Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati

(Empowered Autonomous)

Three/Four Year Honours/Honours with Research B. Sc. Degree

Program in Botany

(Faculty of Science)

CBCS Syllabus

S. Y. B. Sc. (Botany) Semester - III

For Department of Botany

NEP 2.0

Choice Based Credit System Syllabus (2024 Pattern)

(As Per NEP 2020)

To be implemented from Academic Year 2025-2026

Title of the Programme: S.Y. B. Sc. (Botany)

Preamble

AES's Tuljaram Chaturchand College of Arts, Science and Commerce (Autonomous) has decided to change the syllabus of various faculties from June, 2023 by taking into consideration the guidelines and provisions given in National Education Policy (NEP), 2020. The NEP envisions making education more holistic and effective and to lay emphasis on the integration of general (academic) education, vocational education and experiential learning. The NEP introduces holistic and multidisciplinary education that would help to develop intellectual, scientific, social, physical, emotional, ethical and moral capacities of the students. The NEP 2020 envisages flexible curricular structures and learning based outcome approach for the development of the students. The credit structure and courses framework provided in the NEP are nationally accepted and internationally comparable.

The rapid changes in science and technology and new approaches in different areas of Botany and related subjects, the Board of Studies in Botany at Tuljaram Chaturchand College, Baramati - Pune, has prepare the syllabus of F.Y. B.Sc. Botany Sem. I and II the Choice Based Credit System (CBCS) by following the guidelines of NEP 2020, NCrF, NHEQF, Prof. R.D. Kulkarni's Report, GR of Government of Maharashtra dated 20th April, 16th May 2023 and 13th March 2024 and the Circular of SPPU, Pune dated 31st May 2023 and 2nd May, 2024.

A Botany degree equips students with the knowledge and skills necessary for a diverse range of fulfilling career paths. Graduates in Botany find opportunities in various fields, including urban planning, teaching, environmental science, all plant sciences, organic farming, nursery management, entrepreneurship, mushroom cultivation, medicinal plant, floriculture, horticulture, propagation methods and plant tissue culture method and many other domains. Throughout their three year degree program, students explore the significance of plant in life of each and every living organism on Earth. They learn tool, techniques, process which is required to set up agencies including pickles, jam, and jelly, medicinal plant, fruit processing, vegetable processing, organic product, organic fertilizer and pesticides producing industries also they can earn the knowledge to produce natural remedies for various diseases. They became expert in discovery and development of many new therapeutic compounds which are now used in pharmaceutical herbal cosmetics and other compound based industries.

Overall, revising the Botany syllabi in accordance with the NEP 2020 ensures that students receive an education that is relevant, comprehensive, and prepares them to navigate the dynamic and interconnected world of today. It equips them with the knowledge, skills, and competencies needed to contribute meaningfully to society and pursue their academic and professional goals in a rapidly changing global landscape.

Programme Specific Outcomes (PSOs)

PSO1. Knowledge and understanding of: 1. The range of plant diversity in terms of structure, anatomy, function and environmental relationships. 2. The evaluation of plant diversity. 3. Identification and classification and the flora of Maharashtra. 4. The role of plants in the functioning of the global ecosystem. 5. A selection of more specialized, optional topics. 6. Application of Statistics to solve biological problem.

PSO2. Intellectual skills – able to: 1. Think logically and organize tasks into a structured form. 2. Assimilate knowledge and ideas based on wide reading and through the internet. 3. Transfer of appropriate knowledge and methods from one concept to another within the subject. 4. Understand the evolving state of knowledge in a rapidly developing research field. 5. Construct and test hypothesis. 6. Plan, conduct and write a report on an independent term project.

PSO3. Practical skills: Students learn to carry out practical work, in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain greater proficiency in a selection of them depending on their choice of optional modules. 1. Interpreting plant morphology and anatomy. 2. Plant identification. 3. Vegetation study techniques. 4. Analysis of chemical compounds in plant materials in the context of plant physiology and biochemistry. 5. Analyze data using appropriate statistical methods and computational packages. 6. Plant pathology to be added for lab to land farm.

PSO4. Transferable skills: 1. Use of IT (word-processing, use of internet, statistical packages and databases). 2. Communication of scientific ideas in writing and orally. 3. Ability to co-ordinate as part of team. 4. Ability to use library resources. 5. Time

PSO5. Scientific Knowledge: Apply the knowledge of basic plant science, life sciences and fundamental process of plants to study and analyze any plant form.

PSO6. Problem analysis: Identify the taxonomic position of plants, formulate the research literature and analyze PET structure and non-reported plants with substantiated conclusions using first principles and methods of nomenclature and classification in Botany.

PSO7. Design/development of solutions: Design solutions from medicinal plants to solve health problems, disorders and disease of human beings and animals

estimate the phytochemical content of plants which fulfil the specified needs to appropriate consideration for the public and animal health.

PSO8. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide scientific conclusions.

PSO9. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Bioinformatics, Biophysics, Biostatistics, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and

PSO10. The Botanist and society: Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

PSO11. Environment and sustainability: Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable agricultural and environmental development.

PSO12. Ethics: Apply ethical principles and commit to environmental ethics and responsibilities and norms of the biodiversity conservation.

PSO13. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary task settings.

PSO14. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and intertie effective reports and design documentation, make effective presentations and give and receive clear instructions.

PSO15. Project management and finance: Apply knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team to manage projects and in eco-friendly environments.

PSO16. Life-long learning: Identify the necessities and have the preparation and ability to engage in independent and life-long learning in the broadest context of upcoming advanced technology.

Credit Distribution Structure for Three/Four Year Honours/Honours with Research Degree Programme

Level/ Difficulty	Sem	Subject DSC-1	Subject DSC-2	Subject DSC-3	GE/OE	SEC	IKS	AEC	VEC	CC	Total
4.5/100	I	2(T)+2(P)	2(T)+2(P)	2(T)+ 2(P)	2(T)	2 (T/P)	2(T) (Generic)	2(T)	2(T)	--	22
	II	2(T)+2(P)	2(T)+2(P)	2(T)+2(P)	2(P)	2 (T/P)	--	2(T)	2(T)	2(T	22
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/Internship OR Continue with Major and Minor **Continue option**: Student will select one subject among the (subject 1, subject 2 and subject 3) as major and other as minor and third subject will be dropped.											
Level/ Difficulty	**Sem**	**Credits Related to Major**				**Minor**	--	**GE/OE**	**SEC**	**IKS**	**AEC**	**VEC**	**CC**	**Total**
		Major Core	**Major Elective**	**VSC**	**FP/OJT/CEP/RP**									
5.0/200	III	4(T)+2(P)	--	2 (T/P)	2(FP)	2(T)+2(P)	--	2(T)	--	2(T)	2(T)	--	2(T)	22
	IV	4(T)+2(P)	--	2 (T/P)	2(CEP)	2(T)+2(P)	--	2(P)	2 (T/P)	--	2(T)	--	2(T)	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4credits core NSQF course/Internship OR Continue with Major and Minor														
5.5/300	V	8(T)+4(P)	2(T)+2(P)	2 (T/P)	2(FP/CEP)	2(T)	--	--	--	--	--	--	--	22
	VI	8(T)+4(P)	2(T)+2(P)	2 (T/P)	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 3Years		**44**	**8**	**8**	**10**	**18**	**8**	**8**	**6**	**4**	**8**	**4**	**6**	**132**
Exit option: Award of **UG Degree in Major** with 132 credits OR Continue with Major and Minor														
6.0/400	VII	6(T)+4(P)	2(T)+2 (T/P)	--	4(RP)	4(RM)(T)	--	--	--	--	--	--	--	22
	VIII	6(T)+4(P)	2(T)+2 (T/P)	--	6(RP)	--	--	--	--	--	--	--	--	22
Total 4Years		**64**	**16**	**8**	**22**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year **UG Honours with Research Degree** in Major and Minor with 176 credits														
6.0/400	VII	10(T)+4(P)	2(T)+2 (T/P)	--	--	4(RM) (T)	--	--	--	--	--	--	--	22
	VIII	10(T)+4(P)	2(T)+2 (T/P)	--	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 4Years		**72**	**16**	**8**	**14**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year **UG Honours Degree** in Major and Minor with 176 credits														

