AC 01.09.23 ITEM NO: 25.1

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

National Education Policy (NEP) based

Syllabus for
Program: Bachelor of Science
Course: F.Y.B.SC.
Subject: BOTANY

Choice Based Credit System (CBCS)
with effect from
Academic Year 2023-2024

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in **Science** Program will be able to	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Programme. Execute strong theoretical and practical understanding generated from the specific graduate Programme in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	**Research-related skills and Scientific temper:** Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

Deccan Education Society's
Kirti M. Doongursee College (Autonomous)
Proposed Curriculum as per NEP 2020
Year of implementation- 2023-24
Name of the Department: BOTANY

Semester	Course Code	Course Title	Vertical	Credit
I	K23USBOTMJ111	Paper I – Plant Diversity-1	Major	2
	K23USBOTMJ112	(Paper II): Form and Function-1	Major	2
	K23USBOTMJP111	Practical 1 - Plant Diversity 1+ Form and Function 1	Major Practical	2
	K23USBOTOE131	Paper I- Systems of medicine	OE	2
	K23USBOTVC141	Organic Farming	VSC	2
	K23USBOTSC151	Field Botany – Morphology Based identification of plants	SEC	2
II	K23USBOTMJ211	Paper I: Plant Diversity-2	Major	2
	K23USBOTMJ212	Paper II: Form and Function-2	Major	2
	K23USBOTMJP 211	Practical 2 - Plant Diversity 2+ Form and Function 2	Major Practical	2
	K23USBOTMR221	Paper I – Current Trends In Plant Science-1	Minor	2
	K23USBOTVC241	Paper II- Floriculture	VSC	2
	K23USBOTSC251	Paper II- Preservation techniques of fruits and vegetables	SEC	2

Course Code	MAJOR SEM – I: BOTANY-	Credits	Lectures/Week
K23USBOTMJ111	Paper I – Plant Diversity-1	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- describe the salient features of major groups of algae (viz. Chlorophyta), Fungi and Bryophyta (Hepaticae) with suitable examples.
- understand life cycle and recent techniques related to cryptogam's viz. algae, fungi and bryophytes.
- use algae, fungi and bryophytes in day-to-day life.
- analyze systematic position and biotechnological aspects of algae and fungi.

Unit	Topics	No of Lectures
I	**ALGAE AND FUNGI:** 1. Structure, life cycle and systematic position of *Spirogyra.* 2. Structure, life cycle and systematic position of *Rhizopus.* 3. Economic importance of Algae and Fungi.	**15**
II	**BRYOPHYTA:** *1.* Structure, life cycle and systematic position of *Riccia.* 2. Economic importance of Bryophyta related to horticulture.	**15**

Textbooks:

1. Botany (I & II)-Sem. 1- By Dr. Avinash Patil, Dr. Darshana Patil, Dr. Anil Avhad, Tech-Max publications, Pune.
2. A New Course in Botany by Dr. Vikas V. Golatkar, Dr. Behnaz B. Patel and Dr. Neeraja S. Tutakne. Sheth Publication.

Additional References:

1. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises
2. Cryptogamic Botany Volume I and II by G M Smith, McGraw Hill publication.
3. Book for Degree Students- Algae by B R Vasistha, A.K.Sinha, S Chand Publication.
4. Book for Degree Students- Fungi by B R Vasistha **,** A.K.Sinha, S Chand Publication.
5. Book for Degree Students- Bryophytes by B R Vasistha **,** A.K.Sinha, S Chand Publication.

Course Code	MAJOR SEM – I: BOTANY-	Credits	Lectures/Week
K23USBOTMJ112	Paper II : Form and Function-1	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- describe plant cell structure and Genetic terminology.
- understand Ecosystem and functions of different cell organelles.
- apply basic concepts related to Mendelian Genetics, environmental landscape formations and functioning of an ecosystem.
- analyze functioning of cell organelles, types of ecosystem and hereditary phenomenon observed in nature and interactions of genetic crosses.

