

John Wilson Education Society's

Wilson College (Autonomous)

Chowpatty, Mumbai - 400007

RE-ACCREDITED

'A'

Grade by NAAC

Affiliated to the

UNIVERSITY OF MUMBAI

Syllabus for F.Y.

Program: B.Sc - BOTANY

Program Code: WSBOT

Choice Based Credit System (CBCS) with effect from

Academic year 2023–2024

(Under NEP 2020)

PREAMBLE:

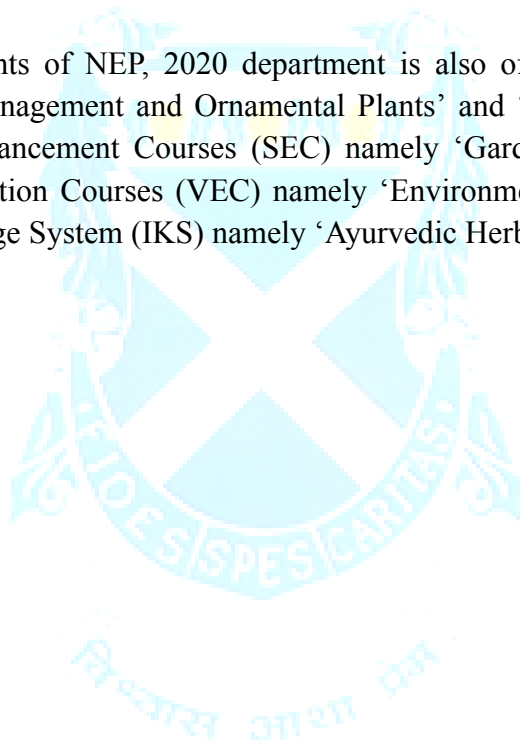
With implementation of NEP from the academic year 2023-24, the syllabus for first year B.Sc. has been revised keeping in mind the objectives and guidelines of National Education Policy (NEP) 2020 and also resonating with the vision & mission of the institution.

The syllabus mainly focuses on understanding the fundamentals of the subject with respect to the study of diverse life forms and their functions along with emphasis on the current trends and applications of the same.

The curriculum of the programme will be progressively upgraded upto third year aiming at thorough understanding of the subject, making a provision for basic level research for the students and entrepreneurial skill development.

The two courses at First year B.Sc level cover a broad spectrum of subject branches, viz. Plant Diversity, Taxonomy of Angiosperms, Plant Genetics, Biostatistics, Plant Physiology & Biochemistry, Molecular Biology, Plant Anatomy, Plant Ecology-Environmental Botany, Medicinal Botany, Palaeobotany, etc.

Aligning with the requirements of NEP, 2020 department is also offering two Open Electives(OE) courses namely 'Nursery Management and Ornamental Plants' and 'Nutraceuticals and Plant Based Supplements', two Skill Enhancement Courses (SEC) namely 'Gardening: Basics' and 'Gardening: Advanced', one Value Education Courses (VEC) namely 'Environmental Laws and Ethics' and one course under Indian Knowledge System (IKS) namely 'Ayurvedic Herbs and Human Health'.



PROGRAMME SPECIFIC OUTCOME (PSOs)

The Learner will be able to -

PSO1. Apply the knowledge acquired for exploring different facets of plant sciences.

PSO2. Address environment related issues/concerns.

PSO3. Apply the principles and practice the techniques learnt in routine and professional life.

PSO4. Analyze information/data and use statistical tools to arrive at a judicious conclusion.

PSO5. Use knowledge of plant sciences for personal, professional, environmental and societal benefits.

PSO6. Develop an aptitude towards research in plant sciences and allied fields.

PROGRAM OUTLINE 2023-2024

	SEM	COURSE CODE	COURSE TITLE	Credits
FY	I	WSBOTMJ111/ WSBOTMN111	Plant Diversity I	2
		WSBOTMJ112/ WSBOTMN112	Form & Function - I	2
		WSBOTMJ113/ WSBOTMN113	Practical I	2
		WSBOTOE111	Nursery Management and Ornamental Plants	2
		WSBOTSE111	Gardening : Basics	2
		WSBOTVE111	Environmental Laws and Ethics	2
	II	WSBOTMJ121/ WSBOTMN121	Plant Diversity I	2
		WSBOTMJ122/ WSBOTMN122	Form & Function - I	2
		WSBOTMJ123/ WSBOTMN123	Practical II	2
		WSBOTOE121	Nutraceuticals and Plant Based Supplements	2
		WSBOTSE121	Gardening: Advanced	2
		WSBOTIK121	Ayurvedic Herbs and Human Health	2

PROGRAM: F. Y. B.Sc.				SEMESTER: I	
Course: Plant Diversity I				Course Code: WSBOTMJ111/ WSBOTMN111	
Teaching Scheme				Evaluation Scheme	
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CA) (Marks- 40)	Semester End Examination (Marks- 60)
2	2	NA	3	40	60

Learning Objectives:

The specific objectives of this course are:

1. To study the general characteristics of Algae, Fungi and Bryophytes.
2. To study the systematic position of selected life forms.
3. To explain different stages in the life cycle of the representative members.
4. To expose students to the ecological and economic significance of lower forms of plants.
5. To make students aware of contributions of eminent scientists/workers in the relevant fields.

Course Outcomes:

The Learners will be able to -

Unit-I Algae

CO1- Use economically and ecologically important algae in human welfare.

CO2- Apply *Nostoc* as biofertilizer in cultivated fields to reduce the use and harmful impacts of nitrogenous fertilizers.

Unit-II Fungi

CO3- Apply knowledge of general mycological studies and the significance of fungi in human life.