T = Theory **P** = Practical **DSC** = Discipline Specific Course **OE** = Open Elective **SEC** = Skill Enhancement Course

IKS = Indian Knowledge System **AEC** = Ability Enhancement Course **VEC** = Value Education Course **CC** = Co-curricular Course

VSC= Vocational Skill Course **OJT**= On Job Training **CEP**= Community Engagement Project **FP**= Field Project **RP**= Research Project

With Multiple Entry and Exit options as per National Education Policy (2024 Pattern as per NEP 2020)

Course Structure (2024 Pattern)

Course Structure for F.Y. B. Sc. Botany Semester I and II (2024 Pattern)

Sem.	Course Type	Course Code	Course Title	Theory / Practical	Credits
I	DSC-I (General)	-101-GEN		T	02
		-102-GEN		P	02
	DSC-II (General)	-101-GEN		T	02
		-102-GEN		P	02
	DSC-III (General)	BOT-101-GEN	Plant Diversity	T	02
		BOT-102-GEN	Botany Practical - I	p	02
	Open Elective (OE)	BOT-103-OE	Horticulture	T	02
	Skill Enhancement Course (SEC)	BOT-104-SEC	Fruit Processing Industries	P	02
	Ability Enhancement Course (AEC)	ENG-104-AEC		T	02
	Value Education Course (VEC)	ENV-105-VEC		T	02
	Generic Indian Knowledge System (GIKS)	GEN-106-IKS		T	02
	Total Credits Semester-I				**22**
II	DSC-I (General)	-151-GEN		T	02
		-152-GEN		P	02
	DSC-II (General)	-151-GEN		T	02
		-152-GEN		P	02
	DSC-III (General)	BOT-151-GEN	Industrial Botany	T	02
		BOT-152-GEN	Botany Practical - II	P	02
	Open Elective (OE)	BOT-153-OE	Floriculture	P	02
	Skill Enhancement Course (SEC)	BOT-154-SEC	Mushroom Cultivation	P	02
	Ability Enhancement Course (AEC)	ENG-154-AEC		T	02
	Value Education Course (VEC)	COS-155-VEC		T	02
	Co-curricular Course (CC)	YOG/PES/CUL/NSS/NCC-156-CC	To be selected from the CC Basket	T	02
	Total Credits Semester-II				**22**
	Cumulative Credits Semester I + Semester II				**44**

Course Structure (2024 Pattern)

Course Structure for S.Y. B. Sc. Botany Semester III and IV (2024 Pattern)

Sem.	Course Type	Course Code	Course Title	Theory/ Practical	Credits
III	Major Mandatory	BOT-201-MRM	Taxonomy of Angiosperm	Theory	02
	Major Mandatory	BOT-202-MRM	Plant Physiology	Theory	02
	Major Mandatory	BOT-203-MRM	Botany Practical - I	Practical	02
	Vocational Skill Course (VSC)	BOT-204-VSC	Practical based on Herbal Cosmetics	Practical	02
	Feld Project (FP)	BOT-205-FP	Field Project	Practical	02
	Minor	BOT-206-MN	Floriculture	Theory	02
	Minor	BOT-207-MN	Practical based on Floriculture	Practical	02
	Open Elective (OE)	BOT-208-OE	Economic Botany	Theory	02
	Subject Specific Indian Knowledge System (IKS)	BOT-209-IKS	Botany in Ayurveda	Theory	02
	Ability Enhancement Course (AEC)	MAR-210-AEC/ HIN-210-AEC/ SAN-210-AEC	-	Theory (Any one)	02
	Co-curricular Course (CC)	YOG/PES/CUL/ NSS/ NCC-211-CC	To be continue from the Semester - II	-	02
				Total Credits Semester - III	**22**
IV	Major Mandatory	BOT-251-MRM	Plant Anatomy	Theory	02
	Major Mandatory	BOT-252-MRM	Plant Ecology	Theory	02
	Major Mandatory	BOT-253-MRM	Botany Practical - II	Practical	02
	Vocational Skill Course (VSC)	BOT-254-VSC	Herbal Cosmetics	Theory	02
	Community Engagement Project (CEP)	BOT-255-CEP	Community Engagement Project	Practical	02
	Minor	BOT-256-MN	Industrial Botany	Theory	02
	Minor	BOT-257-MN	Practical based on Industrial Botany	Practical	02
	Open Elective (OE)	BOT-258-OE	Practical based on Horticulture	Practical	02
	Skill Enhancement Course (SEC)	BOT-259-SEC	Practical based on Floriculture	Practical	02
	Ability Enhancement Course (AEC)	MAR-260-AEC/ HIN-260-AEC/ SAN-260-AEC	-	Theory (Any one)	02
	Co-curricular Course (CC)	YOG/PES/CUL/ NSS/ NCC-261-CC	To be continue from the Semester - III	-	02
				Total Credits Semester - IV	**22**
				Total Credits Semester II + IV	**44**

Name of the Programme : **B. Sc. Botany**
Program Code : **USBT**
Class : **S. Y. B. Sc.**
Semester : **III**
Course Type : **Major Mandatory (Theory)**
Course Code : **BOT-201-MRM**
Course Title : **Taxonomy of Angiosperms**
No. of Credits : **02**
No. of Teaching Hours : **30**

Course Objectives:

1. To identify scope and objectives of Plant Taxonomy.
2. To impart knowledge of identification of plants and their nomenclature.
3. To give knowledge of identification of plants using different sources.
4. To understand primitive and advanced systems of classification of angiosperms.
5. To know the economic importance of plants.
6. To understand research concept for publication of taxonomic literature.
7. To inculcate knowledge of digitization of taxonomic data.