Unit	Topics	No of Lectures
I	**CELL BIOLOGY AND GENETICS:** 1. General structure of plant cell: cell wall, Plasma membrane (bilayer lipid structure, fluid mosaic model) 2. Ultra-structure and functions of the following cell organelles: Endoplasmic reticulum, and Chloroplast. 3. Genetic Terminology and Mendelian Genetics: monohybrid, dihybrid, test cross and back cross ratios.	**15**
II	**ECOLOGY:** 1. Ecosystem: Concept, components and functions. 2. Interactions of Biotic components. 3. Types of ecosystems: aquatic and terrestrial.	**15**

Textbooks:

1. Botany (I & II)-Sem. 1- By Dr. Avinash Patil, Dr. Darshana Patil, Dr. Anil Avhad, Tech-Max publications, Pune.

2. A New Course in Botany by Dr. Vikas V. Golatkar, Dr. Behnaz B. Patel and Dr. Neeraja S. Tutakne. Sheth Publication.

Additional References:

1. Cell and Molecular Biology by De Robertis. Publisher- Walters Kluwer.
2. Fundamentals of Ecology by E P Odum and G W Barrett. Thompson Asia Pvt. Ltd. Singapore.
3. Ecology by P. D. Sharma
4. Genetics by Russel. Wesley Longman inc. publishers. (5th edition)
5. An introduction to Genetics by A. M. Winchester, Publication-Barnes and Noble

Course Code	SEM I - Course Title-Botany practical	Credits	Lectures /Week
K23USBOTMJ P111	**Practical 1 - Plant Diversity 1+ Form and Function 1**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

- describe algae, fungi bryophytes by observing them under microscope with the help of fresh/preserved material and permanent slides.
- understand the technique of chromosomal staining to observe the stages of cell division during mitosis.
- apply algae, fungi and bryophytes for day to day life and adaptations of plants to specific ecological conditions.
- perform biostatistics, sampling, central tendency calculation of mean, median and mode.

Paper 1	
1	Study of stages in the life cycle of *Spirogyra* from fresh/ preserved material and permanent slides.
2	Study of stages in the life cycle of *Rhizopus* from fresh/ preserved material and permanent slides.
3	Economic importance of algae: *Ulva* (Biofuel), *Spirulina* (Neutraceutical), *Gelidium* (Agar).
4	Preparation of Jelly/ Pudding / Custard using Agar-Agar
5	Economic importance of Fungi: Mushroom, Yeast, wood rotting fungi (any bracket fungus).
6	Study of stages in the life cycle of *Riccia* from fresh/ preserved material and permanent slides.
7	Economic importance of Bryophytes in Horticultural practices: Preparation of Moss sticks.
Paper 2	
8	Examining various stages of mitosis in root tip cells (*Allium*)
9	Identification of cell organelles with the help of photomicrograph: Nucleus, Chloroplast and Endoplasmic Reticulum.
10	Cell inclusions: Starch grains (Potato and Rice); Aleurone layer (Maize), Cystolith (*Ficus*); Raphides (*Pistia*); Sphaeraphides (*Opuntia*).

11	Study of Human Karyoptypes: Normal male and female.
12	Identification of plants adapted to different environmental conditions: Hydrophytes: Floating: Free floating (*Pistia/Eichornia*); Rooted floating (*Nymphaea*); Submerged (*Hydrilla*)
13	Mesophytes (Sunflower); Hygrophytes (*Typha/Cyperus*)
14	Xerophytes : Succulent (*Opuntia*); Woody Xerophyte (*Nerium*);Halophyte (*Avicennia* pneumatophore) No sections in ecology, only identification and description of specimens. Morphological adaptations only.
15	Calculation of mean, median and mode.

Course Code	Open Elective (OE) SEM – I: BOTANY	Credits	Lectures/Week
K23USBOTOE131	Paper I- Systems of medicine	2	2

About the Course:

Course Objectives

After successful completion of this course, students would be able to

- understand history of medicine
- know different systems of traditional medicines
- apply the knowledge of Indian systems of medicine
- analyze and apply alternative therapy for day to day life

Unit	Topics	No of Lectures
I	**SYSTEMS OF MEDICINE 1:** 1. Introduction and history of medicine 2. Ayurveda - Shusrut Samhita, Charak Samhita, Philosophy 3. Unani -Introduction History , Principal and concept 4. Homeopathy - Principal and concept	**15**
II	**SYSTEMS OF MEDICINE 2:** 1. Allopathy- Pharmaceutical medicine, Psychotherapy, Surgery , radiation therapy, Physical rehab 2. Alternative therapy – Acupuncture, Acupressure, Massage therapy, Yoga. Reiki, Tai chi and aromatherapy 3. Infectious and contagious disease -Symptoms and prevention	**15**

References:

1. The practical guide to Healthy Living, Danny Cavanagh and Carol Willis, Ayurveda UK publication
2. Ayurvedic Healing by Dr. David Frawley and O.M.D, Motilal Banarasidass Publishers 1989.

