



**Anekant Education Society's  
Tuljaram Chaturchand College of Arts, Science  
and Commerce, Baramati.  
(Autonomous)**

**Four B. Sc. Degree Program in Botany  
(Faculty of Science and Technology)**

**CBCS Syllabus**

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

## Program Outcomes for B.Sc.

- PO.1 Comprehensive Knowledge and Understanding:** Graduates will possess a profound understanding of their field of study, including foundational theories, principles, methodologies, and key concepts, within a broader multidisciplinary context.
- PO2. Practical, Professional, and Procedural Knowledge:** Graduates will acquire practical skills and expertise essential for professional tasks within their field. This includes knowledge of industry standards, best practices, regulations, and ethical considerations, with the ability to apply this knowledge effectively in real-world scenarios.
- PO3. Entrepreneurial Mindset and Knowledge:** Graduates will cultivate an entrepreneurial mindset, identifying opportunities, fostering innovation, and understanding business principles, market dynamics, and risk management strategies.
- PO4. Specialized Skills and Competencies:** Graduates will demonstrate proficiency in technical skills, analytical abilities, problem-solving, effective communication, and leadership, relevant to their field of study. They will also adapt and innovate in response to changing circumstances.
- PO5. Capacity for Application, Problem-Solving, and Analytical Reasoning:** Graduates will possess the capacity to apply learned concepts in practical settings, solve complex problems, and analyze data effectively. This requires critical thinking, creativity, adaptability, and a readiness to learn and take calculated risks.
- PO6. Communication Skills and Collaboration:** Graduates will effectively communicate complex information, both orally and in writing, using appropriate media and language. They will also collaborate effectively in diverse teams, demonstrating leadership qualities and facilitating cooperative efforts toward common goals.
- PO7. Research-related Skills:** Graduates will demonstrate observational and inquiry skills, formulate research questions, and utilize appropriate methodologies for data collection and analysis. They will also adhere to research ethics and effectively report research findings.
- PO8. Learning How to Learn Skills:** Graduates will acquire new knowledge and skills through self-directed learning, adapt to changing demands, and set and achieve goals independently.
- PO9. Digital and Technological Skills:** Graduates will demonstrate proficiency in using ICT, accessing information sources, and analyzing data using appropriate software.
- PO10. Multicultural Competence, Inclusive Spirit, and Empathy:** Graduates will engage effectively in multicultural settings, respecting diverse perspectives, leading diverse teams, and demonstrating empathy and understanding of others' perspectives and emotions.
- PO11. Value Inculcation and Environmental Awareness:** Graduates will embrace ethical and moral values, practice responsible citizenship, recognize and address ethical issues, and take appropriate actions to promote sustainability and environmental conservation.
- PO12. Autonomy, Responsibility, and Accountability:** Graduates will apply knowledge and skills independently, manage projects effectively, and demonstrate responsibility and accountability in work and learning contexts.
- PO13. Community Engagement and Service:** Graduates will actively participate in community-engaged services and activities, promoting societal well-being.

**Anekant Education of Society's  
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati  
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**SYLLABUS (CBCS) FOR S. Y. B. Sc. BOTANY (w.e. from June, 2024)**

Sem.	Course Type	Course Code	Course Title	Theory/ Practical	Credits	
<b>III</b>	Major Mandatory	BOT-201-MJM	Taxonomy of Angiosperms	Theory	02	
	Major Mandatory	BOT-202-MJM	Plant Physiology - I	Theory	02	
	Major Mandatory	BOT-203-MJM	Plant Biotechnology - I	Theory	02	
	Major Mandatory	BOT-204-MJM	Practical - I	Practical	02	
	Minor	BOT-241-MN	Floriculture - I	Theory	02	
	Minor	BOT-242-MN	Floriculture - I	Practical	02	
	Open Elective (OE)	BOT-216-OE	Bio-fertilizers	Theory	02	
	Vocational Skill Course (VSC)	BOT-221-VSC	Herbal Cosmetics	Theory	02	
	Ability Enhancement Course (AEC)	MAR-231-AEC HIN-231-AEC SAN-231-AEC	-	Theory	02	
	Co-curricular Course (CC)	YOG/PES/CUL/NSS/NCC-239-CC	To be selected from the Basket	Theory	02	
	Field Project (FP)	BOT-235-FP	-	Practical	02	
	Generic IKS Course (IKS)	GEN-245-IKS	-	Theory	02	
	<b>Total Credits Semester - III</b>					<b>24</b>
<b>IV</b>	Major Mandatory	BOT-251-MJM	Plant Anatomy	Theory	02	
	Major Mandatory	BOT-252-MJM	Plant Embryology	Theory	02	
	Major Mandatory	BOT-253-MJM	Plant Ecology	Theory	02	
	Major Mandatory	BOT-254-MJM	Practical - II	Practical	02	
	Minor	BOT-261-MN	Horticulture	Theory	02	
	Minor	BOT-262-MN	Horticulture	Practical	02	
	Open Elective (OE)	BOT-266-OE	Bio fertilizer	Practical	02	
	Skill Enhancement Course (VSC)	BOT-276-SEC	Herbal Cosmetics	Practical	02	
	Ability Enhancement Course (AEC)	MAR-281-AEC HIN-281-AEC SAN-281-AEC	-	Theory	02	
	Co-curricular Course (CC)	YOG/PES/CUL/NSS/NCC-289-CC	To be selected from the Basket	Theory	02	
	Community Engagement Project (CEP)	BOT-285-CEP	-	Practical	02	
	<b>Total Credits Semester - IV</b>					<b>22</b>
	<b>Cumulative Credits Semester III + Semester IV</b>					<b>46</b>