B) Course Outcomes:

By the end of the course, students will be able to:

CO1. Develop skill of plant identification
CO2. Identify and describe different plants.
CO3. Use knowledge of systematics in plant studies
CO4. Develop knowledge of classification of flowering plants.
CO5. Aware about conservation of biodiversity.
CO6. Know importance of taxonomy in plant Sciences.
CO7. Utilize Artificial Intelligence in plant taxonomy

Credit – I **(15 L)**

Unit – I

1.1 Introduction to Plant Taxonomy: **2L**

Definition, scope, importance, objectives of plant taxonomy.

1.2. Systems of classification: **6L**

Types of systems with their merits and demerits- a)Natural system -Bentham and Hooker

b)Phylogenetic System: APG system.

1.3. Taxonomic literature: **3L**

Flora, monograph, manuals, journals, periodicals, references books.

1.4. Sources of data for Systematics: **4L**

Morphology, Cytology, Phytochemistry, Molecular biology.

Credit – II **(15L)**

Unit – II

1. Study of Plant Families **10L**

Study of following families with reference to systematic position, salient features, floral formula, floral diagram and any five examples with their economic importance - Annonaceae, Myrtaceae, Solanaceae, Euphorbiaceae and Amaryllidaceae.

2. Computer in taxonomy: **5L**

Concept of herbarium, advantages and disadvantages, Digital /e-herbarium advantages and disadvantages, QR code in Plant taxonomy.

References:

1. Almeida, M.R. 2009. *Flora of Maharashtra*. Vol. 1(Ranunculaceae to Connaraceae), 294 pp.; Vol. 2(Fabaceae to Apiaceae), 372 pp.; Vol. 3a(Rubiaceae to Ehretiaceae)300 pp.; Vol. 3b(Cuscutaceae to Martyniaceae) 301–464 pp.; Vol. 4a(Acanthaceae to Balanophoraceae)278 pp.; Vol. 4b(Bischofiaceae to Ceratophyllaceae) 279– 399 pp. and Vol. 5a(Hydrocharitaceae to Typhaceae) 1–245 pp.St. Xavier's College, Mumbai.
2. Angiosperm Phylogeny Group, 2016, An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1–20.
3. Douglas E. Soltis, Pamela E. Soltis, Peter K. Endress and Mark W. Chase, 2005. Phylogeny and Evolution of Angiosperms. Sinauer Associates, Inc., Publishers, Sunderland, USA.
4. Simpson, Michael George. 2006. Plant systematics. Elsevier Academic Press.
5. Singh, Gurcharan. 2019. Plant Systematics: An Integrated Approach, Fourth Edition. CRC Press.7. Singh, N.P., Karthikeyan, S., Lakshminarasimhan, P. & Prasanna, P.V. (2000) *Flora of Maharashtra State: Dicotyledons Vol. I*. Botanical Survey of India, Calcatta, 898.
6. Singh, N.P., Lakshminarasimhan, P., Karthikeyan, S. & Prasanna, P.V. , 2001, *Flora of Maharashtra State (Dicotyledones). Vol. 2*. Botanical Survey of India, Calcutta, India, 1080.
7. Stuessy Tod F. 2002. Plant taxonomy. The systematic Evaluation of comparative data. Bishen Singh Mahendra Pal Singh, Dehra Dun.

8. Stuessy, Tod F., 2009. Plant taxonomy: the systematic evaluation of comparative data (2nd ed.). New York: Columbia University Press.
9. Walter S. Judd, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens and Michael J. Donoghue, 2007. Plant Systematics: A Phylogenetic Approach, Third Edition. Sinauer Associates, Inc., Publishers, Sunderland, USA.
10. Yadav S.R. and Sardesai M.M. , 2002, Flora of Kolhapur District. Shivaji University, Kolhapur.

Mapping of Program Outcomes with Course Outcomes

Class : S.Y.B. Sc. (Sem. III) **Subject** : Botany

Course : Taxonomy of Angiosperms **Course Code : BOT-201-MRM**

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation.

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1		3				2			1				
CO2	3	3			3						2	3	
CO3	3	3		3		3					3	3	
CO4	3	3		3		3							
CO5				3				3					
CO6				3		3	3						
CO 7	2	2			2	3	2	2					

PO1 :Disciplinary Knowledge:
CO1. Use artificial intelligence in plant taxonomy
CO2. Give nomenclature to plants.
CO3. Expertise in systematic studies
CO4. Develop technique of identification and classification of plant of flowering plants.

PO2 : Critical Thinking and Problem solving
CO1. Identify importance of plants in human welfare..
CO2. Give nomenclature to plants.
CO3. Expertise in systematic studies
CO4. Develop technique of identification and classification of plant of flowering plants.
CO5. Use artificial intelligence in plant taxonomy

PO4: Research-related skills and Scientific temper
CO1. Expertise in systematic studies
CO2. Develop technique of identification and classification of plant of flowering plants.
CO3. Create awareness of conservation of biodiversity.
CO4. Creating awareness on importance of Taxonomist in Life Sciences.

PO5:Trans-disciplinary knowledge
CO1. Give nomenclature to plants.
CO2. Use artificial intelligence in plant taxonomy

PO6:Personal and professional competence
CO1. Identify importance of plants in human welfare..
CO2. Give nomenclature to plants.
CO3. Expertise in systematic studies
CO4. Develop technique of identification and classification of plant of flowering plants.
CO5. Use artificial intelligence in plant taxonomy

PO7:Effective Citizenship and Ethics
CO1. Create awareness of conservation of biodiversity.
CO2. Creating awareness on importance of Taxonomist in Life Sciences.

PO8: Environment and Sustainability
CO 1 .Create awareness of conservation of biodiversity
CO 2.Use artificial intelligence in plant taxonomy

PO9:Self-directed and Life-long learning
CO1. Identify importance of plants in human welfare.

PO11:Value Inculcation and Environmental Awareness:
CO2. Identify and describe different plants.
CO3. Use knowledge of systematics in plant studies

PO12:Autonomy, Responsibility, and Accountability:
CO2. Identify and describe different plants.
CO3. Use knowledge of systematics in plant studies

Name of the Programme : B.Sc.
Program Code : USBT
Class : S.Y. B. Sc.
Semester : III
Course Type : Major Mandatory (Theory)
Course Code : BOT-202-MRM
Course Title : Plant Physiology
No. of Credits : 02
No. of Teaching Hours : 30

A) Learning Objectives:

1. To understand basic physiology of plants.
2. To study the physiological processes occurring in plants.
3. To get idea about functioning of instruments.
4. To make student expert in plant physiology.
5. To understand the plant metabolism.
6. To get idea about metabolic cycles occurs in plants.
7. To get knowledge about role of biomolecules in plant physiology.

B) Course Outcomes:

At the end of this course students will able to:

CO1. Understand basic physiological concepts.
CO2. Aware about the plant to response environmental conditions.
CO3. Get knowledge of internal activities in plant.
CO4. Develop the expertise in plant physiology. CO5. Get knowledge of plant metabolism.
CO6. Get knowledge of plant cycle.
CO7. Get knowledge of biomolecules.

