AC: 02.06.2025 ITEM NO: 25.2

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: S.Y.B.SC.
Subject: BOTANY

Choice Based Credit System (CBCS)

with effect from

Academic Year 2024-2025

(NEP 2020)

The Semester-wise and Broad Course Category-wise Distribution of credits of the Undergraduate Programme: **SCIENCE 2024-25**

LEVEL	Semester	MAJOR SUBJECT 1	MAJOR SUBJECT 2	Minor	OE	VSC SEC	AEC VEC IKS	OJT FP CEP, CC, RP	CC/SEM
4.5	I	2 + 2 = 4	2 + 2 = 4	-----	2	2 + 2 VSC 2 SEC 2	2 + 2 + 2 VEC EVS 2 IKS 2 AEC L1 1 AEC L2 1	CC 2	22
	II	2 + 2 = 4	2 + 2 = 4	-----	2 + 2	2 + 2 VSC 2 SEC 2	2 + 2 VEC EVS 2 AEC L1 1 AEC L2 1	CC 2	22
5.0	III	2 + 2 + 4 = 8	-----	2 + 2 = 4	2	VSC 2	AEC L1 1 AEC L2 1	FP 2 CC 2	22
	IV	2 + 2 + 4 = 8	-----	2 + 2 = 4	2	SEC 2	AEC L1 1 AEC L2 1	FP 2 CC 2	22

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- 2024-25
Name of the Department: BOTANY
CLASS-S.Y.B.Sc

Semester	Course Code	Course Title	Vertical	Credit
III	24BOTMJ311	Plant Diversity III	Major	2
	24BOTMJ312	Forms and Function III	Major	2
	24BOTMJP31	Practical - Plant Diversity III and Forms and Function III.	Major Practical	4
	24BOTMR321	Current Trends in Plant Sciences II	Minor	2
	24BOTMRP31	Practical - Paper -Current Trends in Plant Sciences II	Minor Practical	2
	24BOTOE331	Nutrition and Wellness Science	OE	2
	24BOTVS341	Polyhouse Management	VSC	2
IV	24BOTMJ411	Plant Diversity-IV	Major	2
	24BOTMJ412	Forms and Function IV	Major	2
	24BOTMJP41	Practical- Plant Diversity-IV and Forms and Function IV	Major Practical	4
	24BOTMR421	Current Trends in Plant Science III	Minor	2
	24BOTMRP41	Practical- Current Trends in Plant Science	Minor Practical	2
	24BOTOE431	Fundamental of Dietetics	OE	2
	24BOTSE451	Entrepreneurship development in Post-Harvest Technology	SEC	2

Course Code	SEM – III: BOTANY- MAJOR	Credits	Lectures/Week
24BOTMJ311	Plant Diversity III	2	2

Course Outcomes:

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

CO 1: Describe salient features of Phaeophyta from Algae with suitable examples.

CO 2: Explain characters of Class Anthocerotae from Bryophytes with suitable examples andforest types.

CO 3: Apply objectives and goals of plant systematics for identifying specific plant families andtheir interactions with other branches of Botany. Silviculture and aromatherapy.

CO 4: Analyze industrial applications of plant based products in mainly pharmaceuticals and fuels.

Unit	Topics	No of Lectures
I	**Thallophyta (Algae) & Spermatophyta** 1. Structure, life cycle and systematic position of *Sargassum*. 2. Structure, life cycle and systematic position of *Anthoceros*. 3. General characters of Class Phaeophyta. 4. General characters of Class Anthocerotae. 5. Systematics: Objectives and Goals of Plant Systematic & Plant Nomenclature. 6. With the help of Bentham and Hooker's system of Classification for flowering plants, study the vegetative and floral characters with its economic importance of the following families: ● Leguminosae- Caesalpinae, Papilionaceae and Mimosae ● Apocynaceae ● Palmae	**15**

II	**Application of Plant Sciences** 1. Introduction to pharmacopoeia: ● Indian pharmacopoeia 2. Secondary Metabolites: ● Alkaloids ● Volatile oils ● Gums ● Resins ● Tannins 3. Forestry: ● Types of Forest	**15**
	● Silviculture 4. Aromatherapy- Jasmine, Lemon and Jojoba 5. Biofuels 6. Microbiology-Types of Media and Sterilization Techniques.	