3. Unani: The system of Medicine, Prof. Rais-Ur-Rahman; Advisor, Department of Ayush, Ministry of Health and Family Welfare, Govt of India.
4. Homeopathic Principles and Practice of Medicine, Dr. V.K. Chauhan, B. Jain Publishers.
5. Aromatherapeutic Blending, Jennifer Peace Rhind, Singing Dragon Publishers.
6. Physical Rehabilitation, 5th Edition, Susan B. O'Sulivan, F.A. Davis Company, USA
7. Tai-Chi Beginners Guide, Dr. Aihan Kuhn, YMAA Publication.
8. Book on Ancient Wisdom Modern concept, Indus Valley ayurvedic Centre, Mysore Karnataka.
9. Charak Samhita – 4 volumes, P.V. Sharma, Chaukhambha Orientalia Publisher
10. Acupuncture from ancient art to modern medicine by Alexander Macdonald, Geroge Allen, Unwin London, 1982.
11. Hand Book of Aromatic Plants by Prof. Supriya Kumar Bhattacharjee, Pointer Publishers, 2000.

Course Code	VOCATIONAL SKILL COURSE -BOTANY SEM – I - Course Title	Credits	Lectures/ Week
K23USBOTVC141	Paper I- Organic Farming	2	2

About the Course:

Course Objectives:

After successful completion of this course, students would be able to

- explain fundamentals of farming with pure organic methodologies.
- describe various applications of organic farming.
- analyze possibility of setting business with the organic commodities (sales and marketing).
- build and promote demand for organic product commodities.

Unit	Topics	No of Lectures
I	**BASICS OF FARMING PRACTICES:** 1. Organic Farming- Concept, Aims and Objectives, Importance and significance of organic farming with its features. 2. City farming—Need , Methodology 3. Advantages and Disadvantages, Case study of Organic farming	15
II	**FARMING TECHNOLOGY** 1. Methods of organic farming--- Soil health management, weed management, Crop diversity. 2. Biological Fertilizers- Organic manures, • Manure—Making methods of compost, vermicompost and Green manure ,Mulching and Organic mulches • Biofertilizers—Types, Use and significance. • Plant health promoters—*Amrutpani, Panchgavya, Jeevamrut, Beejamrut*, Natural Insecticides. *3.* Systems of organic certification and inspection, Government schemes related to organic farming. Indian scenario and future scope.	15

References:

1. Manual of Doshi City farming Published by Marathi Vidnyan Parishad ' *Shahari Sheti*"
2. Hand book of Organic farming By Arun K. Sharma, Agrobios India, 2001.
3. Organic Farming for Business By Dr. T. Natrajan, Swastik Publications Delhi, 2011.

4. Fundamental of Horticulture - 4th edition by Edmand, Senn, Andrew's Halfacre 1990 , Tata Mc Graw Hill publishing Company Ltd. New Delhi.
5. Principles of Horticulture - Denisen E. L. Macmillan Publication.

Course Code	SKILL ENHANCEMENT COURSE -BOTANY SEM – I - Course Title	Credits	Lectures/Week
K23USBOTSC151	Paper I- Field Botany – Morphology Based identification of plants	2	2

About the Course:

Course Objectives:

After successful completion of this course, students would be able to

- (Understanding)- to identify the plants by observations.
- (Apply)-to develop insight in nature education so that they help in conservation of nature.
- (Apply)-to apply acquired knowledge of techniques to do survey of habitats and local areas.
- (Analyze)- to analyze changes in the habitat over a period of time

