SNDT Women's University, Mumbai

Bachelor Of Science
(Botany)

B.Sc. In Botany

As Per NEP – 2020

Semester – III & IV

Syllabus

(WEF. 2025-2026)

Structure with Course Titles

SN	Courses	Type of Course	Credits	Marks	Int	Ext
	Semester III					
30132611	Plant Physiology I	Major (Core)	4	100	50	50
30132612	Plant Physiology II	Major (Core)	4	100	50	50
30132613	Plant Physiology III	Major (Core)	4	100	50	50
30332611	Practical Course in Plant Physiology	Minor Stream	2	50	0	50
30432611	**Economic Botany**	OEC	2	50	0	50
	-	AEC (Modern Indian Language)	2	50	50	0
31332601	-	FP	2	50	50	0
	-	CC	2	50	50	0
			22	**550**	**300**	**250**
SN	**Courses**	**Type of Course**	**Credits**	**Marks**	**Int**	**Ext**
	Semester IV					
40132611	Cell Biology I	Major (Core)	4	100	50	50
40132612	Cell Biology II	Major (Core)	4	100	50	50
40132613	Biochemistry	Major (Core)	4	100	50	50
40432611	**Medicinal Plants**	OEC	2	50	0	50
40732611	Herbal Cosmetics	SEC	2	50	0	50
	-	AEC(Modern Indian Language)	2	50	0	50
41532601	-	CE	2	50	50	0
	-	CC	2	50	50	0
			22	**550**	**250**	**300**

Exit with UG Diploma with 4 extra credits (44 + 4 credits)

Course Syllabus

Semester: III

3.1 To 3.4 Major (Core)

Course Title	**Plant Physiology**
Course Credits	**12**
Course Outcomes	After going through the course, learners will be able to

	• Importance of water and the mechanism of transport
	• To understand biosynthesis and breakdown of biomolecules.
	• Role of plant hormones in plant development and about secondary metabolites
	• Preliminary understanding of the basic functions and metabolism in a plant body
	• To understand the importance of nutrients in plant metabolism and crop yield.
Module 3.1(Credit 4)	**Plant Physiology I**
Learning Outcomes	After learning the module, learners will be able to
	Understand Plant water relations and ascent of sap
Content Outline	Plant water relations: Water as a solvent, Diffusion, osmosis, imbibition, osmotic pressure, osmotic potential, turgor pressure, wall pressure, water potential and its components. Transpiration. Types and process, Mechanism of guard cell movement, K+ ion mechanism, Antitranspirants. Mechanism of ascent of sap
Module 3.2(Credit 4)	**Plant Physiology II**
Learning Outcomes	After learning the module, learners will be able to understand
	Mechanism of Photosynthesis and Photorespiration
Content Outline	Photosynthesis: Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation Photorespiration. Respiration: Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Oxidative Pentose Phosphate Pathway. Nitrogen metabolism: Biological nitrogen fixation: Nitrate and ammonia assimilation.
Module 3.3(Credit 4)	**Plant Physiology III**
Learning Outcomes	After learning the module, learners will be able to
	Understand the role of Plant Growth regulators
Content Outline	Plant growth regulators: Definition and classification, Auxins, Gibberellins, cytokinins, ABA and ethylene . Synthetic growth regulators: Biological clocks, photoperiodism. Plant

	Movements
Module 3.4(Credit 2) Plant Physiology Practical	
Learning Outcomes	After learning the module, learners will be able to
	Know the physiological processes in plant metabolism
Content Outline	1. Experiment to demonstrate the phenomenon of exosmosis and endosmosis. 2. To determine the osmotic pressure of the cell sap by plasmolytic method. 3. To demonstrate that oxygen is liberated in the process of photosynthesis. 4. Separation of photosynthetic pigments by paper chromatography and measure their Rf values 5. To Study of Phototrophism.

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

As part of the Comprehensive Continuous Evaluation (CCE), the course instructor is expected to design activities for each chapter that bridge theoretical knowledge to practical application, emphasizing problem-solving and collaboration. These activities aim to evaluate both theoretical understanding and practical skills, aligning the curriculum with real-world problem scenarios. The evaluation can be done in the following manner External Examination with Theory papers and the practical examination including Product submission, projects, etc. The Internal evaluation should comprise the Unit tests, and continuous Internal evaluation emphasizing practical, Projects, activities, presentations, seminars, workshops, products, assignments and reports

References:

1. Wilson, K. and Walker, J. 1994 Fundamentals of Biochemistry 2nd Ed, John Wiley and Sons Inc.
2. JainV K, 2008. Fundamentals of Plant Physiology.S Chand and Co.
3. Kochhar P L, Krishnamoorthy H N. Plant Physiology. Atmaram and sons, Delhi.
4. Kumar and Purohit. Plant Physiology: Fundementals and Applications.Agrobotanical Publishers.
5. Malik CP, 2002. Plant Physiology. Kalyani publishers.
6. Mukherjii S, Ghosh AK, 2005. Plant Physiology. New Central Book Agency, Culcutta.
7. Noggle GR, Fritz GJ, Introductory Plant Physiology.Prentice Hall of India.
8. Pandey SN, Sinha BK, 2006. Plant physiology.Vikas Publishing House, NewDelhi.
9. Salisbury F B, Ross C W, 1992. Plant Physiology. CBS publishers and Distributers, NewDelhi.
10. Sinha A K, 2004. Modern Plant Physilogy. Narosa publishing House, NewDelhi.
11. Srivastava H S, 2004. Plant physiology and Biochemistry. Rasthogi publications.
12. Verma V, 2007.Text Book of Plant Physiology. Ane Books Pvt. Ltd.

3.5 OEC

Course Title	**Economic Botany**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to understand the economic importance of plants in various applications
	• The uses of Forest products
	• Applications of plants in various industries
	• Identifying the source and plant part used in the industy
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	Understand the importance of plants in food and nutrition
Content Outline	**Industry based on plant products** **Botanical Sources, plant part used, properties, active constituents, processing and uses** **Spices and Condiments:** Saffron and Cardamom Flavors Vanillin, **Nutraceuticals** - Spirulina Chlorella
Module 2(Credit 1)	
Learning Outcomes	The students will learn the sources of plant material used in the paper and textile industries
Content Outline	**Botanical Sources, Properties, Processing and uses.** **Types of Fibres:** Jute and Cotton, **Types of Papers:** Paper yielding plants, Process of pulping and paper making

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References: -

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Pharmacognosy & Pharmacobiotechnology by Ashutosh Kar
4. Essential of Pharmacognosy by Dr. S. H. Ansari
5. Economic Botany by Kocchar.

Semester: IV

4.1 To 4.3 Major (Core)

Course Title	**Cell Biology and Biochemistry**
Course Credits	**12**
Course Outcomes	After going through the course, learners will be able to Understand Cell metabolism, chemical composition, physiochemical and functional organization of organelle
	• Contemporary approaches in modern cell and molecular biology.
	• Study the organization of cell, cell organelles and biomolecules
	• To gain knowledge on the activities of diverse macro molecules and microscopic
	• To understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.
Module 4.1(Credit 4)	
Learning Outcomes	After learning the module, learners will be able to
	Know the types of plant cells and its structure
Content Outline	Structure of Plant Cell – Prokaryotic and Eukaryotic cell, Cell wall, distribution, chemical composition, functions and variations in prokaryotic and eukaryotic cells Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- . .
Module 4.2(Credit 4)	After learning the module, learners will be able to
Learning Outcomes	Understand the structure of cell organells
Content Outline	Cell organells- Mitochondria, Chloroplast, Ribosomes and Nucleus Structure of DNA and RNA Chromosomes: History, types and functions of chromosomes. Giant chromosomes, Polytene chromosome and Lampbrush chromosome
Module 4.3(Credit 4) Biochemisrty	
Learning Outcomes	After learning the module, learners will be able to
	Understand the structure and functions of Biomolecules

Content Outline	Introduction and scope of Biochemistry Carbohydrates :Structure, Classification and functions of Carbohydrates Enzymes: Classification, kinetics and mechanism of action. Proteins and amino acids: Classification, structure - primary, secondary, tertiary and quaternary. Classification of Amino acids. Vitamins: Lipids: Classification, structure, function and biosynthesis of fatty acids.

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References:

1. Cooper, G.M., Hausman, R.E. (2009). The Cell: A Molecular Approach, 5th edition. Washington, D.C.: ASM Press & Sunderland, Sinauer Associates, MA 2 3
2. Karp, G. (2010). Cell Biology, 6th edition. New Jersey, U.S.A.: John Wiley & Sons.
3. De Robertis, E. D. P. and De Robertis R. E. 2009. Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia.
4. Becker W. M., Kleinsmith L.J. and Bertni G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San fransisco.
5. Reven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H.Freeman and Company
6. Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2013). Essential cell biology (4th ed.). Garland Publishing.
7. Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992).Biology of Plants. New York, NY: W.H. Freeman and Co.