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- Bryophytes by B R Vasistha**,** A.K.Sinha, S Chand Publication.
5. Text book of Algae Bilgrami K. S CBS Publishers
6. A Pharmacognosy and Pharmacobiotechnology. New Age International (P) Limited, Publishers (formerly Wiley Eastern Limited)
7. Pharmacognosy, Phytochemistry, Medicinal Plants: Bruncton, J, Intercept Limited.
8. Kokate, C. K., Purohit, A. P. and Gokhale, S. B., Pharmacognosy, Nirali Prakashan, Pune.
9. Forest and forestry by K. P. Sagreiya NBT-1994
10. The Complete Aromatherapy & Essential Oils Handbook for Everyday Wellness- Nerys Purchon and Lora Cantele
11. Microbiology by Pelzer, Micheal & others – Tata McGraw Hill Education
12. Fundamental of Microbiology by Frobisher Hinsdil – W. B. Saunders
13. Textbook Of Microbiology 5th Edition by Dubey R C & Maheshwari D. K. - S Chand & Company
14. Textbook Of Microbiology 5Th Edition May 2016 By Arora And Arora by D R Arora and Brij Bala Arora, CBS PUBLICATION

Course Code	SEM – III: BOTANY- MAJOR	Credits	Lectures/Week
24BOTMJ312	FORMS AND FUNCTION III	2	2

Course Outcomes:

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

CO 1: Describe the structure and function of some cell organelles and micro-bodies in cell.

CO 2: Explain mechanisms of cell division and structure of cell organelles

CO 3: Application of Enzymes in industry and techniques of Electrophoresis.

CO 4: Analyze hereditary carriers and their role in genetic mechanism of living organisms and molecular biological aspect of genes and analytical techniques in Electrophoresis

Unit	Topics	No of Lectures
I	**CELL BIOLOGY AND GENETICS** 1. Cell Biology ● Ultra Structure and functions of the following cell organelles: ● Mitochondrion, (membranes, cristae, F1 particles and matrix) ● Ribosomes (prokaryotic, eukaryotic and subunits) Cell Division and its significance ● Meiosis 2. Genetics ● Variation in Chromosome structure (Chromosomal Aberrations) Definition, origin, cytological and genetic effects of the following: Deletions, Duplications, Inversions and Translocations. ● Extranuclear Genetics- Organelle heredity-Chloroplast determines heredity - Plastid transmission in plants, *Mirabilis Jalapa* Streptomycin resistance in *Chlamydomonas* and Male sterility in Maize 3. Enzymes industry: Cellulases and Papain.	**15**
II	**Molecular Biology** 1. Nucleic Acids: Types, structure and functions of DNA and RNA. 2. DNA replication: Modes of Replication, Messelson and Stahl Experiment. 3. DNA replication in prokaryotes and eukakaryotes, enzymes involved and molecular mechanism of replication. 4. Electrophoresis-Analytical technique.	**15**

References:

- Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by Dr. P. S. Verma, Dr.V. K. Agarwal, S. Chand publication
- Principles of molecular biology, 2nd edn- Veer Bala Rastogi Ane books pvt.
- Essentials in Plant Molecular biology- Sobati R.C. & Sharma V. L. Ane books pvt.
- Text book of genetics- Veer Bala Rastogi, Kedarnath & Ramnath Ane books pvt.

Course Code	SEM III -Botany Practical	Credits	Lectures/ Week	Total Hrs
24BOTMJP31	**Practical - Plant Diversity III + Form andFunction III**	**4**	**8**	**120**

Course Outcomes:

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

CO 1: Describe life cycle of *Sargassum, Anthoceros,* characters of family Leguminosae, Apocynaceae, Palmae.

CO 2: Explain method of gram staining, Biodiversity Composition, sterilization techniques ultra-structure of cell organelles.

CO 3: Uses of algae from Phaeophyta and applications of plants for Aromatherapy

CO 4: Analyze estimation and sequencing of DNA and RNA, qualitative test for phytochemicals.

Paper 1		
1	Study of stages in the life cycle of *Sargassum.* from fresh/ preservedmaterial and permanent slides.	120
2	Study of stages in the life cycle of *Anthoceros* from fresh/ preserved material and permanent slides.	
3	Economic importance of Phaeophyta.	
4	Study of range of thallus in Phaeophyta.	
5	Study of one plant from each family -Leguminosae –Caesalpinae and Papilionaceae Morphological peculiarities and economic importance of the members of these families.	
6	Study of one plant from family -Leguminosae - Mimosae	

	Morphological peculiarities and economic importance of the members of this family.	
7	Study of one plant from family Apocynaceae Morphological peculiarities and economic importance of the members of this family.	
8	Study of one plant from family Palmae Morphological peculiarities and economic importance of the members of this family.	
9	Gram staining of Bacteria	
10	Qualitative test of: ● Alkaloids ● Tannins	
11	● Study of Biodiversity Composition of different types of forests in India(tropical, subtropical & temperate)	
12	● Sources, properties and uses of plants for Aromatherapy (Jasmine, Lemongrass, *Eucalyptus*, Rose,) and Biofuels *(Jatropha*, Karanj, *Saccharum*)	
13	● Sterilization techniques	
14	● Preparation of Stock solutions, PDA and Nutrient agar	
Paper 2		
15	Examining various stages of Meiosis in plants cells	
16	Study of the ultra-structure of cell organelles : Mitochondrion and Ribosomes	
17	Study of Chromosomal Aberrations: Laggards, Ring Chromosome and chromosomal bridge.	
18	Study of Syndromes: Cri – du- chat and D-G translocation**.**	
19	Study of Enzymes: Cellulase (Sugarcane) and Papain (Papaya).	
20	Estimation of DNA from plant material	
21	Estimation of RNA from plant material	
22	DNA sequencing- Sanger’s method	
23	Determining the sequence of amino acids in the protein molecule synthesized fromthe given m-RNA strand (prokaryotic)	
24	Determining the sequence of amino acids in the protein molecule synthesized fromthe given m-RNA strand (eukaryotic)	
25	Horizontal and vertical Gel Electrophoresis – Demonstration	