Credit-I

Unit - I **(15L)**

1.1 Introduction to Plant Physiology:

Brief history, Scope and applications of plant physiology, Contribution of some Indian physiologist. **3L**

1.2 Plant – Water relations:

Structure of cell and types of tissue – Definition of water potential, cellular and organism level. Membrane structure (Fluid Mosaic Model), permeability and aquaporins. **2L**

Diffusion – Definition, factors affecting diffusion, importance of diffusion in plants **Osmosis** – Definition, types of solutions – hypotonic, hypertonic and isotonic, endosmosis and exosmosis, concept of osmotic pressure (OP), turgor pressure (TP),

wall pressure (WP), Diffusion pressure deficit (DPD), relation between OP, TP and DPD, role of osmosis in plant **4L**

Plasmolysis – Definition, mechanism, de-plasmolysis, significance of plasmolysis **Imbibition** – Concept, mechanism and significance. **2L**

1.3 Ascent of sap:

Introduction and definition. Theories of ascent of sap, Vital theories: Jamin – Chame theory and Bose theory, Physical force theories: a) Capillary theory, b) Imbibitional theory c) Atmospheric pressure theory. Transpiration pull or cohesion-tension theory, evidences and objections, Factors affecting on ascent of sap. **4L**

Credit II

Unit II **(15L)**

2.1 Transpiration:

Definition, Types of transpiration – cuticular, lenticular and stomatal. Structure of stomata, Mechanism of opening and closing of stomata –Steward's hypothesis, active K+ transport mechanism, Factors affecting the rate of transpiration, Significance of transpiration Antitranspirants, Guttation, Exudation. **4L**

2.2 Seed dormancy, germination and plant growth:

Definition and types of seed dormancy, Factors causing seed dormancy, Methods to break seed dormancy, metabolic changes occurs during seed germination. Introduction, Phases of growth and plant growth curve. Measurement of growth- Arc auxanometer, Bose Crescograph, fresh and dry weight method, Factors affecting on growth. **8L**

2.3 Physiology of flowering:

Photoperiodism– Concept, definition, short day plants, long day plants and day neutral plants, Applications of photoperiodism, Phytochrome- properties, Pr to Pfr interconversion,. **Vernalization–** concept and definition, mechanism of vernalisation, applications of vernalisation, devernalization. **3L**

References:

1. Jain, V.K. (2000): Fundamentals Of Plant Physiology, S.Chand&Co, New Delhi.
2. Verma, V. (2007): Text Book Of Plant Physiology, Ane Books India, New Delhi.

3. Nobel, P.S. 2009. Physicochemical and Environmental Plant Physiology.4th edition Academic Press, UK
4. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition. Sinnauers Associates, Saunders land, Massachusetts, USA
5. Salisbury F.B. and Ross C.B. 2005. Plant Physiology. 5th Edition. Wadsworth Publishing Co.Belmont CA.
6. Helgi OPik, Stephen A. Rolfe, Arthur J. Willis. 2005. The Physiology of Flowering Plants,Cambridge University Press, UK.
7. Kirkham, M.B. 2004. Principles of Soil and Plant Water Relations. Elsevier, Amsterdam, Netherlands.
8. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. 1997. Plant Metabolism. 2ndEdition. Longman Group, U.K.
9. Fitter, A. and Hay, R.K.M. 2001. Environmental Physiology of Plants. Academic Press, UK.
10. Lincoln Taiz, Eduardo Zeiger, Ian M. Møller, Angus Murphy. 2018. Plant Physiology and Development. 6th edition. OUP USA.
11. Press, M.C., Barker, M.G., and Scholes, J.D. 2000. Physiological Plant Ecology, British Ecological Society Symposium, Volume 39, Blackwell Science, UK.

Mapping of Program Outcomes with Course Outcomes

Class: S.Y.B. Sc. (Sem. III) **Subject**: Botany

Course: Major Mandatory **Course Code**: BOT-202-MRM

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO 1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO10	PO11	PO12	PO13
CO 1	3												
CO 2	3	3									2		
CO 3				3									
CO 4		3											
CO 5	2			2					2				
CO 6	3			3									
CO 7				3									

Justification for the mapping

PO1: Identify and describe different plants.

CO1. Use knowledge for improvement of agricultural yield.
CO2. Aware about the plant to response environmental conditions.
CO5. Get knowledge of plant metabolism.
CO6. Students get knowledge of plant cycle.

PO2: Practical, Professional, and Procedural Knowledge

CO2. Students aware about the plant to response environmental conditions.
CO4. Develop the expertise in plant physiology.

PO 4: Specialized Skills and Competencies:

CO3. Get knowledge of internal activities in plant.
CO5. Get knowledge of plant metabolism.
CO6. Get knowledge of plant cycle.
CO7. Get knowledge of biomolecules.

PO 9: Digital and Technological Skills:

CO5. Get knowledge of plant metabolism.

PO11.Value Inculcation and Environmental Awareness:

CO2. Aware about the plant to response environmental conditions.

Name of the Programme : B. Sc. Botany
Program Code : USBT
Class : S. Y. B. Sc.
Semester : III
Course Type : Major Mandatory (Practical)
Course Code : BOT-203-MRM
Course Title : Botany Practical I
No. of Credits : 02
No. of Teaching Hours : 60

A) Course Objectives:

1. To understand terminologies in plant identification.
2. To classify the plant using morphology.
3. To study the physiological processes occurring in plants.
4. To get idea about functioning of instruments.
5. To get knowledge about preparation of M.S. Medium.
6. To get knowledge about Culture techniques.
7. To study the different gene transfer methods.

B) Course Outcomes:

By the end of this course students will able to :

CO1. Expertise in plant taxonomy.
CO2. Prepare critical thinking for identification and classification of plant.
CO3. Aware on enhancing yield with the use of green house.
CO4. Make use to for handling of Instruments.
CO5. Expertise in media preparation.
CO6. Expertise in different plant tissue culture techniques.
CO7. Well known about different gene transfer methods.

Practicals

	(15P)
1) Tools of taxonomy.	1P
2) Description of flowering plant in botanical terms (Part I- vegetative)	1P
3) Description of flowering plant in botanical terms (Part II- Reproductive)	1P
4) Study of plant family: Myrtaceae	1P
5) Study of plant family : Rubiaceae	1P
6) Study of plant family : Euphorbiaceae.	1P
7) Study of plant family : Solanaceae	1P
8) Study of plant family : Amaryllidaceae.	1P
9) Study of plasmolysis in suitable plant material.	1P
10) Studies on phenophases in seasonal plant.	1P
11) Determination of Diffusion Pressure Deficit (DPD).	1P
12) Determine rate of transpiration in different conditions: Sunlight, Shade and wind.	1P

13) Study of Physiological Instruments: Spectrophotometer, Portable leaf area meter, Conductivity meter, Centrifuge. 1P

14) Assessing seed viability by TTC method. 1P

15) Study of plant physiology by demonstration experiments: Imbibition in seeds, transpiration pull, Arc Auxanometer, Osmosis: curling experiment. 1P

Note :

1. Study Tour is compulsory. Submission of Botanical excursion report and herbarium of at least five correctly identified local dominant plants is compulsory.