CO4- Differentiate between the classes of fungi through their morphological & reproductive characters.

CO5- Differentiate between the categories of heterotrophs based on their modes of nutrition.

Unit-III Bryophyta

CO6- Describe the general characteristics of Bryophytes.

CO7- Compare the representative members of Bryophytes under a single class.

CO8- Differentiate between gametophytic and sporophytic generations in Bryophyte.

DETAILED SYLLABUS

Course Title		Plant Diversity I		
Course Code		WSBOTMJ111/ WSBOTMN111		
Unit	Sub-Unit	Unit Title	Lectures	Credits
I		Life forms- Algae	10	2
	1.1	Introduction and General Characters.		
	1.2	Classification & Distinguishing characters of - Cyanophyta, Euglenophyta, Chlorophyta, Phaeophyta, Pyrrophyta, Chrysophyta, Rhodophyta.		
	1.3	Structure, life cycle and systematic position of <i>Nostoc</i> and <i>Zygnema</i> .		
	1.4	Economic importance of Algae		
II		Life forms- Fungi & Lichens	10	2
	2.1	Introduction- Structure of cell, Reproduction and Nutrition.		
	2.2	Eumycophyta (True Fungi)- General characteristics of Phycomycetes, Ascomycetes, Basidiomycetes, Deuteromycetes		
	2.3	Life cycle of <i>Rhizopus</i>		
	2.4	Symbiotic Associations Lichens: General account, Thallus structure and Significance. Mycorrhiza: Ectomycorrhiza and Endomycorrhiza and their Significance		
III		Life forms- Bryophytes	10	2
	3.1	Introduction - General characters, Difference between Gametophyte and Sporophyte, Adaptations to land habits.		
	3.2	Economic and Ecological significance of Bryophytes.		
	3.3	Systematic position , Morphology, Anatomy and Life cycle of <i>Riccia</i> & <i>Anthoceros</i> .		

PROGRAM:F.Y.B.Sc		SEMESTER: I			
Course: Form & Function - I				Course Code: WSBOTMJ112 / WSBOTMN112	
Teaching Scheme				Evaluation Scheme	
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
2	2	NA	3	40	60
<p>Learning Objectives: The specific objectives of this course are:</p> <ol style="list-style-type: none"> 1. To study typical plant cells with respect to structure and functions of cell organelles. 2. To learn the structure and functions of carbohydrates and proteins. 3. To study various ecosystems with respect to different factors/ components, energy flow and characteristics. 4. To introduce advanced ecological concepts. 5. To study Mendelian and Non- Mendelian inheritance patterns. 6. To solve numericals based on Mendal's laws of genetics. 7. To make students aware of contributions of eminent scientists/workers in the relevant fields. 					
<p>Course Outcomes: The Learners will be able to -</p> <p>Unit-I Cell Biology & Biomolecules CO1- Describe the organization of typical plant cells. CO2- Correlate the structure and function of various cell organelles. CO3- Apply the knowledge of selected macromolecules with respect to plant metabolism.</p> <p>Unit-II Ecology & Environmental Studies CO4- Discover different specialized areas of ecology and environment CO5- Characterize ecosystems on the basis of ecological factors. CO6- Evaluate functions and overall performance of the ecosystems.</p> <p>Unit-III Genetics CO7- Analyze the heritable traits and the pedigree charts. CO8- Differentiate the cellular and molecular mechanisms of genetics. CO9- Apply the knowledge of Genetics for understanding consequences of gene interactions.</p>					

DETAILED SYLLABUS

Course Title		Form & Function - I		
Course Code		WSBOTMJ112/ WSBOTMN112		
Unit	Sub-unit	Unit Title	Lectures	Credits
I		Cell Biology & Biomolecules	10	2
	1.1	Structure of a typical plant cell.		
	1.2	Structure and functions of cell organelles- Cell wall , Cell membrane, Nucleus, Plastids, Mitochondrion, Endoplasmic reticulum, Golgi apparatus, Ribosomes, Peroxisome, Glyoxysome and Vacuole.		
	1.3	Introduction to Biomolecules- (Definition, Classification, Structures, Functions and examples w.r.t plants): Carbohydrates		
II		Ecology & Environmental Studies	10	2
	2.1	Introduction to Ecology		
	2.2	Ecological Energetics- Energy flow in an ecosystem, Food Chains and Food Webs, Ecological pyramids.		
	2.3	Ecosystem Ecology- Concept of Ecosystem, Types of ecosystems: natural and artificial		
	2.4	Introduction to: Soil ecology, Succession ecology, Social Forestry, Biodiversity, EIA (environmental impact assessment), conservation ecology.		
	2.5	Contribution of Dr. Ratan Lal		
III		Genetics	10	2
	3.1	Mendelian Genetics- Phenotype & Genotype, Monohybrid cross, Dihybrid cross, Test cross and Back cross.		
	3.2	Deviation from Mendelian Genetics: Epistasis (types of epistasis), non epistatic interactions and Multiple alleles.		
	3.3	Concept of Karyotype: Autosomes and Allosomes, Structural and Numerical chromosomal aberrations		

References:

Semester I: Paper I

1. Textbook of Algae by Sharma O.P. (Tata McGraw-Hill Co, New Delhi).
2. Algae by Vashishtha. (S. Chand Publishers- New Delhi).
3. A Textbook of Algae by Sambamurty A.V.S.S. (I.K.International Ltd New Delhi).
4. A Textbook of Botany by A.K. Thakur, S.K. Bassi . (S. Chand Publishers-New Delhi).
5. Botany for degree students-Fungi- Vashishtha,B.R. and Sinha, A.K. (S. Chand Publishers- New Delhi).
6. Cryptogamic Botany Volume I, G. M. Smith
<https://archive.org/details/cryptogamicbotan031880mbp/page/2/mode/2up>
7. Botany for degree students- Gymnosperms- Vashishtha,B.R., Sinha, A.K and A. Kumar (S. Chand Publishers- New Delhi)