Course Code	SEM – III: BOTANY- MINOR	Credits	Lectures/Week
24BOTMR321	**Current Trends In Plant Science-II**	**2**	**2**

Course Outcomes:

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

CO 1: Describe general characters of algae and their uses.

CO 2: Explain characters of fungi and gymnosperms.

CO 3: Use algae, fungi, gymnosperm and angiosperm and apply research methodology.

CO 4: Analyze characters of Malvaceae.

Unit	Topics	No of Lectures
I	**Plant Diversity** 1. General characteristics and Economic Importance of Algae. 2. General characteristics and Economic Importance of Fungi. 3. General characteristics and economic importance of Gymnosperms. 4. General characteristics of Angiosperms. ● Family Malvaceae 5. Grandma's pouch- concept	**15**
II	**Industrial Botany** 1. Pharmacognosy-Introduction to pharmacopoeia 2. Secondary Metabolites: Alkaloids, Volatile oils, Gums and Resins. 3. Forestry-Types of forests, Types of foresty 4. Economic Botany-Fibre, Spices, Condiments and Paper 5. Aromatherapy 6. Research Methodology: Introduction and basic outline for the conduct of research.	**15**

References:

1. A Pharmacognosy and Pharmacobiotechnology. New Age International (P) Limited, Publishers (formerly Wiley Easterm Limited)
2. Kokate, C. K., Purohit, A. P. and Gokhale, S. B., Pharmacognosy, Nirali Prakashan, Pune.
3. Botany-III (Current Trends in Plant Sciences I) by Dr. Darshana Patil, Dr. Sudhir Dhuri,

Dr. Bindu Gopalkrishnan, Tech-Max publications, Pune.
- A New Course in Botany S.Y.BSc semester-III & IV by Vikas V. Golatkar, Dr. Behnaz B. Patel, Dr. Neeraja S. Tutakne, Dr. Rachana R. Birje, Sheth Publishers PVT. LTD.
- College Botany by Gangulee Das Datta- Vol- I Central B K & Co
- Forest and forestry by K. P. Sargreiya – NBT- 1994
- Text book of Algae Bilgrami K. S. CBS publisher.
- Economic Botany by Hill, Albert F. Tata MaGraw Hill
- Text book of Economic Botany by Verma – Ane Books Pvt.

Course Code	**SEM III - Minor-Botany Practical**	**Credits**	**Lectures/Week**	**Total Hrs**
24BOTMRP31	**Current Trends In Plant Science II**	**2**	**4**	**60**

Course Outcomes:

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

CO 1: Describe diagnostic characters of Malvaceae with the help of fresh/preserved material also characters of plants used in Grandma's pouch

CO 2: Explain biodiversity, composition of different types of forests and objectives of Aromatherapy

CO 3: Use Algae, Fungi Gymnosperms for day to day life and plants used for Fibres, Paper, Aromatherapy, Spices and Condiments.

CO 4: Analyze vegetation of given area and phyto-constituents of medicinal plants.

Paper 1		
1	Economic Importance of algae. *Nostoc, Sargassum, Chlorella* and *Gellidium*	60
2	Economic Importance of Fungi Yeast, Mushroom, *Ganoderma* and *Aspergillus*	
3	Economic importance of Gymnosperms Wood, Food, Turpetine and Ornamental	
4	Diagnostic characteristics and economic importance of family Malvaceae	
5	Grandma's pouch: Tulsi, Turmeric, Ginger, Aloe, Adulsa and Sandalwood	
6	Qualitative test for Alkaloids and Volatile oils	

7	Study of Biodiversity Composition of different types of forests in India (tropical, subtropical & temperate) Study of vegetation by Quadrat method	

8	Sources, properties and uses of : Fibres and Paper	
9	Sources, properties and uses of plants for Aromatherapy (Jasmine, Lemongrass, Eucalyptus and Rose,)	
10	Sources , properties and uses of spices and condiments	

Course Code	**SEM – III Open Elective (OE)**	**Credits**	**Lectures/Week**
24BOTOE331	**Nutrition and Wellness Science**	**2**	**2**

Course Outcomes:
After successful completion of this course, students would be able to
CO 1: Describe the nutritional aspects, macro and micro elements its roles and food source.
CO 2: Understand nutritional requirements of macro and micro elements.
CO 3: Analyze the nutritional components and the concept of wellness.
CO 4: Use of macro and micro elements for the improvement of health.