Mapping of Program Outcomes with Course Outcomes

Class : S.Y.B. Sc. (Sem. III) **Subject** : Botany

Course : Major Mandatory Practical **Course Code : BOT-203-MRM**

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO10	PO11	PO12	PO13
CO 1	3	2	1	2	2							1	
CO 2			1	2			2						
CO 3	2					2	3						2
CO 4													
CO 5					2								
CO 6		3	1									2	
CO 7		2		3		1						2	

Justification for the mapping

PO1:Comprehensive Knowledge and Understanding:

CO2. Prepare critical thinking for identification and classification of plant.
CO3. Aware on enhancing yield with the use of green house.

PO2:Practical, Professional, and Procedural Knowledge:

CO1. Expertise in plant taxonomy.
CO6. Expertise in different plant tissue culture techniques.
CO7. Well known about different gene transfer methods.

PO3:Entrepreneurial Mindset and Knowledge:

CO1. Expertise in plant taxonomy.
CO2. Prepare critical thinking for identification and classification of plant.
CO6. Expertise in different plant tissue culture techniques.

PO4:Specialized Skills and Competencies:

CO1. Expertise in plant taxonomy.
CO2. Prepare critical thinking for identification and classification of plant.
CO7. Well known about different gene transfer methods.

PO5:Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO1. Expertise in plant taxonomy.
CO5. Expertise in media preparation.

PO6:Communication Skills and Collaboration:
CO3. Aware on enhancing yield with the use of green house.
CO7. Well known about different gene transfer methods.

PO7:Research-related Skills:
CO2. Prepare critical thinking for identification and classification of plant.
CO3. Aware on enhancing yield with the use of green house

PO12:Autonomy, Responsibility, and Accountability:
CO1. Expertise in plant taxonomy.
CO6. Expertise in different plant tissue culture techniques.
CO7. Well known about different gene transfer methods.

PO13:Community Engagement and Service:
CO3. Aware on enhancing yield with the use of green house.

Name of the Programme : B. Sc. Botany
Programme Code : USBT
Class : S.Y. B. Sc.
Semester : III
Course Type : Vocational skill course (Practical)
Course Code : BOT-204-VSC
Course Title : Herbal cosmetics
No. of Credits : 02
No. of Teaching Hours : 60

A) Learning Objectives:

1. To understand the Basics of Herbal Ingredients.
2. To study Formulation of Herbal Skin Care Products.
3. To learn various Extraction Techniques of crude drugs.
4. To study how to Assess Quality and Stability of Herbal Products.
5. To Evaluate the Efficacy of Herbal Cosmetics
6. To Develop Sustainable and Ethical Practices
7. To develop Eco-friendly and Sustainable herbal Products

B)Course Outcome:

By the end of the course, students will be able to:

CO1. Identify and describe various herbal ingredients commonly used in cosmetics, including their sources, properties, and benefits.
CO2. Gain hands-on experience in formulating basic herbal skincare products like creams, lotions, and face packs, understanding the role of each ingredient.
CO3. Demonstrate proficiency in different extraction techniques for active herbal ingredients, such as maceration, infusion, and distillation.
CO4. Develop the ability to assess the quality and stability of herbal cosmetics, including understanding factors that affect product shelf life.
CO5. Evaluate the efficacy of herbal cosmetics through practical testing methods, including user trials and laboratory analysis.
CO6. Understand and implement sustainable and ethical practices in sourcing, formulating, and packaging herbal cosmetics, promoting environmental and social responsibility.
CO7. Apply principles of sustainability in sourcing, formulating, and packaging herbal cosmetics, focusing on reducing environmental impact and promoting ethical practices.

Practicals

1. Demonstration of various instruments used in herbal cosmetics industry. 2P
2. Introduction to plants used in preparation of herbal cosmetics. 1P
3. Study of extraction of essential oils. 1P
4. Preparation of moisturizing cream using herbal extracts. 1P
5. Preparation of Ubtan using herbal ingredients. 1P
6. Preparation of herbal face mask. 1P
7. Study of methods of qualitative analysis of herbal cosmetic products. 2P
8. Preparation of *Hibiscus* and Curry leaves Hair oil. 1P
9. Preparation of soap using *Aloe vera* gel. 1P
10. Study of various methods used in storage and packaging of herbal products. 2P
11. Study of plants used in Aromatherapy. 1P

12. Submission of any five herbal cosmetics. 1P

Mapping of Program Outcomes with Course Outcomes

Class: S.Y.B. Sc. (Sem. III) **Subject**: Botany
Course: Herbal cosmetics **Course Code**: BOT-204-VSC
Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	P09	PO 10	PO 11	PO 12	PO 13
CO 1	3												
CO 2		2											
CO 3		3		3	3								
CO 4				3	3								
CO 5							3						
CO 6											3		
CO 7											3		

Justification for the mapping

PO1. Comprehensive Knowledge and Understanding.

CO1. Identify and describe various herbal ingredients commonly used in cosmetics, including their sources, properties, and benefits.

PO2. Practical, Professional, and Procedural Knowledge

CO2. Gain hands-on experience in formulating basic herbal skincare products like creams, lotions, and face packs, understanding the role of each ingredient.
CO3. Demonstrate proficiency in different extraction techniques for active herbal ingredients, such as maceration, infusion, and distillation.

PO4. Specialized Skills and Competencies

CO3. Demonstrate proficiency in different extraction techniques for active herbal ingredients, such as maceration, infusion, and distillation.
CO4. Develop the ability to assess the quality and stability of herbal cosmetics, including understanding factors that affect product shelf life.

PO5. Capacity for Application, Problem-Solving, and Analytical Reasoning

CO3. Demonstrate proficiency in different extraction techniques for active herbal ingredients, such as maceration, infusion, and distillation.
CO4. Develop the ability to assess the quality and stability of herbal cosmetics, including understanding factors that affect product shelf life.

PO7. Research-related Skills

CO5. Evaluate the efficacy of herbal cosmetics through practical testing methods, including user trials and laboratory analysis.

PO11. Value Inculcation and Environmental Awareness

CO6. Understand and implement sustainable and ethical practices in sourcing, formulating, and packaging herbal cosmetics, promoting environmental and social responsibility.
CO7. Apply principles of sustainability in sourcing, formulating, and packaging herbal cosmetics, focusing on reducing environmental impact and promoting ethical practices.

Name of the Programme : B. Sc.
Program Code : USBT
Class : S. Y. B. Sc.
Semester : III
Course Type : Field Project (FP)
Course Code : BOT-205-FP
Course Title : Field Project
No. of Credits : 02
No. of Teaching Hours : 60

A) Learning Objectives:

1. To identify research problem.
2. To set objectives of the project.
3. To write review of literature.
4. To identify methodology of the project
5. To interpret results of the project.
6. To find out conclusions or outputs of the project.
7. To prepare project report.