Semester I : Paper II

1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. Verma and V.K. Agarwal, S. Chand & Company Ltd.
2. Cell Biology by Bruce Albert , W.W. Norton & Co publication.
3. Ecology and Environment By P. D. Sharma, Rastogi Publications.
4. Plant Ecology by Weaver & Clements, TMH Edition.
5. Principles of Biochemistry by A.L.Lehninger, D. L. Nelson and M. M. Cox
6. Fundamentals of Biochemistry, J L Jain, Nitin Jain & Sunjay Jain, S.Chand publication.
7. Genetics by Peter J. Russell, Benjamin-Cummings Publishing.
8. Principles of Genetics, by Eldon John Gardner, Michael J. Simmons, D. Peter Snustad, Wiley publications.

Practical- I

Course code: WSBOTMJ113/ WSBOTMN113

Course Outcomes:

Section -I

The Learners will be able to -

- CO1- Use economically and ecologically important algae in human welfare.
- CO2- Apply *Nostoc* as biofertilizer in cultivated fields to reduce the use and harmful impacts of nitrogenous fertilizers.
- CO3- Apply knowledge of the significance of fungi in human life.
- CO4- Differentiate between the classes of fungi through their morphological & reproductive characters.
- CO5- Differentiate between the categories of heterotrophs based on their modes of nutrition.
- CO6- Describe the general characteristics of Bryophytes.
- CO7- Differentiate between gametophytic and sporophytic generations in Bryophyte.

Section - II

The Learners will be able to -

- CO1- Describe the organization of typical plant cells.
- CO2- Correlate the structure and function of various cell organelles.
- CO3- Apply the knowledge of selected macromolecules with respect to plant metabolism.
- CO4- Evaluate the status of the ecosystems.
- CO5- Analyze the heritable traits and the pedigree charts.
- CO6- Differentiate the cellular and molecular mechanisms of genetics.
- CO7- Apply the knowledge of Genetics for understanding consequences of gene interactions.

Course code	Course Title	Credits
WSBOTMJ113/ WSBOTMN113	PRACTICAL-1	
Section I (Practicals based on Theory Course I)		
Unit-I	Algae Study of the life cycle of <i>Nostoc</i> Study of the life cycle of <i>Zygnema</i> . Economic Importance of Algae (food/ fodder/ drugs/ fertilizer/ land reclamation/ biofuels).	1
Unit-II	Fungi & Lichens Study of the life cycle of <i>Rhizopus</i> . Types of Lichens (morphological features) Economic importance of Fungi (food/ medicines/ industries/ ecological significance).	
Unit-III	Bryophytes Study of the life cycle of <i>Riccia</i> . Study of the life cycle of <i>Anthoceros</i> .	
Field Visit/Excursion - Local		
Section II (Practicals based on Theory Course II)		
Unit-I	Cell Biology & Biomolecules 1. Study of cell division - Mitosis 2. Qualitative Tests for Carbohydrates - starch and sugar	1
Unit-II	Ecology & Environmental Studies 1. Study of coastal ecosystem - a. Report on characteristics of ecosystem b. pH and turbidity of water 2. Mapping of Phytogeographical regions of India. 3. Study of the following with the help of photomicrographs/map/charts - a. Soil profile b. Ecological pyramids.	
Unit-III	Genetics 1. Identification of Karyotypes - <i>Allium cepa</i> , <i>Oryza sativa</i> . 2. Numericals based on Monohybrid, Dihybrid cross and Multiple alleles. 3. Problems based on Pedigree Analysis	

Modality of Assessment

Theory Examination Pattern:

A. Internal Assessment- 40%- 40 Marks per paper

Sr. No.	Evaluation Type	Marks
1	Written Objective Examination	20
2	Assignment/ Case study/ field visit report/ presentation/ project/Open Book Test/Group Activities	20
	Total	40

B. External Examination- 60%- 60 Marks per paper

Semester End Theory Examination:

1. Duration - These examinations shall be of **two hours** duration.
2. Theory question paper pattern:
 - a. All questions with internal choice shall be compulsory.
 - b. There shall be one descriptive type question of 10 marks with 100% option from each unit.
 - c. There shall be two short notes of 5 marks each with 50% option from each unit.

Paper Pattern:

Question	Options	Marks	Questions Based on
Q 1.1 Descriptive	100%	10	Unit I
Q1.2 Short Notes	50%	5 + 5	
Q 2.1 Descriptive	100%	10	Unit II
Q2.2 Short Notes	50%	5 + 5	
Q3.1 Descriptive	100%	10	Unit III
Q3.2 Short Notes	50%	5 + 5	
	TOTAL	60	

Practical Examination Pattern:

A. Internal Examination: 40%- 40 Marks

Particulars	Paper I	Paper II
Journal	5	5
Presentations/Test Based on practicals	10	10
Participation	5	5
Total	20	20

B. External Examination: 60%- 60 Marks

Semester End Practical Examination:

Particulars	Section I	Section II
Laboratory work	24	24
Spots/Quiz/Viva	6	6
Total	30	30

PRACTICAL BOOK/JOURNAL

1. Students are required to perform 75% of the Practical for the journal to be duly certified.
2. Students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.
3. Minimum passing percentage in the Semester End Examination will be overall 40% marks (Including section I and II).
4. Students need to score a minimum 40% marks from section I and II collectively to pass internal assessment.