Unit	**Topics**	**No of Lectures**
I	**Nutrition and nutrients** Introduction, Importance of nutrition, Macro nutrients; Carbohydrates, Lipids, Proteins Water and Fiber (Definition, importance and food source) Micronutrients; Vitamins and Minerals; types and functions	**15**
II	**Concept of wellness** Introduction, Dimensions of wellness, Diet and diet plans, Health benefits of diet, line of diet action for various deficiency disease, Organic wellness; Benefits of Organic Food for Health, Fitness and its types, Wellness with respect to physical fitness	**15**

References:

1. Nutritional Biochemistry, Home Science- Nutrition and Dietetics, Vikas Publishing house, Alagappa University, University by MHRD-UGC, Govt. of Tamil-Nadu, Karaikudi.
2. Clinical Biochemistry 9th Edition, Simon Walker, Geoffrey Beckett, Peter Rae, Peter Ashby, Wiley Blackwell, A John Wiley and Sons Publications.
3. Nutritional Biochemistry: Current topics in Nutrition Research, Apple Academic Press, CRC Press: Taylor & Francis group, Editor: Chad Cox, Ph.D., International Standard book number-13:978-1-77188-285-9, Oakville, Canada.
4. Fundamentals of Foods, Nutrition and Diet Therapy 5th Edition, S.R. Mudambi., M.V. Rajagopal., New Age International Publishers, New Delhi.

- Nutrition and Dietetics, Tamilnadu Textbook Corporation, Dr. Sheila John, Mrs. Sadhana Rajamohan Parimalam, Mrs. S. Karthiga, Mrs. Anna Ragini Chellapa, Govt. of Tamilnadu.
- An Introduction to Nutrition, Volume 1.0, Licensed under Creative Commons.
- Practical Exercise Therapy 4th Edition, Margarett Hollis, Phyl Fletcher-Cook, Blackwell Science Ltd. U.S.A.
- Concepts of Fitness and Wellness 2nd Edition, Scott Flynn, Lisa Jellum, Jonathan Howard, Althea Moser, David Mathis. University system of Georgia.

Course Code	**SEM – III VOCATIONAL SKILL COURSE**	**Credits**	**Lectures/ Week**	**Total Hrs.**
24BOTVS341	**Polyhouse Management (Practical based)**	**2**	**4**	**60**

Course Outcomes:

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

CO 1: Describe components and types of polyhouse

CO 2: Understand the difference between polyhouse and green house, along with its advantages and disadvantages.

CO 3: Apply the knowledge of cultivation practice for various flowering and fruiting crops

CO 4: Analyze the Costing, Polyhouse subsidy and Success story of Polyhouse management.

Sr. No.	**Experiment (Theory incorporated along with practicals)**	
1	Study of various types of Polyhouse.	
2	Study of core material and covering material for Polyhouse.	
3	Application of computers, instruments, devices and equipment used for Polyhouse.	
4	Media for growing plants in Polyhouse: Soil, peat, perlite, vermiculite, sawdust, barkchips, sand, gravel, pumice, polyurethane mats and water.	
5	Determination of pH of media used in Polyhouse cultivation.	
6	Application of fertilizers, nutrients and other water-soluble products.	
7	Study of Irrigation techniques in polyhouse.	60
8	Identification of Major Pest and diseases in Polyhouse: Aphids, caterpillar, white flies,spider mites, mealy bug, rodent, powdery mildew, mosaic, rot.	

9	Study of various types of fertilizers used in Polyhouse. Micronutrient liquid fertilizer, growth promoters, bio NPK liquid fertilizers, growthboosters.	
10	Costing, Polyhouse Success story and Case study.	
11	Soil less cultivation of leafy vegetables	
12	Cultivation of microgreens: Ragi and Jowar	

References:

1. Introduction to Soil Science: SSAC-121, Indian Council of Agricultural Research (ICAR), Tamilnadu Agricultural University. Fitzpatrick E.A. Publisher- Oliver & Boyd
2. Certificate course on Integrated Nutrition Management for fertilizer dealers, National Institute of Agriculture Extension Management. Govt. of India, Hyderabad.
3. Water management handbook, westlands water district. https://wwd.ca.gov/wp-content/uploads/2015/09/water-management-handbook-2013.pdf.
4. Training manual of organic agriculture. TECA. Climate and tenure division of Food and Agriculture organization of United Nation.
5. Farmers handbook on Basic Agriculture (2nd Edition). Dr. P. Chandra Shekara, Dr. N. Balasubramani, Dr. Rajiv Sharma. Desai Fruits and Vegetables pvt. Ltd.
6. Nutrient Management Handbook. International Fertilizer Association. Global Alliance for Climate- Smart Agriculture.Soilless Culture theory and practice. Michael Raviv, J. Henrich Lieth. Elsevier; USA.