8. Verma, P. S. (2004). Cell Biology,Genetics, Molecular Biology: Evoloution and Ecology. India: S. Chand Limited.

4.4 OEC

Course Title	**Medicinal Plants**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to Recognize the basic medicinal plants
	• Apply techniques of conservation and propagation of medicinal plants
	• Setup process of harvesting, drying and storage of medicinal herbs
	• Propose new strategies to enhance growth of medicinal herbs
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	Know the importance of Medicinal Plants and its conservation
Content Outline	History, Scope and Importance of Medicinal Plants; polyherbal formulations. Conservation, Augmentation and Ethnobotany and Folk Medicine Conservation of Endemic and endangered medicinal plants,
Module 2(Credit 1)	
Learning Outcomes	The learners will be aware of the various medicinal plants and its application
Content Outline	Brief description of selected plants and derived drugs, Guggul (Commiphora), Boswellia, Arjuna (Terminalia arjuna), Turmeric (Curcuma longa), Kutaki (Picrorhiza kurroa), Opium Poppy, Cincona and Artemisia and Podophyllum

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References:

1. Akerele, O., Heywood, V. and Synge, H. (1991). The Conservation of Medicinal Plants. Cambridge University Press.

2. AYUSH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. New

Delhi: Department of

3. Ayurveda, Yogaand Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare, Government of India.
4. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). Aush Gyanya: Handbook of Medicinal and Aromatic Plant Cultivation.
5. Dev, S. (1997). Ethno-therapeutics and modern drug development: The potential of Ayurveda. Current Science 73:909–928.
6. Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16thedn. Philadelphia, PA: Elsevier Saunders Ltd.
7. Jain, S.K. and Jain, Vartika. (eds.) (2017). Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects. Deep Publications, Delhi
8. Kapoor, L.D. (2001). Handbook of Ayurvedic medicinal plants. Boca Raton, FL: CRC Press.
9. Saroya, A.S. (2017). Ethnobotany. ICAR publication.
10. Sharma, R.(2003). Medicinal Plants of India-An Encyclopaedia. Delhi: DayaPublishing House.
11. Sharma, R. (2013) Agro Techniques of Medicinal Plants. Daya Publishing House,Delhi.
12. Thakur, R.S., H.S. Puri, and Husain, A.(1989). Major medicinal plants of India.Central Institute of Medicinal and Aromatic Plants, Lucknow, India.

4.5 SEC

Course Title	**Herbal Cosmetics**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to Understand and recognize the various raw materials used in Herbal Cosmetics and their properties.
	Understand the various raw materials and their properties
	Understand the standard guidelines and regulations to be followed for cosmetics.
	Gain the knowledge of Job opportunities in the cosmetic industry
	Understand the scope for entrepreneurship in cosmetic fields
Module 1(Credit 1	
Learning Outcomes	After learning the module, learners will be able to
Content Outline	**Raw materials used for formulation of Skin care and Hair care Cosmetics:** Biological source and description of raw materials of natural origin like fixed oils, waxes, gums, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulation. Herbal Skin care Cosmetics: • Cleansing agents - Apricot. • Emollients - Aloe, Almond. • Astringent – Amla • Freshening agent - Chandan, Khus. • Skin Pigmentation - Saffron, Ambe haldi.
Module 2(Credit 1)	
Learning Outcomes	
Content Outline	Herbs used as antioxidants, free-radical scavenger, antiseptic, antibacterial, antiwrinkle, anti-fungal. CHerbal Hair Care Products • Hair grooming: Apricot, Aloe • Hair growth promotors: Brahmi, Manjistha, Jatamansi. • Hair Tonics: Bavachi, Hibiscus, Amla

	• Anti-dandruff: Tulsi, Neem, Lemon, Orange, Ritha • Hair colorants: Henna, Amla, Bhringaraja, Chamomile • Hair cleansing: Ritha, Shikakai, Amla Formulation of Cosmetic products using herbs: • Hair Oil • Hair Conditioner • Hair Shampoo

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References:

1. Marvin Balsam, Edward Sagarin; Cosmetic Science and Technology Vol I, II, III Ed. 2nd, John Wiley & Co. England
2. The Wealth of India: Raw Materials (11 Vol.+ 2 Suppl.). Head, NISCIR, Dr. K. S. Krishnan Marg, Pusa Campus New Delhi-110 012, India. 1950.
3. Bare P., Cosmetics Analysis selective methods with techniques.
4. Behl PN, Srivastava G. Herbs Useful in Dermatological Therapy. Ed. 2nd New Delhi, India: CBS Publishers. 2002
5. Hand Book of herbal products Vol I & II by NIIR Board of Technologist. National Institute of Industrial Research,
6. Trease and Evans Pharmacognosy: William Charles Evans Revised with the assistance of Daphne Evans Ed. 16th Elsevier 2009