<b>Name of the Programme :</b>	<b>B.Sc. Botany</b>
<b>Program Code :</b>	<b>USBOT</b>
<b>Class :</b>	<b>S.Y.B.Sc.</b>
<b>Semester :</b>	<b>III</b>
<b>Course Type :</b>	<b>Major Mandatory (Theory)</b>
<b>Course Code :</b>	<b>BOT-201-MJM</b>
<b>Course Title :</b>	<b>Taxonomy of Angiosperms</b>
<b>No. of Credits :</b>	<b>02</b>
<b>No. of Teaching Hours :</b>	<b>30</b>

#### **A) Course Objectives:**

1. To identify scope of 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**

**Unit - I** (15 L)

##### **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**

**Unit - II** (15L)

##### **2.1 Study of Plant Families:**

Study of following families with reference to systematic position, salient features,

floral formula, floral diagram and any five examples with their economic importance - **AES's T. C. College (Autonomous) Baramati. CBCS Syllabus 2023 Pattern (NEP 2020)**

Annonaceae,, Myrtaceae, Solanaceae, Euphorbiaceae and Amaryllidaceae. **10L**

## **2.2 Computer in taxonomy:**

Concept of herbarium, advantages and disadvantages, Digital /e-herbarium advantages and disadvantages, QR code in Plant taxonomy. **5L**

### **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, Calcutta, 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 SinghMahendra Pal Singh, Dehra Dun.
- 8) Stuessy, Tod F., 2009. *Plant taxonomy: the systematic evaluation of comparative data* (2nd ed.). NewYork: 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.

### **Choice Based Credit System Syllabus (NEP Pattern) Mapping of Program Outcomes with Course Outcomes**

**Course:** Taxonomy of Angiosperms

**Course Code:** BOT-201-MJM

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

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

### Justification for mapping

**PO1. Comprehensive Knowledge and Understanding.**

CO3. Use knowledge of systematics in plant studies.

**PO2. Practical, Professional, and Procedural Knowledge.**

CO6. Know importance of taxonomy in plant Sciences.

**PO4. Specialized Skills and Competencies.**

CO1. Develop skill of plant identification.

CO4. Develop knowledge of classification of flowering plants.

**PO6. Communication Skills and Collaboration.**

CO2. Identify and describe different plants.

**PO9. Digital and Technological Skills.**

CO7. Utilize Artificial Intelligence in plant taxonomy.

**PO11. Value Inculcation and Environmental Awareness**

CO5. Aware about conservation of biodiversity.

**Name of the Programme :** B.Sc. Botany  
**Program Code :** USBOT  
**Class :** S.Y.B.Sc.  
**Semester :** III  
**Course Type :** Major Mandatory (Theory)  
**Course Code :** BOT-202-MJM  
**Course Title :** Plant Physiology- I  
**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** – 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  
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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<sup>+</sup> 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. Sinauer 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. 6<sup>th</sup> 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.

**Choice Based Credit System Syllabus (NEP Pattern)**

**Mapping of Program Outcomes with Course Outcomes**

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

**Subject:** Botany

**Course:** Plant Physiology- I

**Course Code:** BOT-202-MJM

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

Course Outcomes	Programme Outcomes (POs)												
	PO1	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.

<b>Name of the Programme:</b>	<b>B.Sc. Botany</b>
<b>Program Code :</b>	<b>USBOT</b>
<b>Class :</b>	<b>S.Y.B.Sc.</b>
<b>Semester :</b>	<b>III</b>
<b>Course Type :</b>	<b>Major Mandatory (Theory)</b>
<b>Course Code :</b>	<b>BOT-203-MJM</b>
<b>Course Title :</b>	<b>Plant Biotechnology- I</b>
<b>No. of Credits :</b>	<b>02</b>
<b>No. of Teaching Hours :</b>	<b>30</b>

#### **A) Learning Objectives:**

1. To promote students for development of plant tissue culture industry.
2. To give knowledge of development of agro industries.
3. To understand the field of industrial botany.
4. To get basic knowledge about resource based industries.
5. To understand the basic techniques in plant biotechnology.
6. To apply the knowledge in industrial field.
7. To understand the different biotechniques.