Course Code	SEM – IV BOTANY MAJOR	Credits	Lectures / Week
24BOTMJ411	Plant Diversity-IV	2	2

Course Outcomes:

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

CO 1: Describe general characters of phycomycetae and lepidophyta, morphology of fruits and bio-geo chemical cycles

CO 2: Understand the lifecycle of *Albugo* and *Selaginella*, formation of fossil and its types,secondary growth in dicotyledonous stem and root

CO 3: Use of lichens in day-to-day life, and apply the knowledge of garden features

CO 4: To analyze the characteristics of plant community and types of garden

Unit	Topics	No of Lectures
I	**Thallophyta and Spermatophyta II** 1. General characters of Phycomycetae. 2. Life cycle of *Albugo,* and symptoms and control measures of disease caused by *Albugo*. 3. Lichens- Classification, structure, method of reproduction, economic Importance and ecological significance of Lichens. 4. General characters of Lepidophyta. *5.* Life cycle of *Selaginella.* *6.* Life cycle of *Cycas.* 7. Morphology of Fruits (Angiosperms)	**15**
II	**Paleobotany, Ecology and Horticulture** 1. Paleobotany- Life scale of *Rhynia* , formation and types of fossils 2. Ecology- Biogeochemical Cycles- Carbon, Nitrogen, Phosphorous and Water.	**15**

	3. Community ecology-Plant Community and Characters of community. 4. Horticulture- Garden features and Types of garden- Formal and informal gardens.	

References:

1. Book for Degree Students- Fungi by B R Vasistha A.K. Sinha, S. Chand Publications.
2. Plant Diseases by K. D. Chincholkar, Rajat publications-New Delhi.
3. Book for Degree Students- Pteridophyta by P C Vasistha (2010) S. Chand Delhi India.
4. Agashe S.N - Paleobotany.
5. Arnold A.C - An Introduction to Paleobotany.
6. Book for Degree Students- Gymnosperm by P C Vasistha (2010) S. Chand Delhi India.
7. The plant community by H. G. Hanson and E. D. Churchill
8. Plant Ecology by P.L. Kochar. Publishers- S- Nagin & Co.
9. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises
10. Principles of Horticulture – E. L. Denisen – Macmillan publication
11. Principles of Horticulture and fruit growing by Y. N. Kunte, M.P.Kawthalkar, K. S. Yawalkar, 10th Edition , Agri-Horticultural Publishing House, Nagpur.
12. Fundamentals of Horticulture- 4th edition by Edmand, Senn, Andrews, Halfcare 1990- Tata McGrew Hill publication- New Delhi
13. Introduction to Palebotany- Amod, Chester R Tata Mc-Graw Hill

Course Code	SEM – IV BOTANY MAJOR	Credits	Lectures / Week
24BOTMJ412	Form and Function- IV	2	2

Course Outcomes:

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

CO 1: Describe the types of vascular bundles, normal secondary growth in dicotyledonous stemand root and types of enzymes. Lab organization for PTC

CO 2: Understand secondary growth in dicotyledons, plant water relations, transpiration, osmosis, carbohydrate metabolism and organ culture in PTC.

CO 3: Use knowledge of secondary growth, photo-periodism, phytochrome response and PTC intotipotency and organogenesis.

CO 4: Analyze the biotechnological methods and bio statistical applications.

Unit	Topics	No of Lectures
I	**Anatomy And Physiology** 1. Anatomy- ● Types of Vascular Bundles. ● Normal Secondary Growth in Dicotyledonous stem and root. 2. Physiology- ● Plant-Water Relations, transpiration and osmosis. ● Enzymes, Carbohydrates metabolism. ● Photoperiodism: Phytochrome response ● Vernalization.	**15**
II	**Biotechnology, Biostatistics and Research Methodology** 1. Introduction to plant tissue culture ● Laboratory organization and techniques in plant tissue culture. ● Totipotency	**15**

	● Organogenesis ● Organ culture – root cultures, meristem cultures,anther and pollen culture, embryo culture. 2. Introduction to R-DNA technology. 3. Biostatistics ● Introduction ● Mean, Median, Mode, Frequency distribution and Coefficient of Correlation.	

References:

1. Plant Anatomy by B. P. Pandey, Publisher S. Chand
2. Plant Physiology by Taiz and Zeiger Sinauer Associates inc. publishers
3. Introductory Plant physiology by Noggle and Fritz, publisher phi learning Pv. Ltd, New Delhi 1.
4. Introduction to Biostatistics by P. K. Banerjee, S, Chand publication.
5. Plant Biotechnology by K. Ramavat.
6. Plant Biotechnology by R. C.Dubey, S Chand publication.
7. Bioinformatics by Igasimuthu

Course Code	SEM IV - Botany practical MAJOR	Credits	Lectures/ Week	Total Hrs.
24BOTMJP41	**Plant Diversity IV + Form and Function IV**	**4**	**8**	**120**

Course Outcomes:

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

CO 1: Describe the life cycle of *Albugo, Selaginella and Cycas*, normal secondary growth in dicotyledonous stem and root and study the types of vascular bundles.