Overall Examination & Marks Distribution Pattern

Semester I

Course	I			II			Grand Total
	Internal	External	Total	Internal	External	Total	
Theory	40	60	100	40	60	100	200
	Section I			Section II			
Practicals	20	30	50	20	30	50	100

PROGRAM(s): F.Y.B.Sc				SEMESTER: I
Course:Nursery Management and Ornamental Plants (Open Elective)				Course Code: WSBOTOE111
Teaching Scheme				Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Assessment- 60 Marks
2	NA	NA	2	2 assignments (30+30 marks)
<p>Learning Objectives: The specific objectives of this course are:</p> <ol style="list-style-type: none"> 1. To introduce the students to the concept of nursery and its importance. 2. To make them aware of the types/categories of nursery. 3. To train them to differentiate/distinguish ornamental plants on the basis of characterization. 4. To equip the students with the management aspects of the nursery. 5. To utilize their plant knowledge in caring for plants. 				
<p>Course Outcomes: The Learners will be able to -</p> <p>CO1- Identify the importance of nursery in the field of horticulture. CO2- Distinguish the types/categories of nursery. CO3- Differentiate types of ornamental plants based on characterization. CO4- Decide the caring measures of ornamental plants. CO5- Evaluate the needs/necessities of a nursery.</p>				

DETAILED SYLLABUS

Course Title	Nursery Management & Ornamental plants		
Course Code	WSBOTOE111		
Unit	Unit Title	Lectures	Credits
I	Plant Nursery	15	2
	<ul style="list-style-type: none"> ● Introduction to Nursery <ul style="list-style-type: none"> ○ Importance of Plant Nurseries ○ Types of Nursery ○ Openfield & Closed ○ Traditional and Modern ○ General and Specialised ○ Small scale and commercial ● Necessities of Nursery <ul style="list-style-type: none"> ○ Soil and beds ○ Alternate media ○ Implements ○ Composts and fertilizers ○ Seeds & other propagules ○ Human resource ● Nursery Management <ul style="list-style-type: none"> ○ Important considerations ○ Infrastructure & facilities ○ Market and sale ○ Management of operations 		
II	Ornamental Plants	15	
	<ul style="list-style-type: none"> ● Introduction to Ornamental Plants ● General Importance of Ornamental Plants ● Types of Ornamental Plants <ul style="list-style-type: none"> ○ Foliage - herbs, shrubs, trees ○ Flowering - herbs, shrubs, trees ○ Indoor ornamental plants ○ Xeric ornamental plants ○ Aquatic ornamental plants ○ Exotic ornamental plants ● Caring of ornamental plants <ul style="list-style-type: none"> ○ Minerals/fertilizers/compost ○ Watering ○ Diseases & Pests ○ Pruning and training <p>* Commercial importance of ornamental plants</p>		

References:

1. Home gardening by Pratibha Trivedi, ICAR.
2. The House Plant handbook by Elaine Smallwood, SB publication.

Modality of Assessment: 60 Marks (2 Assignments- 30+30)

Evaluation Type	Marks
Assignment / Case study/ field visit report/ presentation / project/Open Book Test/Group Activities /Quiz/ Illustrations	30
	30
Total	60



PROGRAM(s): F.Y.B.Sc				SEMESTER: I
Course: Gardening- Basics (Skill Enhancement Courses)				Course Code: WSBOTSE111
Teaching Scheme				Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Semester end practical examination (Marks- 60)
NA	4	NA	2	
Learning Objectives: The specific objectives of this course are: <ol style="list-style-type: none"> 1. To make students aware of tools, media, pots and propagules required in gardening. 2. To train the students in plantation techniques. 3. To provide hands-on practice of different propagation methods. 4. To equip them to manage the problems of pests and diseases. 				
Course Outcomes: The Learners will be able to - CO1- Identify and describe garden tools, types of media and pots. CO2- Apply the knowledge of gardening in propagation, plantation and caring of plants. CO3- Prepare a basic plan for the kitchen garden.				

DETAILED SYLLABUS

Course Title	Gardening- Basics	
Course Code	WSBOTSE111	Credits
1. Introduction and Basics 2. Garden Tools 3. Soil, alternate media, compost and fertilizers 4. Seeds and vegetative propagules 5. Pots and planters 6. Potting and reporting 7. Seeding and seed beds 8. Vegetative propagation - principle, precautions and management 10. Cutting - stem, root and leaf 11. Grafting 12. Budding 13. Layering 14. Kitchen garden- Plan and preparation 15. Common pests, diseases and their control		2

References:

1. The Practical Gardening Encyclopaedia by Peter McHoy
2. Practical Handbook

Modality of Assessment: Semester End Practical Examination: 60 Marks

Particulars	Marks
Journal	10
Spots	10
Viva	10
Performing	30
Total	60



PROGRAM(s): F.Y.B.Sc				SEMESTER: I
Course: Environmental Laws and Ethics(Value Education Course)				Course Code: WSBOTVE111
Teaching Scheme				Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Assessment- 60 Marks
2	NA	NA	2	2 assignments (30+30 marks)
<p>Learning Objectives: The specific objectives of this course are: 1. To make students aware of the concept, theories and importance of environmental ethics. 2. To introduce them to the concept of sustainable development and ambassadors of environmental ethics. 3. To connect the students with the eminent constitutional and legal provisions (Acts) and case studies related to the environment and their impact.</p>				
<p>Course Outcomes: The Learners will be able to - CO1- Explain the concept of environmental ethics and its significance. CO2- Relate the knowledge of environmental ethics with the sustainable development and eco friendly lifestyle. CO3- Compare the constitutional provisions and various Acts related to the environment. CO4- Evaluate the significance of the legal case studies related to the environment.</p>				

