Thallophyta and Economic Botany**	**No. of Lectures**

I	**Thallophyta:** 1.1 Careers in Private Industry and Government Sector. Introduction, objective, and scope of algae, fungi, and Bryophyta. General characters of Algae, Fungi and Bryophyta, 1.1 General structure (Morphology) of *Riccia*, economic importance of Bryophytes (*Marchantia*, Peat moss). Economic importance of algae, fungi (02 examples). 1.2 Moss in indoor gardening- Kokedama (moss ball) for hanging plants, use of moss in hanging baskets, Moss Sticks for climbers, use of Moss for Bottle garden. Contributions made by Prof.Mandayam Osuri Parthasarathy Iyengar.Agharkar Research Institute (ARI)-Pune.Green Dating.	**15**
II	**Economic botany:** 2.1 Introduction, objective and scope of economic botany 2.2 Spices: Morphology and uses with special reference to fennel, clove, coriander, and black pepper Beverages: Tea, Coffee (morphology and uses), Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to *Papaver* and *Cannabis*. 2.3 Oils: Sesame, Castor, linseed, Timber: Sal and teak, Rubber-Rubber, Tobacco: Tobacco (Morphology, uses and health hazards. Some Plants So Expensive?" (E.g., Saffron, Vanilla, Sandalwood,Organic vs. GM Crops	**15**
	Contemporary Issues: Expert lectures, YouTube Videos, Animations, NPTEL, MOOC videos, and online seminars –webinars for strengthening the subject matters.	
	Pedagogy: Seminar, Quiz, Debate, collection of and identification and preservation of local area bryophytes and report on it. Collection study of fresh and marine Algae available in the local area. Observation and collection of plant diseases and report on it.	

Semester - II

MAJOR COURSE CODE: 23BUBO2T01	CREDIT -02	NO OF LECTURES IN HRS. 30
MINOR COURSE CODE: 23BUBO2T03	CREDIT -02	NO OF LECTURES IN HRS. 30

Plant Diversity - II

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO 1	Summarize objective, scope, general characters and economic importance of pteridophytes and gymnosperms.	L2
CO 2	Explain systematic position and life cycle of *Nephrolepis* and *Cycas* .	L2
CO 3	Distinguish the plant families on the basis of morphological characters.	L4
CO 4	Appraise the objective, scope, general characters of plant taxonomy and plants used in butterfly garden.	L5

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	0	0	2	0	0
CO 2	1	0	0	2	0	0
CO 3	1	0	0	2	0	0
CO 4	0	0	0	3	0	0

MAJOR COURSE CODE: 23BUBO2T01	CREDIT -02	NO . OF LECTURES IN HRS. 30
MINOR COURSE CODE :23BUBO2T03	CREDIT -02	NO . OF LECTURES IN HRS. 30

Unit	Description	No. of Hours.
I	**Pteridophytes and Gymnosperms:** 1.1 Introduction, objective and scope, and general characters of Pteridophyta and Gymnosperms. 1.2 Structure life cycle, systematic position, and alternation of generations in *Nephrolepis.*Structure life cycle, systematic position and alternation of generations in Cycas.Economic importance of Gymnosperms - *Pinus* wood, turpentine oil, and seeds. The contribution made by Janaki Ammal.	15

II	**Plant Taxonomy:** 2.1 Introduction, objective and scope and general characters of plant taxonomy.Plant Nomenclature 2.2 Study of the following families: Malvaceae, Apocynaceae, Amaryllidaceae. 2.3 Important plants in butterfly garden : [*Lantana* (Ghaneri), *Hamelia* (Firebush), *Stachytarpheta* ,(Jamaican spike), *Calotropis* (Rui)].Pioneer in plant taxonomy.Religious, Folklore, and ritual plants in Thane district.Smart farming.Phenology.Sacred trees, Wad and Pimpal. Sacred groves of Thane district.Key aspects of Astrobotany.Prof.M V Almeda. **Contemporary Issues:** Expert lectures, YouTube Videos, Animations, NPTEL, MOOCvideos, and online seminars – webinars for strengthening the subject matters. **Pedagogy:** Seminar, quiz, debate, visit to the local area and identify the flora of the College campus and report on it. Herbarium local wild plants.	**15**