CO 2: Understand plant water relations, transpiration, osmosis and carbohydrate metabolism.

CO 3: To study photo-periodism, phytochrome response and plant tissue culture- totipotency, organogenesis and organ culture.

CO 4: To study and analyze the biotechnological method: r-DNA and biostatistics- mean, median, mode, frequency distribution and co-efficient of correlation with respect to research methodology.

Plant Diversity IV		
1	Study of stages in the life cycle of *Albugo* from fresh/ preserved material and permanentslides.	120
2	Study of stages in the life cycle of *Selaginella* from fresh/ preserved material.	
3	Study of stages in the life cycle of *Cycas* from fresh/ preserved material.	
4	Study of fungal diseases- powdery mildew.	
5	Study of Lichens (crustose, foliose, & fruticose).	
6	Angiosperm: Morphology of fruit	
7	Study of the working of the following Ecological Instruments- Soil thermometer, Soiltesting kit, Soil pH, Wind anemometer	
8	Mechanical analysis of soil by the sieve method & pH of soil.	
9	Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapidtitration method.	
10	Study of vegetation by the list quadrat method.	
11	Study of five examples of plants for each of the garden locations as prescribed for theory.	
12	Preparation of garden plans – formal and informal gardens.	
13	Preparation of Bottle and dish garden.	
Form and Function IV		
14	Study of different types of vascular bundles.	

15	Study of normal secondary growth in the stem of a Dicotyledonous plant.	

16	Study of normal secondary growth in the root of a Dicotyledonous plant.	
17	Study of conducting tissues- Xylem and phloem elements in Gymnosperms andAngiosperms as seen in LS and through macerationtechnique.	
18	Various sterilization techniques.	
19	Preparation of Stock solutions, Preparation of MS medium.	
20	Seed sterilization, callus induction.	
21	Regeneration of plantlet from callus.	
22	Identification of the cloning vectors – pBR322, pUC 18, Ti plasmid.	
23	Calculation of coefficient of correlation.	
24	Q10 – germinating seeds using Phenol red indicator	
25	NR activity – in-vivo.	
26	Estimation of proteins by Lowry’s method (Prepare standard graph).	

Course Code	SEM – IV: BOTANY- MINOR	Credits	Lectures/Week
24BOTMR41	Current Trends In Plant Science III	2	2

Course Outcomes:

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

CO 1: Describe general characters of Bryophyta, Pteridophyta, cell structure, cell wall, cell organelles: mitochondria and ribosome. Describe Garden and its types and study of botanicalgarden: Veer Mata Jijabai Udyan (Victoria garden).

CO 2: Understand plant disease: fungal, bacterial and viral and understand the types of media and sterilization technique.

CO 3: Use the application of different features of garden to plan garden layout.

CO 4: Analyze the concept of Mendelian inheritance: monohybrid and dihybrid cross with respect to the pea plant.

Unit	Topics	No of Lectures
I	**Plant Diversity & Microbiology** 1. General Characteristics and Economic importance of Bryophyta. 2. General Characteristics and Economic importance of Pteridophyta. 3. Disease-Plant Pathology- Fungal, Bacterial and viral. 4. Microbiology-Introduction, cell structure, Types of media and sterilization.	**15**
II	**Horticulture and genetics** 1. Introduction toHorticulture: Branches of Horticulture and Gardening 2. Locations in the garden- edges, hedges, lawn, flower beds,avenue, water garden (with names of two plants for each category).Focal point. 3. Types of garden a. Formal and informal gardens	**15**

	b. National Park: Sanjay Gandhi National Park. 4. Botanical Garden: Veer Mata Jijabai Udyan (Victoria Garden). 5. Ultra Structure and functions of the following cell organelles: ● Mitochondrion ● Ribosome 6. Cell structure, cell wall and General structure. 7. Mendelian Inheritance:-Monohybrid and Dihybrid cross and ratio	

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- Bryophytes by B R Vasistha**,** A.K.Sinha, S Chand Publication.
5. College Botany by Ganguly Das Datta
6. Plant Pathology by Mehrotra R. S. Publisher TMH
7. Microbiology- Pelzar, Micheal J. and others. Tata McGraw Hill

Course Code	SEM – IV: BOTANY- MINOR-Practical	Credits	Lectures /Week	Total Hrs.
24BOTMRP421	**Current Trends In Plant Science III**	**2**	**2**	**60**

Course Outcomes:

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

CO 1: Describe general characters of Bryophyta, Pteridophyta, cell structure, cell wall, cell organelles: mitochondria and ribosome. Describe Garden and its types and study of botanical garden: Veer Mata Jijabai Udyan (Victoria garden).