DETAILED SYLLABUS

Course Title	Environmental Laws and Ethics		
Course Code	WSBOTVE111		
Unit	Unit Title	Lectures	Credits
I	Environmental Ethics and Allied Areas	15	2
	<ul style="list-style-type: none"> ● Introduction to Environmental Ethics. ● Need to study environmental ethics ● Anthropocentrism ● Ecocentrism ● Deep Ecology ● Ecofeminism ● Sacred Groves - a holistic approach of conservation ● Environmental Ethics & Sustainable Development ● Eco-friendly lifestyle -3 R's ● Ambassadors of Environmental Ethics 		
II	Environmental laws	15	2
	<ul style="list-style-type: none"> ● Constitutional provisions related to the environmental ● Environmental Laws of India - Title, Year, Preamble, eminent provisions and benefits <ol style="list-style-type: none"> 1. The Wildlife Protection Act, 1972 2. Water (Conservation and Control of Pollution) Act in 1974 3. The Forest Conservation Act, 1980 4. The Air (Prevention and Control of Pollution) Act, 1981 5. The Environment Protection Act, 1986 6. Coastal Regulation Zone (CRZ) Notification, 1991 7. The Biological Diversity Act, 2002 8. The National Green Tribunal Act, 2010- Green Tribunal 9. Environmental Judiciary in India 10. Case studies of eminent legal fights related to the environment 11. Adv. M. C. Mehta and his contributions 		

Reference:

1. Environmental Ethics and Law by Dr. Munesh Kumar and Dr.Sunil Kumar Verma
2. Environmental Law by Gurdip Singh, Eastern Book Company
3. <https://www.geeksforgeeks.org/environmental-ethics/>
4. <http://home.iitk.ac.in/~anubha/CE213.pdf>

Modality of Assessment: 60 Marks (2 Assignments- 30+30)

Evaluation Type	Marks
Assignment / Case study/ field visit report/ presentation / project/Open Book Test/Group Activities /Quiz/ Illustrations	30
	30
Total	60



SEMESTER II

PROGRAM(s): F.Y. BSc			SEMESTER: II		
Course: Plant Diversity I			Course Code: WSBOTMJ121/ WSBOTMN121		
Teaching Scheme				Evaluation Scheme	
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks 40)	Semester End Examination (Marks 60)
2	2	NA	3	40	60
<p>Learning Objectives: The specific objectives of this course are:</p> <ol style="list-style-type: none"> 1. To study the general characteristics of Pteridophytes, Gymnosperms and Angiosperms. 2. To expose the students to the evolutionary pattern of the stellar system in Pteridophytes. 3. To study the systematic position of selected life forms. 4. To explain different stages in the life cycle of the representative members. 5. To expose students to the ecological and economic significance of higher forms of plants. 6. To study morphological features of flowering plants with respect to taxonomy. 7. To make students aware of contributions of eminent scientists/workers in the relevant fields. 					
<p>Course Outcomes: The Learners will be able to -</p> <p>Unit-I Pteridophytes CO1- Use knowledge of Pteridophytic characters for comparative studies with allied plant groups CO2- Differentiate the types of stele found in Pteridophytes. CO3- Apply the knowledge of types of steles in understanding the evolution of vascular tissues in plants.</p> <p>Unit-II Gymnosperms CO4 - Use of economically important Gymnosperms in human welfare. CO5 - Use knowledge of Cycas as a representative to understand general and salient features of Cycads/Gymnosperms.</p> <p>Unit-III Angiosperms CO6- Establish the premise of Angiospermic studies via morphology. CO7 - Apply the knowledge of morphology in Taxonomy assignments. CO8 - Appreciate floristic diversity during field studies.</p>					

DETAILED SYLLABUS

Course Title		Plant Diversity I		
Course Code		WSBOTMJ121/ WSBOTMN121		
Unit	Sub-Unit	Unit Title	Lectures	Credits
I		Life forms- Pteridophytes	10	2
	1.1	Introduction & General characteristics, Classification of Pteridophytes- General characteristics of- Psilophyta, Lepidophyta, Calamophyta, Pterophyta		
	1.2	Life cycle of <i>Psilotum</i>		
	1.3	Stelar evolution in Pteridophytes- Protostele(Haplostele, Actinostele, Plectostele, Mixed stele);Siphonostele(Ectophloic siphonostele,Amphiphloic siphonostele;Solenostele(Eustele, Dictyostele).		
	1.4	Ecological and economic importance of Pteridophytes.		
II		Life forms- Gymnosperms	10	2
	2.1	Introduction to Gymnosperms - General characteristics , Occurrence, Morphological variations		
	2.2	Classification of Gymnosperms by Chamberlain (upto order).		
	2.4	Life cycle of <i>Cycas</i>		
	2.5	Economic importance of Gymnosperms		
III		Life forms-Angiosperms	10	2
	3.1	Introduction to Angiosperms - Salient features, Distinguishing characters of dicots & monocots.		
	3.2	Morphological studies and Modifications of - Stem, Leaf (typical leaf, lamina, venation, simple and compound; Phyllotaxy).		
	3.3	Study of plant families (Bentham & Hooker's Classification): Magnoliaceae and Amaryllidaceae		

PROGRAM: F.Y. BSc		SEMESTER: II			
Course:Form and Function I		Course Code:WSBOTMJ122/WSBOTMN122			
Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CA) (Marks-40)	Semester End Examination (Marks-60)
2	2	NA	3	40	60

Learning Objectives:

The specific objectives of this course are:

1. To study anatomy with respect to types of tissues, primary and secondary growth.
2. To explain the scope of anatomy with respect to taxonomy, ecology and pharmacognosy.
3. To study plant water relation with respect to osmosis, transpiration and ascent of sap.
4. To study the role of minerals in plant nutrition.
5. To explain the use of active phytoconstituents in different systems of medicine.