MAJOR COURSE CODE: 23BUBO2T02	**(02 CREDITS)**	**No of lectures in hrs. 30**
MINOR COURSE CODE: 23BUBO2T04	**(02 CREDITS)**	**No of lectures in hrs. 30**
Forms and Function - II		
COURSE OUTCOME Students will be wanted to learn OR on completion of this course, students will be able to learn:		
CO 1	Explain objective and scope of plant anatomy, contribution of Dr. Bose and significance of meristematic and sensory tissue	L2
CO 2	Distinguish different plant tissues, their arrangements and functions in organs of dicot and monocot plants.	L4
CO 3	Outline objective, scope and general characters of plant physiology and different physiological mechanisms in plants.	L2
CO 4	Summarize different reactions, cycles and floral pigments involved in photosynthesis and contribution of physiologists.	L2

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping						
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO 1	1	0	0	0	0	0
CO 2	1	0	0	0	0	0
CO 3	1	0	0	0	0	0
CO 4	2	0	0	0	0	0

MAJOR COURSE CODE: 23BUBO2T02	(02 CREDITS)	No of lectures in hrs. 30
MINOR COURSE CODE: 23BUBO2T04	(02 CREDITS)	No of lectures in hrs. 30

Unit	Description	No. of Hours.
I	**Plant Anatomy:** 1.1 Introduction, objective and scope of plant anatomy 1.2 Plant Meristematic tissue - Definition, types based on origin, function, position and plane of cell divisions 1.3 Simple tissues, complex tissues. Primary structure of the Dicot and Monocot root, stem, and leaf.Epidermal tissue system: Unicellular, multicellular, stellate, peltate, T- shaped leaf hair, Monocot, and Dicot stomata. Sensory tissue - concerning insectivorous plants [*Drosera* (Dewdrop), *Dionaea,*(Venus flytrap), *Utricularia* (Bladderwort)] and *Mimosa* (Touch Me Not). Jagdish Chandra Bose, Father of Indian Plant Anatomy.	1566
II	**Plant Physiology:** 2.1 Introduction, objective and scope and general characters of Plant Physiology. 2.2 Photosynthesis: Light reactions, photolysis of water, photo phosphorylation (cyclic and non-cyclic), carbon fixation phase (C3, C4, and CAM pathways). 2.3 Floral pigments: Anthocyanin, Carotenoids. Dr. Prafullachandra Vishnu Sane- Indian molecular biologist and plant physiologist, pioneering studies on photosynthesis. Contemporary Issues: Expert lectures, YouTube Videos, Animations, NPTEL, MOOC videos, and seminars –webinars for strengthening the subject matters. Pedagogy: Seminar, quiz, debate, visit to the local area and identify the Medicinal plants fromCollegeCampus and report on it.	15

MAJOR COURSE CODE: 23BUBO2P01	(02 CREDITS)	No of lecture in Hrs. 60
Practical based on 23BUBO2T01 and 23BUBO2T02		
MINOR COURSE CODE: 23BUBO2P02	**(02 CREDITS)**	**No of lecture in Hrs. 60**
Practical based on 23BUBO2T03 and 23BUBO2T04		

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO 1	Show different structures and stages of the life cycle of Pteridophytes, Gymnosperms and floral parts of Angiosperms.	L1
CO 2	Identify fossil Pteridophytes, economically important Pteridophytes and Gymnosperms and important plants to develop Butterfly garden	L3
CO 3	Demonstrate various epidermal outgrowths, sensory tissues, stomata and internal structure of a dicot and monocot organs.	L2
CO 4	Interpret the results based on experiments of chromatography, colorimetry, change in pH and transpiration rate.	L2

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	0	0	0	0	2	0
CO 2	1	0	0	0	0	0
CO 3	0	0	0	0	2	0
CO 4	0	2	0	0	2	0