Unit	Topics	No of Lectures
I	**Understanding Field Botany:** 1. Introduction and meaning of field botany—Nature Photography 2. Tools and techniques for study—Camera, Herbaria, Lists of flora, Catalogues, Reference books, Monographs, Mobile apps, Digital Herbaria, GPS instrument, Some handy instruments, Magnifying glass, plastic/paper bags for collection purpose 3. Importance of field botany—Seed collection, Carpology	**15**
II	**Morphological characters for field botany:** 1. Habit related—Herbs, Shrubs, Trees, Climbers, Creepers, Epiphytes, Parasites. 2. Different parts of plants • Root system- Function and Modifications—Tap root, adventitious roots. Modifications—Root nodules, Tuberous • Shoot system—Function and Modifications- Branching, Canopy, Bark pattern, Underground stems- Corm, Tuber, Rhizome, Bulbs, Runner, Phylloclade, Thorns, Tendrils, Spines, Hooks, Hairs	**15**

	• Leaf—Function- simple, compound, Venation, Arrangement, Stipules • Flower- Parts of flower, Trimerous, pentamerous, pedicillate, sessile, unisexual, bisexual, symmetry • Inflorescence—Racemose, cymose, special types • Fruits, seeds and their dispersal • Presence of glands, volatile oils, nectar, latex, fragrance 3. Association of plants—interdependence, coexistence—examples in fields—Insect galls, Myrmycophily,	

References:

1. College Botany Vol I, II and III by Gangulee Das and Dutta Central Education enterprises. Ecology by Santra
2. Ecology by Kumar
3. A handbook of city trees and urban planting by S.G. Neginhal.
4. Leaf based Identification for Trees of Sanhydri by Shrikant Ingalhalikar 2021, Corolla Publication.

Course Code	MAJOR SEM – II BOTANY	Credits	Lectures/Week
K23USBOTMJ211	Paper I : Plant Diversity-2	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- describe life cycle pattern of *Nephrolepis* (Pteridophytes), characters of Gymnosperms and Angiosperm plants.
- understand systematic position, structure of *Nephrolepis* and morphology of flowers.
- use Pteridophytes, Gymnosperms in day-to-day life and also can apply modifications and patterns of arrangement of flowers.
- analyze structure of *Nephrolepis,* and the characters of plants to assign them to respective families.

Unit	Topics	No of Lectures
I	**PTERIDOPHYTES AND GYMNOSPERMS:** 1. Structure, life cycle, systematic position and alternation of generations in *Nephrolepis.* 2. General characteristics and Economic importance of Gymnosperms.	**15**
II	**ANGIOSPERMS:** 1. Morphology of Flower: Parts of flower, calyx, corolla, androecium and gynoecium. 2. Study of following families: Malvaceae, and Amaryllidaceae.	**15**

Textbooks:

1. A New Course in Botany by Dr. Vikas V. Golatkar, Dr. Behnaz B. Patel and Dr. Neeraja S. Tutakne. Sheth Publication.

Additional References:

1. Book for Degree Students- Pteridophyta by P C Vasistha (2010) S. Chand Delhi India.
2. Book for Degree Students- Gymnospersm by P C Vasistha (2010) S. Chand Delhi India.
3. College Botany Volume I, II and III Gangulee, Das and Dutta latest edition. Central Education enterprises

Course Code	MAJOR SEM – II BOTANY	Credits	Lectures/Week
K23USBOTMJ212	Paper II : Form and Function-2	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- describe the internal construction of various plant organs and branches of forestry.
- explain different tissue system, concept of forestry and names of the plant used as medicine.
- apply functions of tissue systems.
- analyze tissue systems, role of forest and household remedies with traditional knowledge for common ailments.

Unit	Topics	No of Lectures
I	**ANATOMY:** 1. Simple tissues and complex tissues. 2. Primary structure of dicot and monocot root. 3. Primary structure of dicot and monocot stem.	**15**
II	**APPLICATIONS OF PLANT SCIENCE:** 1. Traditional medicinal practices for various ailments: (a) Cough and Cold- *Occimum sanctum* (Tulsi) and *Adathoda vasaka* (Adulsa). (b)Gastrointestinal- *Cuminum cymium* (Jeera) and *Ferula narthex* (Hing). 2. Introduction to the concept and branches of Horticulture. 3. Forestry: Concept and branches of forestry (production, protection and Social), role of forests. 4. Analytical technique- Chromatography : Introduction and types.	**15**

Textbooks:

1. A New Course in Botany by Dr. Vikas V. Golatkar, Dr. Behnaz B. Patel and Dr. Neeraja S. Tutakne. Sheth Publication.

Additional References:

1. Plant Anatomy by B. P. Pandey, Publisher S. Chand
2. A Handbook of Ethnobotany by S.K. Jain, V. Mudgal

3. Plants in folk religion and mythology (Contribution to Ethnobotany by S.K.Jain3rdRev.Ed.).
4. Complete Herbalist Volume I & II By Prof. O. Phelps Brown, Logos Press New Delhi, 2009.
5. Herbal Plants and their applications in Cosmeceuticals by Kuntal Das CBS Publishers, 2014.
6. Branches of Horticuture – by Dennisen ,
7. Fundamentals of Forestry- Vol. X- Forest Protection by S.S. Negi 1983, pub. Bishen Singh, Mahendra Pal Singh, Dehradun India.
8. Plant ecology and Phytogeography by V. Kumarsen 2001, Saras Publication.
9. An introduction to Practical Biochemistry 3rd edition by David Plummer- Mc Graw Hill Education (India) Pvt. Ltd. New Delhi.
10. Fundamental of Horticulture - 4th edition by Edmand, Senn, Andrew's Halfacre 1990, Tata Mc Graw Hill publishing Company Ltd. New Delhi.
11. Principles of Horticulture - Denisen E. L. Macmillan Publication.

Course Code	MAJOR SEM II - Course Title- Botany practical	Credits	Lectures /Week
K23USBOTMJP211	**Practical 2 - Plant Diversity 2+ Form and Function 2**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to

- describe different stages in the life cycle of *Nephrolepis*.
- explain plant specimens and their identification with the help of morphological and anatomical characters.
- apply economic importance of Gymnosperms (*Pinus*).
- analyze separation technique s by paper chromatography.

Paper 1	
1	Study of stages in the life cycle of *Nephrolepis*: Mounting of ramentum, hydathode, T.S. of rachis.
2	T.S. of pinna of *Nephrolepis* passing through sorus.
3	Economic importance of pteridophytes; Fun with ferns through aesthetic values of pteridophytes -*Pleopeltis, Adiatum*, Silver fern, *Nephrolepis, Selaginella, Lycopodium, Lygodium.*
4	Economic importance of Gymnosperms: *Pinus* (turpentine, wood, seeds)
5	Flower morphology : as per theory
6	Angiosperms: Family Malvaceae
7	Angiosperms: Family Amaryllidaceae
Paper 2	
8	Primary structure of dicot and monocot root.
9	Primary structure of dicot and monocot stem.
10	Study of dicot and monocot stomata.
11	Identification of forest products: major, minor. Plants suitable for social forestry- fire wood, green manure, biofuel, essential oil, and beautification.
12	Identification of plants or plant parts for Traditional medicinal practices for various ailments as per theory. Conservation of one medicinal plant in college garden.
13	Branch of horticulture with respect to PHT-Preservation- drying vegetable (Methi), Fruit (Chiku), medicinal (turmeric).
14	Separation of amino acids by paper chromatography.

15	Change in colour due to change in pH: Anthocyanin- black grapes/Purple cabbage.

Course Code	SEM – II: BOTANY- MINOR	Credits	Lectures/Week
K23USBOTMR221	Paper I – Current Trends In Plant Science-1	2	2

Course Outcomes:

After successful completion of this course, students would be able to

- describe the important features of Insectivorous plants and parasitic plants; explain the properties of Super-food and Plant-derived Natural Dyes with suitable examples.
- understand the range of morphological diversity with respect to Inflorescence and Flowers and also the concept of Insectivorous plants, parasitic plants, Orchid mimicry and super-food.
- use Super-food in day-to-day life.
- analyze the biotechnological aspects of Super-food and comparative account of Plant-derived Natural dyes/colors with synthetic dyes.