Course Outcomes:

The Learners will be able to -

Unit-I Anatomy

CO1- Identify types, structures and distribution patterns of different tissues.

CO2- Differentiate between various plant tissues and their respective functions.

CO3- Analyse the relationships of Anatomy, Ecology and Pharmacognosy w.r.t to Taxonomy.

Unit-II Physiology

CO4- Relate the structure and role of stomata in transpiration, photosynthesis and respiration.

CO5- Describe the role of water potential in vital physiological processes.

CO6- Apply knowledge of minerals in the field of cultivation and crop management.

Unit-III Medicinal Botany

CO7- Identify primary and secondary metabolites and their role in plant metabolism.

CO8- Apply the knowledge of drugs procured from herbal plants for their therapeutic uses.

DETAILED SYLLABUS

Course Title		Form and Function I		
Course Code		WSBOTMJ122/ WSBOTMN122		
Unit	Sub-Unit	Unit Title	Lectures	Credits
I		Anatomy	10	
	1.1	Introduction to Anatomy		
	1.2	Types of tissue: Simple, complex tissues and meristematic tissues.		
	1.3	Primary structures of root, stem and leaf- dicot and monocot		
	1.4	Scope of Anatomy in- taxonomy, ecology and pharmacognosy.		
II		Plant Physiology	10	2
	2.1	Introduction to plant- water relations, properties of water, water potential and types of solutions		
	2.2	Osmotic relations of plant cells: Diffusion, Imbibition Osmosis and Plasmolysis		
	2.3	Transpiration: Introduction, Types and Significance; Stomatal movement.		
	2.4	Mineral Nutrition: General functions and deficiency symptoms of macronutrients(N, P, K, S and C) and micronutrients(Fe, Mn, Zn, Mb and Cu).		
III		Medicinal Botany	10	
	3.1	Introduction to Medicinal Botany		
	3.2	Secondary metabolites as active phytoconstituents- source, types and therapeutic uses		
	3.3	Study of medicinal plants wrt secondary metabolites and therapeutic values(any one plants from each category): Alkaloids- <i>Curcuma</i> , <i>Vinca</i> , Glycosides- <i>Aloe</i> , <i>Tinospora</i> , Tannins- <i>Thea</i> , <i>Areca</i> , Volatile oils- <i>Santalum</i> , <i>Citronella</i> , Gums- <i>Acacia</i> , <i>Sterculia</i> , Resins- <i>Pinus</i> , <i>Boswellia</i>		
	3.4	Introduction and concepts of different systems of medicines: Ayurveda/Homeopathy/Unani/Naturopathy/Aromatherapy		

References:

Semester II: Paper I

1. An Introduction to Pteridophyta(Diversity and Differentiation), A. Rashid, Vani Educational Books
2. Introduction to Pteridophyta, S. Sundra Rajan, New Age International PublishersLtd, Wiley Estern Limited.
3. Cryptogamic Botany Volume II, G. M. Smith-
<https://archive.org/details/cryptogamicbotan030182mbp/page/n5/mode/2up>
4. Botany (For degree students) PART IV, Pteridophyta (Vascular Cryptogams), P. C. Vasishta. S.Chand and Company Ltd. New Delhi
5. Gymnosperms- S. P. Bhatnagar and A. Moitra
6. Botany for degree students- Gymnosperms- Vashishtha,B.R., inha, A.K and A. Kumar (S. Chand Publishers- New Delhi)
7. Plant Taxonomy, by O.P. Sharma, Tata McGraw Hill Publications.
8. Fundamentals of Plant Systematics by Albert E. Radford, Harper & Row publications.
9. Laboratory Manual of Plant Taxonomy by N.S. Subrahmanyam, Vikas Publishing House.
10. Taxonomy of Angiosperms, S.N. Pandey & S.P. Mishra , Ane Books India

Semester II: Paper II

1. Revised edition - Plant Anatomy, by B.P. Pandey, S.Chand publications.
2. Plant Anatomy and Embryology, by S.N. Pandey and A. Chadha, S. Chand publications.
3. Plant Physiology, Pandey S.N. and Sinha, B.K. (Vikas Publishing House Pvt. Ltd. New Delhi).
4. Fundamentals of Plant Physiology, by Jain, V.K. (S. Chand & Company Ltd. New Delhi).
5. Introductory Plant Physiology by Noggle, G.R and Fritz, G.J. (Prentice Hall of India Pvt. Ltd. New Delhi).
6. Outline of Plant Physiology by Devlin, R.M. (Meditech Pvt Ltd).
7. Principles of Plant Physiology by Nautiyal B.P. and Majumdar, P.K. (Meditech Pvt Ltd).
8. Pharmacognosy , by Dr. C. K. Kokate, Nirali Prakashan Publication.

Practical- I

Course code: WSBOTMJ123/ WSBOTMN123

Course Outcomes: Section -I

Course Outcomes:

The Learners will be able to -

- CO1- Differentiate the types of stele found in Pteridophytes.
- CO2- Describe and classify Pteridophytes on the basis of their distinct characters.
- CO3- Use of economically important Gymnosperms in human welfare.
- CO4- Describe and classify Gymnosperms on the basis of their distinct characters.
- CO5- Relate knowledge of plant morphology to plant taxonomy.
- CO6 -Appreciate floristic diversity during field studies.

Section -II

Course Outcomes:

The Learners will be able to -

- CO1- Identify types, structures and distribution patterns of different tissues.
- CO2- Analyse the relationships of Anatomy, Ecology and Pharmacognosy w.r.t to Taxonomy.
- CO3- Compare different types of stomata and its role.
- CO4- Describe the role of water potential in vital physiological processes.
- CO5- Identify primary and secondary metabolites and their role in plant metabolism.
- CO6- Apply the knowledge of drugs procured from herbal plants for their therapeutic uses.