Paper I Practicals

1	Study of stages in the life cycle of *Nephrolepis*: Mounting of Ramentum, Hydathodes
2	T.S. of the pinna of *Nephrolepis* passing through sorus.
3	Identification of living fossil Pteridophyta – Horsetails (*Equisetum*)
4	**Ornamental Gardening**: Identification of Ornamental Pteridophytes [*Adiantum* (Maidenhair fern),*Platycerium* (Staghorn fern)*, Asplenium* (Bird's nest fern)]
5	*Cycas*: T.S of the leaflet (*Cycas* pinna)
6	Identification of coralloid root, Megasporophyll & Microsporophyll. Slide preparation of microspores of *Cycas*
7	Identification of photomicrographs of *Pinus* wood and seed. Identification of turpentine oil.
8	Identification of Ornamental Gymnosperm [*Araucaria* (Christmas tree), *Zamia*

	(Cardboard palm), *Thuja* (Morpankhi)]
9	**Study of the following families:** Malvaceae, Apocynaceae, Amaryllidaceae
10	**Important plants in butterfly garden** : [*Lantana* (Ghaneri), *Hamelia* (Firebush), *Stachytarpheta* (Jamaican spike), *Calotropis* (Rui)]
	Paper II Practicals
1	Primary structure of Dicot and Monocot root
2	Primary structure of Dicot and Monocot stem.
3	Study of Dicot and Monocot stomata
4	Epidermal outgrowths: with the help of mountings: As in theory.
5	Study of sensory tissue in *Drosera* (Dewdrop), *Dionaea* (Venus fly-trap), *Utricularia*(Bladder-wort)]and *Mimosa* (Touch me not)
6	Separation of chlorophyll pigments by strip paper chromatography.
7	Study of absorption maxima of chlorophyll and carotenoid pigment by colorimetric method.
8	Change in color because of change in pH: Anthocyanin: black grapes/Purple cabbage.
9	To study the effect of different concentrations of CO2 on the rate of photosynthesis.
10	To study the effect of light intensity (by changing the distance) on the rate of photosynthesis aquatic plants

MAJOR COURSE CODE: 23BU2SEC01	**(02 Credits)**	**No of lecture in Hrs. 15**

Floriculture (Flower arrangement)

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO 1	Explain the principle, scope, elements of designs, equipments, styles for flower arrangement.	L2
CO 2	Identify the flowers and different nursery techniques by visiting nursery.	L3
CO 3	Demonstrate equipments, material, different styles of flower arrangement and floral bookmarks.	L2
CO 4	Appraise the flowers in different floriculture businesses.	L5

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	0	0	0	0	2	0

CO 2	0	0	0	2	0	0
CO 3	0	0	0	0	2	0
CO 4	2	0	0	2	2	0

Unit	Description	No. of Hours
I	**Introduction to a flower arrangement: Scope of flower arrangement:** □ Principles of flower arrangement. □ Elements of design for flower arrangement. □ Equipment and materials required for flower arrangement □ Economics of greenhouse production of Gerber	**05**
II	**Flower arrangement – Styles:** □ Western flower arrangement □ Japanese flower arrangement: Ikebana and Moribana □ Indian flower arrangement	**05**
III	**Floriculture Business:** □ Processes in Dry Flower Arrangements □ Floral resin art □ Floral Bookmarks □ Florist shop management □ Flower farming business	**05**
SEC- PRACTICAL		
1	Equipment and material required for flower arrangement	
2	Flower arrangements –Indian (Gajara, Veni, Garland)	
3	Flower arrangements floating rangoli/Bio-Rangoli), Japanese and Western type (demonstration)	
4	Indian flower arrangement	
5	Western flower arrangement	
6	Japanese flower arrangement	
7	Floral Bookmarks	
8	Dry Flower arrangements	
9	Floral resin art	
10	Field visit to the nursery	

	Generic	Credits 02
Course code 23BUBO2T05:	**Course title - Ayurveda and Medicinal Botany**	**No of lectures in hrs 30**

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO 1	Outline the importance of medicinal plants and different plant-based medicines used in Ayurveda	L2
CO 2	Explain the history, concept, theories and current research in Ayurveda	L2
CO 3	List botanical sources, plant parts used, active constituents and medicinal uses of plants mentioned in Grandma's pouch and current work in research institutes.	L1
CO 4	Analyze primary and secondary metabolites from plants and their roles in curing various human health problems.	L4