B) Learning Outcome:

By the end of the course, students will be able to:

CO1. Identify research problem.
CO2. Set objectives of the project.
CO3. Write review of literature.
CO4. Identify methodology of the project.
CO5. Interpret results of the project.
CO6. Find out conclusions or outputs of the project.
CO7. Prepare project report.

Project Work:

1 Survey, Analysis and Compilation of data.

2 Typing, binding and submission of project report.

3 Writing of research paper or review.

4 Power point presentation based on project work.

Typical Time and marks allocation for the different stages of the field project is:

Step of Project	Individual students work in hours	Marks
Topic Selection/ Study Design	05	05
Survey preparation / Fieldwork	25	20
Analysis	10	05
Report writing	20	10
Oral Presentation		10
Total	60	50

Mapping of Program Outcomes with Course Outcomes

Class: S.Y.B. Sc. (Sem. III) **Subject**: Botany

Course: Field Project (FP) **Course Code:** BOT-205-FP

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO 11	PO 12	PO 13
CO 1	3											3	
CO 2	3												
CO 3	3												
CO 4	3												
CO 5		3						3	3				
CO 6		2							2				
CO 7							3						3

Justification for the mapping

PO1. Comprehensive Knowledge and Understanding:

CO1. Identify research problem.
CO2. Set objectives of the project.
CO3. Write review of literature.
CO4. Identify methodology of the project.

PO2.Practical, Professional, and Procedural Knowledge

CO5. Interpret results of the project.
CO6. Find out conclusions or outputs of the project.

PO7. Research-related Skills

CO7. Prepare project report.

PO9. Digital and Technological Skills:

CO5. Interpret results of the project.
CO6. Find out conclusions or outputs of the project.

PO12. Autonomy, Responsibility, and Accountability

CO1. Identify research problem.

PO13. Community Engagement and Service

CO7. Prepare project report.

Name of the Programme : B.Sc. Botany
Program Code : USBT
Class : S. Y. B. Sc.
Semester : III
Course Type : MN - Minor (Theory)
Course Code : BOT-206-MN
Course Title : Floriculture
No. of Credits : 02
No. of Teaching Hours : 30

A) Course Objectives:

1. To inculcate the importance of studying floriculture and usage of floricultural crops.
2. To give knowledge of different horticultural practices of floricultural crops.
3. To familiarize the students with the floriculture based industries at national and international level.
4. To familiarize the students with the flower and foliage crops used in floriculture.
5. To give knowledge of different types of flower arrangement or floral designs.
6. To give knowledge of care and precautions taken during flower arrangement.
7. To develop entrepreneurship in the field of floriculture.

B) Course Outcomes:

By the end of the course, students will be able to:

CO1. Understand plants used in floriculture and usage of floricultural crops.
CO2. Get knowledge of horticultural practices of floricultural crops.
CO3. Get knowledge of floriculture based industries at national and international level.
CO4. Get knowledge of flowers and foliage crops used in floriculture.
CO5. Create different flower arrangements or floral designs.
CO6. Take care and precautions taken during flower arrangement.
CO7. Develop industry or self-employment in the field of floriculture.

Credit - I

Unit – I Introduction of Floriculture (15L)

1.1 Introduction to floriculture, important floricultural crops, **Open cultivation practices:** Concept, advantages and limitations, Cultivation practices, harvesting and marketing of Tuberose. **Greenhouse technology:** Concept, advantages and limitations. Cultivation practices, harvesting and marketing of *Gerbera.* **10L**

1.2 Introduction of floriculture based industries at national and international level**.** **1L**

1.3 Introduction of flower, foliage and other materials used in flower arrangement. **4L**

Credit – II (15L)

Unit – II Types of Flower Arrangement

2.1 Principles and types of flower arrangement. **2L**

2.2 Official Flower Arrangement: **4L**

Western type: Symmetrical, Asymmetrical, Vertical, Round, Cascade, Hogarth.

2.3 Eastern type: Ikebana - Shohin and Moribana. **2L**

2.4 Social type: Bouquet, floral rangoli, flower basket, garland, flower wheel, button hole, floral ornaments. **3L**

2.5 Dry flower arrangement: Methods of drying flowers and the types of dry flower arrangement. **4L**

References:

1. Arora T. S. (2007). Introductory Ornamental Horticulture, Kalyani Publishers, New Delhi.
2. Bose T. K. and Mukherjee D. (1972). Gardening in India. Oxford Publishing Co. New Delhi
3. Kumar N. (1997). Introduction to Horticulture, Rajlaxmi Publications, Nagercoil
4. G. S. Randhawa (1986). Floricuture in India, Allied Publishers.
5. Vishnu Swarup (2008). Garden Flowers, ICAR Publications, New Delhi.

Mapping of Program Outcomes with Course Outcomes

Class: S.Y.B. Sc. (Sem. III) **Subject**: Botany
Course: MN - Minor (Theory) **Course Code:** BOT-206-MN

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO 1	3												
CO 2	3												
CO 3	3	3											
CO 4	3	3											
CO 5				2				3					
CO 6				1									
CO 7		3	2						2				

Justification for the mapping

PO1. Comprehensive Knowledge and Understanding:
CO1. Understand plants used in floriculture and usage of floricultural crops.
CO2. Get knowledge of horticultural practices of floricultural crops.
CO3. Get knowledge of floriculture based industries at national and international level.
CO4. Get knowledge of flowers and foliage crops used in floriculture.

PO2. Practical, Professional, and Procedural Knowledge:
CO3. Get knowledge of floriculture based industries at national and international level.
CO4. Get knowledge of flowers and foliage crops used in floriculture.
CO7. Develop industry or self-employment in the field of floriculture.

PO3. Entrepreneurial Mind-set and Knowledge
CO7. Develop industry or self-employment in the field of floriculture.

P04. Specialized Skills and Competencies
CO5. Create different flower arrangements or floral designs.
CO6. Take care and precautions during flower arrangement.

PO8. Learning How to Learn Skills
CO5. Create different flower arrangements or floral designs.

PO9. Digital and Technological Skills
CO7. Develop industry or self-employment in the field of floriculture.

Name of the Programme : B. Sc. Botany
Program Code : USBT
Class : S. Y. B. Sc.
Semester : III
Course Type : MN - Minor (Practical)
Course Code : BOT-207-MN
Course Title : Practical based on Floriculture
No. of Credits : 02
No. of Teaching Hours : 60

Course Objectives:

1. To inculcate the importance of studying floriculture and usage of floricultural crops.
2. To equip the students with practical knowledge of different horticultural practices of floricultural crops.
3. To familiarize the students with the floriculture based industries at national and international level.
4. To familiarize the students with the flowers and foliage crop used in flower arrangement.
5. To give knowledge of different types of flower arrangement.
6. To give knowledge of care and precautions taken during flower arrangement.
7. To impart the basic skills in the field of floriculture.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Understand plants used in floriculture.
CO2. Knowledge of horticultural practices of floricultural crops.
CO3. Knowledge of floriculture based industries.
CO4. Knowledge of flowers and foliage crop used in flower arrangement.
CO5. Create different floral designs.
CO6. Take care and precautions during flower arrangement.
CO7. Develop entrepreneurship in floriculture.