Unit	Topics	No of Lectures
I	**WONDERS OF BOTANY:** 1. Insectivorous plants: Concept, features and examples –*Nepenthes* (Pitcher), *Dionea* (Venus fly trap), *Utricularia* (Bladderwort) and *Drosera* (Sundew). 2. Parasitic plants*:* Concept, characteristics, classification and examples- *Cuscuta, Santalam album (*Sandal wood), *Striga, Orobanche Loranthus and Viscum.* 3. Orchid mimicry: Concept, types, significance and examples. *Ophrys,* Cryptostylis, *Stapelia* (Carrion-flower) and Passion-flower. 4. Largest inflorescence and largest flower- *Titan arum and Rafflesia arnoldii.*	**15**
II	**INDUSTRIAL BOTANY:** 1. Super-foods: Concept, properties, benefits and source from Algae Fungi, and Angiosperms- *Spirulina*, mushroom, yeast (single cell protein), sago preparation & pollen preparation. 2. Plant-derived Natural Dyes and Colors:	**15**

	types, properties, advantages and disadvantages- Indigo (*Indigofera tinctoria*), Henna (*Lawsonia inermis*), Turmeric (*Curcuma longa*), Beet (*Beta vulgaris*) and Litmus from Lichens.	

References:

1. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises.
2. Intermediate Botany by L. J. F. Brimble, Mac Millan & Co Ltd, New York, St. Martin Press-1960.
3. Plant Classification by Lyman Benson, Oxford & IBH Publishing Co.
4. Plant Taxonomy-Principle and Practice by Dr. Hari Prakash Pandey, Silver line Publications.
5. Plant Taxonomy by O. P. Sharma, Mc Grew Hill Education (India) Pvt. Ltd. 1993.
6. Morphology and Evolution of Vascular Plants by Ernst M. Gifford, Adriance S. Foster-W. H. Freeman Publication 1989.
7. Economic Botany for the Students of B.Sc., M.Sc. and Competitive Examination by B. P. Pandey-S. Chand Publication 1999.
8. Text Book of Economic Botany by Dr. V. Verma, Ane Book Pvt. Ltd Publication 2009.
9. Economic Botany A Comprehensive Study by S. L. Kochhar (Fifth Edition), Cambridge University Press Publication.
10. The Economic Botany of India by B. C. Chatterji-Published by Bipin Bihari Ghosh B. L., Malda.
11. The Pollen Book, Chapter 2-Pollen: Nutrition, Functional Properties, Health By Stefan Bogdanov.
12. Lal, J. J. (2003). "SAGO PALM". Encyclopedia of Food Sciences and Nutrition. pp. 5035–5039. doi:10.1016/B0-12-227055-X/01036-1. ISBN 9780122270550.
13. Palm Sago A Tropical Starch from Marginal Lands. Kenneth Ruddle, Dennis Johnson, Patricia K. Townsend & John D. Rees, AUSTRALIAN NATIONAL UNIVERSITY PRESS, Canberra.
14. Spirulina World Food-How this micro algae can transform your health and our world by Robert Henrikson.
15. “Orchids” by Gerg Allikas and Ned Nash, PRC Publishing LTD., 2000
16. Fundamentals of ecology and environmental biology by S. C. Santra, 2010, Publication - New central Book Agency (P) Ltd. Delhi.

Course Code	Vocational Skill Courses (VSC) Semester II -Course Title	Credits	Lectures/Week
K23USBOTVC241	**Paper II- Floriculture**	**2**	**2**
About the Course:			
Course Objectives: After successful completion of this course, students would be able to • discuss basic concepts of floriculture to make use of floriculture techniques in daily life. • understand cultivation practices of different flowers. • outline the aspects of cut flower industry to explore business opportunities. • impart advanced knowledge about field cultivation and Hi-tech methodologies related with floral crops.			
Unit	**Topics**		No of Lectures
I	**INTRODUCTION TO FLORICULTURE:** 1. Definition and Concept—Present status and future prospects. 2. Scope and Importance of Floriculture, Important Floriculture crops-Fillers and Foliage. 3. Methods of cultivation for cultivation of - Gerbera, Gladiolus, Orchids, Carnation and Lily, use of Green House Technology for cultivation of flowers.		**15**
II	**FLOWER INDUSTRY:** 1. Dry Flowers **–** • Introduction , Indian market of dry flowers, selection of material and basic technique- Maintenance of flower shape • Techniques of drying - Air drying, sun drying, press drying, desiccants, oven and microwave drying methods. • Preservation methods, bleaching, dyeing and painting, Embedding, Pressing. Procedure for Pot-Pourri. • Storage, care of dried flowers etc. • Dry flower arrangement and drift wood arrangement. 2. Cut Flowers –		**15**