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	0	0	0	0	0
CO 2	0	1	0	0	0	0
CO 3	0	0	0	2	0	0
CO 4	0	2	0	2	0	0

	Course: Generic – II	
	AYURVEDA AND MEDICINAL BOTANY	
Unit	**Topics**	**No. of Lectures**
I	**Ayurveda:** 1.1 History of Botanical Science - Vedas to Present. Introduction, Examples of plants used since the Vedic era are Aghada, Rui, Pimpal, Vad, and Udumber. 1.2 Ayurveda: Concept of Tridosha and Five Elements, Formulations in Ayurveda (Swarna Bhasma, Triphala Churna, Chyawanprash (Avaleh), Bhrungadi-Vati). 1.3 Central Council for Research in Ayurvedic Sciences (CCRAS), Central Council for Research in Yoga and Naturopathy (CCRYN),	**15**
II	**Medicinal Botany:** 2.1 Primary and Secondary metabolites of plants 2.2 Grandma's pouch plants concerning the botanical source, part of the plant used, active constituents present and medicinal uses: Tulsi, Adulsa, Sunth, Haldi, Chandan, and Lavang. 2.3 Central Council for Research in Unani Medicine (CCRUM),	**15**

	Contemporary Issues: Expert lectures, YouTube Videos, Animations, NPTEL, MOOC videos, and online seminars –webinars for strengthening the subject matters	
	Pedagogy: Seminar, Quiz, Debate, Submission of Grandamas Pouch.	

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3.	B.R. Vashishta, (1998). The Algae. S. Chanda & Company, New Delhi
4.	C.G. Bose. Manual of Indian Botany
5.	C.L. Chopra, (1982). Algae. S. Chanda & Company, New Delhi
6.	Chopra, R. N. 2005. Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.
7.	Dr. P.K. Mishra. Botany in Vedas Publisher: Write And Print Publications
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9.	PRACTICAL
10.	Bendre and Kumar. Practical Volume 1 and 2 Rastogi Publication, Meerut 1 st 2008
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12.	Purohit, S.D., Kundra, G. K. and Singhvi, A. (2013). Practical Botany (part I). Apex Publishing House Durga Nursery Road Udaipur, Rajasthan.
13.	Sambamurty, A.V.S.S. (2006). A textbook of algae. I.K International Publishing House, Pvt. Ltd.
23BUBO1T02/T04	**Forms and Function - I**
1.	De Robertis E. D. P., Cell Biology and Molecular Biology, 8th edition, Lea and Febinger, 1987.
2.	Mahajan B.K., Methods in Biostatistics: For medical students and research workers, Jaypee Brothers
3.	Medical Publishers, 2008.
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5.	P S S Sunder Rao Introduction to Biostatistics and Research Methods
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7.	Verma P. S., Agarwal V.K., Textbook of Environmental Biology, S. Chand, 2000.
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3.	Purohit, S.D., Kundra, G. K. and Singhvi, A. (2013). Practical Botany (part I). Apex Publishing House Durga Nursery Road Udaipur, Rajasthan.
4.	Sambamurty, A.V.S.S. (2006). A textbook of algae. I.K International Publishing House, Pvt. Ltd.
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6.	Molecular Biology of the Cell Albert B. Bray, D Lewis, J Raff, M. Robert, K. and Walter Garland New York.2 nd 1989
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23BUBO2T01/T03 PLANT DIVERSITY-II	
1.	Biswas, C. and Johrc, B.M. 1977. The Gymnosperms. Narosa Publishing House, New Delhi.
2.	Gangulee, Das &Kar. (2001). College Botany Vol II. New Central Book Agency Pvt. Ltd. Calcutta.
3.	P.C Vashista, (1992). Pteridophyta. Chand & Co., New Delhi.
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3.	Cell and Molecular Biology: Concept and Experiments Vol. 2 Karp, G. John Wiley and Sons, Inc., USA.1999
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23BUBO1T05 Thallophyta and Economic Botany and 23BUBO2T05 Ayurveda and Medicinal Botany	
1.	Gangulee, Das &Kar. (2001). College Botany Vol II. New Central Book Agency Pvt. Ltd. Calcutta.
2.	Indian Herbal Pharmacopoeia Indian drug Manufacturers' Association Mumbai: Indian drug Manufacturers' Association
3.	2002
4.	Pandey B.P. Economic Botany S. Chand Publishers 1978
5.	Pandey, B.P. (2001). Plant Anatomy. S. Chand and Company Ltd., Ram Nagar, New Delhi.
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23BU1SEC01 Horticulture and Gardening and 23BU2SEC01 Floriculture (Flower Arrangement)	
1.	Adams, C., M.Earlyand J.Brrok(2011).Principles of Horticulture.
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VPM's B.N. Bandodkar College of Science (Autonomous), Thane