CO 2: Understand plant disease: fungal, bacterial and viral and understand the types of media and sterilization technique.

CO 3: Use the application of different features of garden to plan garden layout

CO 4: Analyze the concept of Mendelian inheritance: monohybrid and dihybrid cross with respect to the pea plant.

Paper 1		
1	Economic importance of Bryophyta. Sphagnum moss, Marchantia, Polytricum, Funaria.	60
2	Economic importance of Pteridophyta. Lycopodium, Marsilea, Equisetum, Lygodium, Azolla	
3	Fungal: Powdery mildew, Bacterial: Blight of Potato and Viral: Leaf curl of Papaya.	
4	Microbiology- Sterilization: Dry and Wet Types of media: PDA,Nutrient Agar,	
5	Garden features- edges, hedges, lawn, flower beds, avenue, water garden (with names of two plants for each category)	
6	Garden planning of Formal gardens	
7	Garden planning of informal gardens	
8	Ultra Structure and functions of the following cell organelles: Mitochondria, Ribosome	
9	Cell structure, cell wall and general structure.	
10	Mendelian Inheritance:-Monohybrid and Dihybrid cross	

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- Bryophytes by B R Vasistha**,** A.K.Sinha, S Chand Publication.

· Plant Pathology by Mehrotra R. S. Publisher TMH · Microbiology- Pelzar, Micheal J. and others. Tata McGraw Hill Laboratory Manual of Microbiology, Biochemistry &Molecular Biology. Saxena, Jyoti &others. Scientific Publication	

Course Code	SEM – IV Open Elective (OE)	Credits	Lectures/Week
24BOTOE431	Fundamental of dietetics	2	2

Course Outcomes:

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

CO 1: Explain dietetics and methods of cooking and its significance.

CO 2: Understanding importance and nutritive value of Cereals, Pulse, Fats and oil in our diet.

CO 3: Use of Cereals, Pulse, Fats, oil, Vegetables and fruits for best nutritive gain healthy life.

CO 4: Analyze the essential basic requirements of nutritional dietary components Cereals, Pulse, Fats, oil, Vegetables and Fruits**.**

Unit	Topics	No of Lectures
I	**Concept of Dietetics** 1. Introduction to dietetics 2. Food groups system and its significance 3. Functions of food: physiological, psychological, and social. 4. Food pyramid, portion size for different age groups. 5. Cooking methods- moist heat, dry heat. Combination, their merits and demerits.	15
II	**Nutritional Dietetics** 1. Cereals: Types, nutritional value and cereal rich food. Major millet crops of India and their benefits 2. Pulses: Forms of pulse, nutritive value and health benefits of pulses, Products of Soya bean 3. Fats and oil: Types of lipids, Difference between fats and oil, Nutritional significance of fats and Role of fats in cooking 4. Vegetables and fruits: Classification, Nutritive value, and health benefits. 5. Browning of fruits and measure to prevent browning	15

References:

- Nutritional Biochemistry, M.Sc. Home Science- Nutrition and Dietetics, Vikas Publishing house, Alagappa University, University by MHRD-UGC, Govt. of Tamil-Nadu, Karaikudi.
- Textbook of Nutrition and Dietetics by Ranjana Mahna & Seema Puri Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth
- Fundamentals of Foods, Nutrition and Diet Therapy 5th Edition, S.R. Mudambi., M.V. Rajagopal., New Age International Publishers, New Delhi.
- Nutrition and Dietetics, Tamilnadu Textbook Corporation, Dr. Sheila John, Mrs. Sadhana Rajamohan Parimalam, Mrs. S. Karthiga, Mrs. Anna Ragini Chellapa, Govt. of Tamilnadu.
- A Textbook of Foods, Nutrition & Dietetics Begum R M Sterling Publishers Pvt. Ltd, 2008 - Diet therapy
- Dietetics- Sarent Ed – Srilaksmi B. New Age Int.
- Home Science & Dietitics for a career- Indian Ministry of Labour Publisher Ministry of Labour
- Changing trends in health and nutrition – Dass, Sujata K. Isha Book
- Nutrition and health- Jain, Shaanu. Publisher – Khel Sahitya Kendra
- Nutrition Science – Srilaksmi B. New Age Int.
- Nutritional Biochemistry- Trueman, Patrica MJP Publ.

Course Code	Semester IV SKILL ENHANCEMENT-COURSE	Credits	Lectures / Week	Total Hrs.
24BOTSE451	**Paper – ENTREPRENURSHIP DEVELOPMENT AND POST HARVEST TECHNOLOGY**	**2**	**4**	**60**

Course Objectives:

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

CO 1: Describe the types of entrepreneurial competencies and food preservatives. CO 2: Understand Entrepreneurship skills and Storage of plant produce.

CO 3: Apply the product development and pricing, advertising and branding techniques of different preservation and processing skills in terms of the business.