Practicals

1. Study of natural plant propagation methods (Rhizome, Bulb, Sucker, Runners). (01P)
2. Study of artificial plant propagation methods - Part I (Cutting and Grafting). (01P)
3. Study of artificial plant propagation methods - Part II (Air layering and Budding). (01P)
4. Study of flower and foliage plants used in flower arrangement - Part I (Cut flowers). (01P)
5. Study of flower and foliage plants used in flower arrangement- Part II (loose flowers). (01P)
6. Study of different methods of storage and packaging of flowering crop - Part I (01P)
7. Study of different methods of storage and packaging of flowering crop - Part II (01P)
8. Study of different materials used in flower arrangement (Floral foams, Vase, Floral pins). (01P)

9. Preparation of flower arrangement - Part I (Western type: Round, Symmetrical and Asymmetrical). (01P)
10. Preparation of flower arrangement - Part II (Western type: Hogarth, Cascade and Vertical). (01P)
11. Preparation of flower arrangement (Eastern type: Ikebana). (01P)
11. Preparation of garlands, bouquets and button holes. (01P)
12. Preparation of floral wheel, flower basket and floral rangoli. (01P)
13. Study of techniques of preparation of dry flower arrangement - Part I (01P)
14. Study of techniques of preparation of dry flower arrangement - Part II (01P)
15. Submission of one floral article at the time of practical examination.

Mapping of Program Outcomes with Course Outcomes

Class: S.Y.B. Sc. (Sem. III) **Subject**: Botany

Course: MN - Minor (Practical) **Course Code:** BOT-207-MN

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO9	PO10	PO11	PO12	PO13
CO 1	3												
CO 2	3			3									
CO 3	3		3										
CO 4	3												
CO 5		2						3					
CO 6								3					
CO 7			2										

Justification for the mapping

PO1. Comprehensive Knowledge and Understanding
CO1. Understand plants used in floriculture.
CO2. Knowledge of horticultural practices of floricultural crops.
CO3. Knowledge of floriculture based industries.
CO4. Knowledge flowers and foliage crop used in flower arrangement.
PO2. Practical, Professional, and Procedural Knowledge
CO5. Create different floral designs.
PO3. Entrepreneurial Mindset and Knowledge
CO3. Knowledge of floriculture based industries.
CO7. Develop entrepreneurship in floriculture.
PO4. Specialized Skills and Competencies
CO2. Knowledge of horticultural practices of floricultural crops.
P08. Learning How to Learn Skills
CO5. Create different floral designs.
CO6. Take care and precautions during flower arrangement.

Name of the Programme	**: B. Sc. Botany**
Program Code	**: USBT**
Class	**: S. Y. B. Sc.**
Semester	**: III**
Course Type	**: Open Elective (Theory)**
Course Code	**: BOT-208-OE**
Course Title	**: Economic Botany**
No. of Credits	**: 02**
No. of Teaching Hours	**: 30**

Course objectives:

1. To know plant biology.
2. To give knowledge about botanical aspects of economically important plants.
3. To impart and origins of important plats utilized as food, fiber, fodder, medicine, dye.
4. To demonstrate a deeper knowledge of a chosen medicinal plant.
5. To impart the career opportunities agriculture.
6. To evaluate the importance of plants and their different roles.
7. To study use of different plant structures.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.
CO4. Develop agro based industries on their own.
CO5. Develop business opportunity in agriculture industry.
CO6. Get expertise to develop agro based industries.
CO7. Get expertise in field of economic Botany.

Topics and Learning

Study of the following plants with respect to Botanical name, family, method ofcultivation, part used, economic importance of plants of each category.

Credit - I

Unit I: **(10 L)**

1.1 Definition and applications of Economic Botany. **1L**

1.2 Study of the following plants with respect to Botanical name, family, method of cultivation, part used, economic importance of at least three plants of each category.

a) Cereals: Rice, Wheat, Maize. **2L**

b) Millets: *Sorghum*, Ragi, Bajra. **2L**

c) Pulses: Soyabean, Peanut, Chick-pea. **2L**

d) Fibre plants: Cotton, Jute, Agave. **2L**

e) Rubber and its products. **1L**

Credit - II

Unit II: **(10L)**

2.1 Study of the following plants with respect to Botanical name, family, method of cultivation, part used, economic importance of plants of each category.

a) Oil yielding plants: Coconut, Sunflower, Safflower. **2L**

b) Timber: Indian Rosewood (Shisham), Teakwood, Mahogani. **2L**

c) Spices: Clove, Cardamom, Cinnamon. **2L**

d) Beverages: Coffee, Tea, Kokum. **2L**

e) Aromatic plants: Rose, *Geranium*, Sandalwood. **2L**

Unit III: **(10L)**

3.1 Study of the following plants with respect to Botanical name, family, method of cultivation, part used, economic importance of at least three plants of each category.

a) Fruits: Mango, Grapes, Dragon fruit. **2L**

b) Medicinal plants: Amla, Adulsa, *Aloe vera*. **2L**

c) Vegetables: Potato, Brinjal, Tomato. **2L**

d) Nuts: Cashewnut, Walnut, Almond. **2L**

e) Gum and Resin: Neem, Babul, *Pinus*. **2L**

1. Verma V. (2013) : Textbook of Economic Botany, Ane Books Pvt. Ltd.
2. Kochhar S. L. (2012) : Economic Botany in the Tropics, , Macmillan Publisher.
3. Gerald E. Wickens (2001) : Economic Botany: Principles and Practices, Springer Publication.
4. Agner, H.H., & Hikino, & Farns worth, N: Economic & Medicinal plant research, Vol.1- 3, (Academic Press)
5. Pandey, B.P. (1992). Economic Botany. (S. Chand and Sons Co., New Delhi).
6. Verma, (1998). Text book of Economic Botany, Embay Publishers, New Delhi.
7. Simpson, B.B., & Ogorzaly, M.C. (2014). *Plants in Our World: Economic Botany* (4th Edition). McGraw-Hill Education, New York.
8. Pandey, B.P. (2023). *Botany for B.Sc. Students Semester II: Economic Botany and Plant Conservation*. S. Chand Publishing, New Delhi.
9. Upadhyay, R. (2023). *Botany for B.Sc. Students Semester IV: Economic Botany, Ethnomedicine and Phytochemistry*. S. Chand Publishing, New Delhi.
10. Joshi, S., & Trivedi, D. (2023). *A Textbook of Economic Botany, Genetics and Plant Breeding: For Degree Students*. Walnut Publication, Bhubaneswar.