Curriculum Structure for the Undergraduate Degree Programme F.Y.B.Sc Botany

	SEMESTER – I	Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)			Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
23BUBO1T01	Plant Diversity - I	--	--	--	--	--	--	--
23BUBO1T02	Forms and Function - I	--	--	√	--	--	--	--
23BUBO1P01	Botany Practicals based on23BUBO1T01 and 23BUBO1T02	--	--	√	--	--	--	--
23BU1SEC01	Horticulture and Gardening	√	√	√	--	--	--	--
	Minor Course Title							
23BUBO1T03	Plant Diversity - I	--	--	--	--	--	--	--
23BUBO1T04	Form and Function - I	--	--	√	--	--	--	--
23BUBO1P02	Botany Practicals based on 23BUBO1T03 and 23BUBO1T04	--	--	√	--	--	--	--
Course Code	**Generic - Course Title**							
23BUBO1T05	Thallophyta and Economic Botany	--	√	√	--	--	--	--
Optional Electives Semester 1 -Interdisciplinary Sciences								
23BUID1T01	**Soft skills and personality development-I (OE)**	--	--	√	√	--	--	--

Semester 1 - (AEC)								
23BUEN1T01	**Basic English Learning course**	**--**	**--**	**√**	**--**	**--**	**--**	**--**
Semester 1 - Indian Knowledge System								
23BUIK1T01	**The Ancient Indian Social Structure. -I**	**--**	**--**	**--**	**--**	**--**	**√**	**--**
11	***Total***	**01**	**02**	**08**	**01**	**00**	**01**	**00**

	SEMESTER – II	**Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)**			**Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)**			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
23BUBO2T01	Plant Diversity - II	**--**	**--**	**--**	**--**	**--**	**--**	**√**
23BUBO2T02	Forms and Function - II	**--**	**--**	**--**	**--**	**--**	**--**	**--**
23BUBO2P01	Botany Practicals based on23BUBO2T01 and 23BUBO2T02	**--**	**--**	**√**	**--**	**--**	**--**	**--**
23BU2SEC01	Floriculture (Flower Arrangement)	**--**	**√**	**√**	**--**	**--**	**--**	**--**
	Minor Course Title							
23BUBO2T03	Plant Diversity - II	**--**	**--**	**--**	**--**	**--**	**--**	**√**
23BUBO2T04	Form and Function - II	**--**	**--**	**--**	**--**	**--**	**--**	**--**

23BUBO2P02	Botany Practicals based on 23BUBO2T03 and 23BUBO2T04	**--**	**--**	√	**--**	**--**	**--**	**--**
Course Code	**Generic - Course Title**							
23BUBO2T05	Ayurveda and Medicinal Botany	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Optional Electives Semester 1 -Interdisciplinary Sciences								
23BUID2T01	**Soft skills and personality development-I (OE)**	**--**	**--**	√	√	**--**	**--**	**--**
Semester 1 - (AEC)								
23BUEN2T01	**Scientific English writing**	**--**	**--**	√	**--**	**--**	**--**	**--**
Semester 1 - Indian Knowledge System								
23BUIK2T01	**The Ancient Indian Social Structure. -II**	**--**	**--**	**--**	**--**	**--**	√	**--**
11	***Total***	**--**	**01**	**05**	**01**	**00**	**01**	**02**