CO 4: Analyze the Self-help group and Government subsidies and schemes.

Sr. No.	Experiment (Theory incorporated along with practicals)	
1	Study of entrepreneur skills.	60
2	Preparation of Feasibility report.	
3	Preparation of quotation, purchase order and billing.	
4	Marketing strategies and advertisement in business development.	
5	Study of Labeling and Content creation for branding.	
6	Filling of Patent application form and procedure of patenting.	
7	Case study: (Online or visit bank) : Schemes provided by bank or Financial Institutions.	
8	Storing of plant produce by using of Natural and Artificial preservatives.	
9	Post-harvest processing of spices and condiments.	
10	Packing and preservation of plant produce.	
11	Preparation of ready to eat food item(Upma, Poha, Kheer and Utappa)	
12	Preparation of dried Spice mix(Pav bhaji masala, Garam Masala, Sambhar Masala)	
13	Formulation of cosmetic products by using plant produce.	

References:

1. E. Gordon and K. Natrajan. (2017). Entrepreneurship development (6th Revised Edition). Himalaya Publishing house pvt. Ltd.
2. Entrepreneurship development skills. Shivaji University Kolhapur.
3. Vijay Rakesh Reddy. (2018). Dehydration of arid- horticultural crops. ICAR- Rajasthan.
4. N.S.D.C. Food Industry capacity and skill initiative (FICSI) Handbook of Jam, jelly,Ketchup. Food processing sector: Govt. of India
5. Practical manual, Learning assistance center, University of Hawaii, Manoa
6. Communications, training and consultations, Karen Rayl & David Bassham Bassham, Rayl & Associates, Business writing skills.
7. Effective communication (Student Manual), IS-242.b. Training FEMA.
8. Practical manual of Entrepreneurship development and Business management. Dr. Sanjeev Kumar and Dr. Ashutosh Verma. College of Agriculture, Jhansi 284003.
9. Practical guide to write business plan, Lousinia Small Business Center. Southeastern Lousinia University.
10. Practical Guide to preparing Your Business plan. New York State Business Development Center.
11. Manual of patent office practice and procedure. (2019). Indian Patent office. Government of India
12. Patent application form. Indian patent office. Government of India.
13. Business quotation template. Queensland University. Quotation practical guide preparation.
14. Steps to prepare purchase order (2024). The Complete Guide to Purchase Order Process (2024) (kissflow.com)
15. Prepare purchase order. What is Purchase Order? Definition, Sample Format & Process – Tally Solutions.
16. Practical guide. Genio solutions. Invoice, Receipt and Estimate templates.
17. Practical guide. Becoming and entrepreneur, from idea to launch havinf a clear vision. Charles Sunnen. Banque of Luxemberg.
18. Practical manual dairy management and Entrepreneurship. Experiment on Identification of Entrepreneur skills.
19. Marketing Strategy and types of marketing. 5 Marketing Experiments That Show the Value of Testing Ideas (propelrr.com)
20. Practical manual content on labeling of business product. Designing a Package Label – Food Product Development Lab Manual (pressbooks.pub)
21. Lab manualfor digital marketing. Chandigarh University. School of Business administration.
22. Beginners manual on digital marketing and E-Commerce. UNESCAP. South Asia Network and CDG.
23. Schemes for MSME (2022). Govt. of India.
24. MSME SCHEMES. Government of India ISO 9001:2008 Certified Organization
25. Post-Harvest Technology A Text Book by S. Krishnaprbhu
26. The Complete Book on Spices & Condiments (with Cultivation, Processing & Uses) 2nd Revised Edition- NIIR Board of Consultants & Engineers, Asia Pacific Business Press Inc.
27. Jam, Jelly and Pickle Making Business Startup by Samantha Parker
28. Food preservation techniques'- Zeuthen, Petervalion Techniques English Woodhead Publications.
29. Practical manual on Post-harvest and value addition of frutis and vegetables. Neha Nishchal. College

of Agriculture. Namkum. Jharkhand Rai University.

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

I. Internal Evaluation for Theory Courses – 20 Marks

1) **Continuous Internal Assessment (CIA-1)** Assignment – 10 marks

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

II. External Evaluation for Theory Courses – 30 Marks

Duration: 1 Hour

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 for 2 credits and 100 marks for 4 credits.
- Duration: 2 Hours for each practical course of 2 credits and 4 hrs. for each practical course for 4 credits.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

PASSING STANDARD NEP Second Year:

- The learners /students shall obtain minimum of 40% marks in the Internal Assessment and External Assessment (Semester End Examination) COMBINED, to pass the course in a particular semester. A learner / student will be said to have passed the course if He/She passes the Internal Assessment + Semester End Examination COMBINED.

- To pass the examination attendance is compulsory in both internal and external (theory plus practical) examination.

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 S.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 S.Y.BSc. 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 practicals 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.