Course code	Course Title	Credits
WSBOTMJ123/ WSBOTMN123	PRACTICAL-2	
Section I (Practicals based on Theory Course I)		
Unit-I	Pteridophytes 1. Study of Life cycle of <i>Psilotum</i> . 2. Study of Stelar evolution in Pteridophytes (with the help of Permanent slides).	1
Unit-II	Gymnosperms 1. Study of the life cycle of <i>Cycas</i> . 2. Economic importance of Gymnosperms	
Unit-III	Angiosperms 1. Study of types and modifications of stem. 2. Study of leaf morphology (as per theory) 3. Study of plant families: a. Magnoliaceae b. Amaryllidaceae	
Field Visit - Local		
Section II (Practicals based on Theory Course II)		
Unit-I	Anatomy 1. Primary structure of dicot and Monocot a. Stem b. Root 2. Mounting of dicot and monocot stomata.	1
Unit-II	Plant Physiology 1. Determination of potential by potato tuber using weight loss method. 2. Study of plasmolysis (using <i>Tradescantia</i> leaves).	
Unit-III	Medicinal Botany ● Qualitative tests for: ○ Alkaloids ○ Glycosides ○ Tannins ● Identify the medicinal plants w.r.t following phytoconstituents: ○ Volatile oils (<i>Citronella</i>) ○ Gums (<i>Acacia</i>) ○ Resins (<i>Ferula</i>)	

Modality of Assessment

Theory Examination Pattern:

A. Internal Assessment- 40%- 40 Marks per paper

Sr. No.	Evaluation Type	Marks
1	Written Objective Examination	20
2	Assignment/ Case study/ field visit report/ presentation/ project/Open Book Test/Group activities	20
	Total	40

B. External Examination- 60%- 60 Marks per paper

Semester End Theory Examination:

1. Duration - These examinations shall be of **two hours** duration.
2. Theory question paper pattern:
 - a. All questions with internal choice shall be compulsory.
 - b. There shall be one descriptive type question of 10 marks with 100% option from each unit.
 - c. There shall be two short notes of 5 marks each with 50% option from each unit.

Paper Pattern:

Question	Options	Marks	Questions Based on
Q 1.1 Descriptive	100%	10	Unit I
Q1.2 Short Notes	50%	5 + 5	
Q 2.1 Descriptive	100%	10	Unit II
Q2.2 Short Notes	50%	5 + 5	
Q 3.1 Descriptive	100%	10	Unit III
Q3.2 Short Notes	50%	5 + 5	
	TOTAL	60	

Practical Examination Pattern:

A. Internal Examination: 40%- 40 Marks

Particulars	Section I	Section II
Journal	5	5
Presentation/ Tests based on practical	10	10
Participation	5	5
Total	20	20

B. External Examination: 60%- 60 Marks

Semester End Practical Examination:

Particulars	Section I	Section II
Laboratory work	24	24
Spots/Quiz/Viva	6	6
Total	30	30

PRACTICAL BOOK/JOURNAL

1. Students are required to perform 75% of the Practical for the journal to be duly certified.
2. Students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.
3. Minimum passing percentage in the Semester End Examination will be overall 40% marks (Including section I and II).
4. Students need to score a minimum 40% marks from section I and II collectively to pass internal assessment.

Overall Examination & Marks Distribution Pattern

Course	Semester II						Grand Total
	I			II			
	Internal	External	Total	Internal	External	Total	
Theory	40	60	100	40	60	100	200
	Section I			Section II			
Practicals	20	30	50	20	30	50	100

PROGRAM(s): F.Y.B.Sc				SEMESTER: II
Course: Nutraceuticals and Plant Based Supplements (Open Elective)				Course Code: WSBOTOE121
Teaching Scheme				Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Assessment- 60 Marks
2	NA	NA	2	2 Assignments (30+30 marks)
<p>Learning Objectives: The specific objectives of this course are:</p> <ol style="list-style-type: none"> 1. To make the students aware about the importance of nutraceuticals in human health. 2. To introduce the students to plant based nutraceutical products. 3. To expose the students to nutraceutical based industries. 				
<p>Course Outcomes: The Learners will be able to -</p> <p>Unit-I CO1- Describe the standard nutraceutical requirements of the human body. . CO2- Classify the nutraceuticals. CO3- Explain the concept of functional food w.r.t health management.</p> <p>Unit-II CO4- Describe the factors affecting absorption of nutraceuticals. CO5- Summarize the role of plant based nutraceuticals in management of various diseases. CO6- Evaluate the current status and future prospects of the nutraceutical industry.</p>				

Course Title	NUTRACEUTICALS AND PLANT BASED SUPPLEMENTS		
Course Code	WSBOTOE121		
Unit	Unit Title	Lectures	Credit
I	Introduction to Nutraceuticals	15	2
	<ul style="list-style-type: none"> ● Definition ● Classification of Nutraceuticals with examples: <ul style="list-style-type: none"> ○ Food source ○ Mechanism of action ○ Chemical nature ● Recommended nutritional requirement of human body ● Functional foods: <ul style="list-style-type: none"> ○ Introduction ○ Definition and examples 		
II	Applications of Nutraceuticals	15	
	<ul style="list-style-type: none"> ● Nutraceuticals of plant origin and their role in <ul style="list-style-type: none"> ○ Diabetes ○ Hypertension ○ Liver disorders ○ Bone health ○ Menstrual health ● Plant based supplements available in market ● Antinutritional factors in food, probiotic and prebiotic ● Nutraceutical industry: scope of industry , Global and Indian scenario 		

References:

- Handbook of nutraceuticals and functional foods, Robert E. C. Wildman.
- Dietary supplements and functional foods, Geoffrey P. Web.