Mapping of Program Outcomes with Course Outcomes

Class: S. Y. B. Sc. (Sem. III) **Subject**: Botany

Course: Open Elective **Course Code**: BOT-208-OE

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO 11	PO 12	PO 13
CO 1	3	2	1	2	2	1	1	2	1	1	2	2	1
CO 2	3	3	2	2	2	1	1	2	2	2	3	2	1
CO 3	3	3	2	2	3	2	1	2	2	2	3	2	1
CO 4	2	2	3	3	3	2	1	2	3	2	3	3	2
CO 5	2	2	3	3	3	2	1	2	3	2	3	3	2
CO 6	2	3	3	3	3	2	2	3	3	2	3	3	2
CO 7	3	3	2	3	3	2	2	2	2	2	3	2	2

Justification for the mapping

PO1:Comprehensive Knowledge and Understanding:
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO2:Practical, Professional, and Procedural Knowledge
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO3:Entrepreneurial Mindset and Knowledge:
CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO4:Specialized Skills and Competencies:
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO5:Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO6:Communication Skills and Collaboration:
CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.

PO7:Research-related Skills:
CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.

PO8:Learning How to Learn Skills:
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO9:Digital and Technological Skills:
CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO10:Multicultural Competence, Inclusive Spirit, and Empathy:
CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.

PO11:Value Inculcation and Environmental Awareness:
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO12:Autonomy, Responsibility, and Accountability:
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

PO13:Community Engagement and Service:
CO1. Understand basics of commercial source of plant part.
CO2. Utilize knowledge about plants utilized in food, fiber, fodder, medicine, dye.
CO3. Use knowledge about different plants and their commercial produts.

Name of the Programme : B. Sc. Botany
Program Code : USBT
Class : S. Y. B. Sc.
Semester : III
Course Type : IKS – Indian Knowledge System
Course Code : BOT-209-IKS
Course Title : Botany in Ayurveda
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives:

1. To understand importance of Ayurveda and its principles.
2. To know Ayurvedic methods for collection and storage of crude drugs.
3. To train students for identification of medicinal plant parts and their description.
4. The make conscious and aware of natural resources and environment.
5. To make aware students for environment of human beings.
6. To give knowledge of biodiversity; ethics, human health and diseases.
7. To train students for use of raw materials in ayurvedic formulations and drugs.

Course Outcomes:

By the end of the course, students will be able to:

CO1. Aware the importance of Ayurveda and its principles.
CO2. Understand the Ayurvedic methods for collection and storage of crude drugs.
CO3. Understand the medicinal plant parts and their description.
CO4. Conscious and aware of natural resources and environment.
CO5. Identify plants and environment for the benefit of human beings,
CO6. Conscious about biodiversity; ethics, human health and diseases.
CO7. Use raw materials in ayurvedic formulations and drugs.

Credit I

UNIT: 1

Introduction to Ayurveda **(15L)**

1.1 Definition and aims of Ayurveda, Brief description of Samhita and Ashtang. **(06L)**

1.2 Introduction to department of AYUSH, CCIM, CCRAS, RAV. **(04L)**

1.3 Ayurveda: Concept of Tridosha and Five Elements, Formulations in Ayurveda (Swarna Bhasma, Triphala Churna, Chyawanprash (Avaleh), Bhrungadi-Vati) **(5L)**

Credit - II

UNIT: 2 **(15L)**

Integrated approach of Ayurveda and dravyas

2.1 Integrated Approach, Ayurveda towards Healthcare, Medicine, Microbiology, Medicine, Surgery and Yoga, etc. **(5L)**

2.2 Study of following dravyas with respect to Sanskrit name, Common name, Botanical name, Family, habit, parts used, medicinal uses and preparation of drug: Amalaki, Arjuna, Ashoka, Bhallataka, Bilva, Brahmi, Chandandravya, Daruharidra, Durva, Eranda, Guduchi, Nimba, Nirgudi , Shatavari, Tulsi, Lavanga, keshara. **(10L)**

References:

1. S. K. Jain (1995): Manual of Ethno botany, Scientific Publishers, Jodhpur.
2. S.K. Jain (Ed.) (1989): Methods and approaches in Ethno-botany. Society of ethno botanists, Lucknow, India.
3. S.K. Jain, (1990): Contributions of Indian Ethno-botany. Scientific publishers, Jodhpur.
4. Colton C.M. (1997): Ethno botany. Principles and applications. John Wiley and Sons, Chichester.
5. Rama Ro, N. and A. N. Henry (1996): The Ethno-botany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah.
6. Trivedi P. C., (2006): Medicinal Plants: Ethno-botanical Approach, Agrobios, India.
7. Purohit and V., (2008): Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
8. D. C. Pal. & Jain, S.K., (1998): Tribal Medicine. Naya Prakash Publishers, Calcutta.
9. Raychudhuri, S.P., (1991): (Ed.) Recent advances in Medicinal aromatic and spice crops.Vol.1, Today& Tomorrow's printers and publishers, New Delhi.

Mapping of Program Outcomes with Course Outcomes

Class: S.Y.B. Sc. (Sem. III) **Subject**: Botany

Course: Indian Knowledge System **Course Code**: BOT-209-IKS

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)												
Course Outcomes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO 1	3										3		
CO 2	3	3									3		
CO 3	3	3									3		
CO 4										3	3		
CO 5			3	3						3			
CO 6	3							3		3	3		
CO 7	3	3	3	3				3					

Justification for the mapping

PO1:Comprehensive Knowledge and Understanding

CO1. Aware the importance of Ayurveda and its principles.

CO2. Understand the Ayurvedic methods for collection and storage of crude drugs.

CO3. Understand the medicinal plant parts and their description.

CO6. Conscious about biodiversity; ethics, human health and diseases.

CO7. Use raw materials in ayurvedic formulations and drugs.

PO2:Practical, Professional, and Procedural Knowledge

CO2. Understand the Ayurvedic methods for collection and storage of crude drugs.

CO3. Understand the medicinal plant parts and their description.

CO7. Use raw materials in ayurvedic formulations and drugs.

PO3:Entrepreneurial Mindset and Knowledge

CO5. Identify plants and environment for the benefit of human beings,

CO7. Use raw materials in ayurvedic formulations and drugs.

PO4:Specialized Skills and Competencies

CO5. Identify plants and environment for the benefit of human beings,

CO7. Use raw materials in ayurvedic formulations and drugs.

PO8:Learning How to Learn Skills

CO6. Conscious about biodiversity; ethics, human health and diseases.

CO7. Use raw materials in ayurvedic formulations and drugs.

PO10:Multicultural Competence, Inclusive Spirit, and Empathy

CO4. Conscious and aware of natural resources and environment.

CO5. Identify plants and environment for the benefit of human beings,

CO6. Conscious about biodiversity; ethics, human health and diseases.

PO11:Value Inculcation and Environmental Awareness

CO1. Aware the importance of Ayurveda and its principles.

CO2. Understand the Ayurvedic methods for collection and storage of crude drugs.

CO3. Understand the medicinal plant parts and their description

CO4. Conscious and aware of natural resources and environment