	• Introduction—Scope, Cut flower standards, Species and cultivars of Orchids, Anthuriums and Heliconias. • Harvesting techniques, Mode of harvesting • Post-harvest handling - Conditioning, precooling, pulsing and impregnation, grading, bunching, wrapping, packing and cold storage, transport of cut flowers. • Indian market of cut flowers -Export-Opportunities and Challenges	

References:

1. Roy A.L.(1992) Introduction to Floriculture, 2nd Edition
2. Gurcharan Singh, Randhawa and Amitabha Mukhopadhyay, Floriculture in India, Allied Publishers
3. Adams, C. R., Principles of Horticulture, Elsevier Publication, 4th edition, 2004.
4. Debashish Sengupta and Raj Kamal, Floriculture Marketing in India, (Excel Books).
5. Sudheer, K. P. and Indira V, Post -Harvest Technology of Horticultural Crops, New Delhi Publications.
6. Introduction to Floriculture Second Edition By Roy A. Larson, Academic Press Elsevier, 2014.
7. Floriculture Fundamentals & Practices By Alex Lauric, Victor H. Ries, Agrobios India, 2001.
8. Ornamental Plants for Gardening by V. L. Chopra and Markanday Singh, Scientific Publishers, 2012.

Course Code	SKILL ENHANCEMENT COURSE Semester II - Course Title-Botany	Credits	Lectures/Week
K23USBOTSC251	Paper II- Preservation techniques of fruits and vegetables	2	2

About the Course:

Course Objectives:

After successful completion of this course, students would be able to

- explain different concepts related with food preservation.
- explore various ways and means for excessive production of perishable food materials.
- impart knowledge for development of business in food preservation industry.
- apply concepts of preservation for value added products from fruits and vegetables

Unit	Topics	No of Lectures
I	**BASICS OF PRESERVATION TECHNIQUES:** 1. Preservation of food—Concept, Demand and necessity, Principles of food preservation. 2. General methods of food preservations—General idea of Drying, Pickling, Use of radiation, Use of temperature, Sugar concentrates 3. Food preservatives—Organic, chemical.(inorganic), Antioxidants 4. Harvest and maturity, Picking, grading, packaging, transport	**15**
II	**METHODS OF FRUIT AND VEGETABLE PRESERVATIONS:** 1. Sugar concentrates—Jam, Jelly, Squash, Syrup, Pulp/ Puree/crush, Candy, Marmalades, Fruit leathers 2. Different types of Pickles, Sun drying of vegetables, (powders),Ready to cook vegetables, Sauce 3. Commercial aspects—Project report preparations, Permissions and technical details, Laws related to food processing, quality control, adulteration etc.	**15**

References:

1. Post-harvest an Introduction to the physiology and handling of fruits, vegetables and ornamentals. By R.B.H. Wills, W.B. Mcglesson & e.t.a.l Univ. of New South Wahs

Press, 2007.
2. Post-Harvest Technology by Verma and Joshi, Indus Publication.
3. Horticulture Marketing and post-harvest management By R. K. Meena and J. S. Yadav, Pointers Publishers, 2012.
4. Fruit Preservation by Daru Jagtiani 1993. Tarang Paperbacks, Vikas Publishing House Pvt. Ltd - New Delhi
5. Food Science by B. Shrilakshmi 1997 , New age international Pvt. Ltd New Delhi

Evaluation Scheme for First Year (UG) under NEP (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment (CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/ Group Discussion / Ind. Visit. – 10 marks

2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern: All questions are compulsory.

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks.
- Duration: 2 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

The passing standards is 40% for external and internal component (24 out of 60 for external and 16 out of 40 for internal).

NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.

Note:
Two short field excursions for habitat studies are compulsory. Field work of not less than eight hours duration is equivalent to one period per week for a batch of 15 students.

- A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal of F.Y.B.Sc. or a certificate from the Head of the department / Institute to the effect that the candidate has completed the practical course of F.Y.B.Sc. as per the minimum requirements. In case of loss of journal, a candidate must produce a certificate from the Head of the department/Institute that the practical's for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination, but the marks allotted for the journal will not be granted.