Modality of Assessment: 60 Marks (2 Assignments- 30+30)

Evaluation Type	Marks
Assignment / Case study/ field visit report/ presentation / project/Open Book Test/Group Activities /Quiz/ Illustrations	30
	30
Total	60

PROGRAM(s): F.Y.B.Sc				SEMESTER: II
Course: Gardening-Advanced (Skill Enhancement Courses)				Course Code: WSBOTSE121
Teaching Scheme				Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Semester End Examination (Marks- 60)
NA	4	NA	2	
Learning Objectives: The specific objectives of this course are: <ol style="list-style-type: none"> 1. To train students to identify and describe different categories of ornamental plants. 2. To develop hands on skills of students to prepare different kinds of indoor gardens. 3. To expose the students to the public gardens and theme based gardens. 4. To develop skills of critical evaluation of gardens through visits and report writing. 				
Course Outcomes: The Learners will be able to - CO1- Describe different categories of the ornamental plants based on their characters. CO2- Characterize the public and theme based gardens. CO3- To prepare/create different kinds of indoor gardens.				

DETAILED SYLLABUS

Course Title	Gardening:Advanced	
Course Code	WSBOTSE121	
	<ol style="list-style-type: none"> 1. Indoor ornamental plants - Types, needs and caring 2. Outdoor ornamental plants - Types, needs and caring - Herbs, Shrubs, Trees 3. Outdoor ornamental plants - Types, needs and caring - Climbers, Creepers, Aquatic plants, Xeric plants 4. Pot gardens - Terrarium, Bottle gardens, 5. Pot gardens - Dish garden, Hanging baskets 6. Bonsai 7. Hydroponics 8. Vertical gardens 9. Terrace/Balcony garden 10. Lawn preparation 11. Visit - Public Garden (to understand garden features and their significance) 12. Visit - Theme based parks/ gardens (Butterfly Garden/ Nakshatra Udyan/ Arboretum/ Botanical Garden) 	2

References:

1. The Practical Gardening Encyclopaedia by Peter McHoy
2. Practical Handbook

Modality of Assessment: Semester End Practical Examination: Marks 60

Particulars	Marks
Journal	10
Spots	10
Viva	10
Performing	30
Total	60



PROGRAM(s): F.Y.B.Sc				SEMESTER: II
Course: Ayurvedic Herbs and Human Health (Indian Knowledge System)				Course Code: WSBOTIK121
Teaching Scheme				Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Assessment: 60 Marks
2	NA	NA	2	2 assignments (30+30 marks)
<p>Learning Objectives: The specific objectives of this course are:</p> <ol style="list-style-type: none"> 1. To introduce the basic principles of Ayurveda. 2. To understand the classification of herbs in Ayurveda 3. To emphasize the importance of Ayurveda in human health – Dincharya, Ritucharya, pathya Apathya, etc. 4. To understand the role of selected Ayurvedic herbs in human health. 				
<p>Course Outcomes: The Learners will be able to -</p> <p>Unit-I CO1-State the basic principles of ayurveda. CO2- Characterize the Prakruti based on the knowledge of Five Element Theory and Tridosa Theory.</p> <p>Unit-II CO3- Discuss the importance of lifestyle and dietary recommendations of Ayurveda CO4- Understand and analyze the role of herbs in Human Health.</p>				

DETAILED SYLLABUS

Course Title	Ayurvedic Herbs and Human Health		
Course Code	WSBOTIK121		
Unit	Unit Title	Lectures	Credits
I	Introduction to Ayurveda	15	
	<ul style="list-style-type: none"> ● History and Philosophy of Ayurveda ● Branches and Basic Principles of Ayurveda ● Five Element Theory (<i>Pancha Mahabhuta</i>), <i>Tridosha</i>, <i>Dhatus</i>, <i>Mala</i> etc. ● <i>Prakriti and Tridosha</i> ● <i>Prakriti Nidan</i> 		
II	Ayurveda in Human Health	15	2
	<ul style="list-style-type: none"> ● Definition of Disease, Treatment and medicine in Ayurveda ● Classification of herbs basis- Rasapanchak, therapeutic groups, part used, etcI. I. Rasapanchak – Rasa (6 Tastes), Guna (properties) Veerya, Vipaka, Prabhava II. Therapeutic group – Cardioprotective, complexion enhancing, anti-asthamatic, Vitalisers, Diuretics, etc. ● Diet (<i>Aahar</i>) & Nutrition - <i>Pathya- Apathya, Aahar Varga</i> ● Herbs in human health & care: <ul style="list-style-type: none"> ○ Weight management ○ Stress management ○ Reproductive health ● Healing through Ayurveda - <i>Panchakarma</i> 		

References:

- Major Herbs of Ayurveda : Editor - Elizabeth Williamson, compiled by Dabur Research Foundation.
- Prakriti: Your Ayurvedic Constitution by Svoboda, Robert E; Lotus Press: Twin Lakes publications.
- Ayurveda: The Science of Self-Healing, by Lad, Vasant; Lotus Press: Santa Fe, 1984.
- Ayurvedic Herbs: A clinical guide to the healing plants of traditional Indian medicine by M.S. Premila, Ph.d ; Haworth Press publications

Modality of Assessment: 60 Marks (2 Assignments- 30+30)

Evaluation Type	Marks
Assignment / Case study/ field visit report/ Industry based report/presentation / project/Open Book Test/Group Activities /Quiz/ Illustrations	30
	30
Total	60