#### **B) Course Outcomes:**

**At the end of this course students will be able to:**

- CO1. Develop plant tissue culture industry.  
 CO2. Get expertise to develop agro based industries.  
 CO3. Get expertise in field of Industrial Botany.  
 CO4. Understand basics of plant resource based industries.  
 CO5. Learn the basic concepts, principles and techniques in plant biotechnology.  
 CO6. Acquired knowledge by students in other branches of life science  
 such as biological, medical, agricultural etc.  
 CO7. Learn the techniques in plants.

**Credit I**

**Unit I**

**(15L)**

#### **1.1 Introduction to Biotechnology:**

Introduction, definition and History of plant Biotechnology, Scope and importance of plant biotechnology. **2L**

#### **1.2 Plant Tissue Culture:**

Definition of cell and tissue, Importance of plant tissue culture, basic technique of plant tissue culture; techniques and applications callus culture, cell suspension culture, protoplast culture, somatic hybridization, Haploid production, Micro-propagation, embryo culture and embryo rescue. **4L**

#### **1.3 Germplasm and Cryopreservation:**

*In situ* and *Ex situ* conservation, techniques of cryopreservation, cold storage, low pressure and low oxygen storage, applications. **2L**

#### **1.4 Methods of gene transfer in plants:**

Restriction enzymes, Types of methods of gene transfer Direct gene transfer methods- Electroporation, Biolystic gene transfer, Liposome mediated gene transfer, Vector mediated gene transfer *Agrobacterium* mediated gene transfer in plants, Ti-plasmid: structure and functions. **4L**

#### **1.5 Biotechnology of Biological Nitrogen Fixation:**

Mechanism of N<sub>2</sub> Fixation, Non symbiotic Nitrogen Fixation, Symbiotic N<sub>2</sub> Fixation- establishment of symbiosis, Nod genes, Nif gene. **3L**

#### **Credit II**

#### **Unit II (15L)**

##### **2.1 Biotechnology and Society:**

Biotechnology- Benefits, GM foods and its safety, patenting of biotechnological inventions, Biotechnology and developing countries, Recombinant foods and religious beliefs, recombinant therapeutic product for human health care, Intellectual property rights. **5L**

##### **2.2 Bioinformatics:**

Introduction, Database and its classification, NCBI, Data retrieval tools INTREZ, BLAST, Applications of Bioinformatics. **3L**

##### **2.3 Genomics and Proteomics:**

Genomics- Concept, methods, types and applications, Proteomics- Concept, types and applications. **4L**

##### **2.4 Molecular techniques:**

Blotting Techniques: Southern, Northern, Western and PCR. **3L**

#### **References:**

1. R. C. Dube (2008). A Text Book of Biotechnology, S. Chand.
2. P.K. Gupta (2019). Elements of Biotechnology.
3. U. Satyanarayana (2017). Biotechnology.
4. Kalyan Kumar De (2020). An introduction to Plant tissue culture.
5. Pal J.K. and Ghaskadabi S.S. (2008). Fundamentals of Molecular Biology.
6. Verma and Agrawal (2010). Molecular Biology
7. Devi P (2008). Principle and Methods of plant Molecular Biology, Biochemistry and Genetics Agrobios, Jodhpur, India.
8. Kumar H.D. (2002) A Text Book of Biotechnology 2nd Edn. Affiliated Easyt- West Pres Private Ltd New Delhi.
9. Ramawat K.G. (2003). Plant Biotechnology, S. Chand & Co. Ltd. Ramnagar New Delhi.
10. Trivedi P.C. (2000). Plant Biotechnology, Panima Publishing Carpation, New Delhi.
11. Razdan M K (2019). Introduction to Plant tissue culture.

## Choice Based Credit System Syllabus (NEP Pattern)

### Mapping of Program Outcomes with Course Outcomes

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

**Subject:** Botany

**Course:** Plant Biotechnology- I

**Course Code:** BOT-203-MJM

**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	PO11	PO12	PO13
CO 1			3										
CO 2			3										
CO 3				3									
CO 4	2												
CO 5				3									
CO 6						1							
CO 7							3						

#### Justification for the mapping

##### **PO.1 Comprehensive Knowledge and Understanding**

CO4. Understand basics of plant resource based industries

##### **PO3. Entrepreneurial Mindset and Knowledge**

CO1. Develop plant tissue culture industry.

CO2. Get expertise to develop agro based industries.

##### **PO4. Specialized Skills and Competencies.**

CO3. Get expertise in field of Industrial Botany.

CO5. Learn the basic concepts, principles and techniques in plant biotechnology.

##### **PO6. Communication Skills and Collaboration**

CO6. Acquired knowledge by students in other branches of life science such as biological, medical, agricultural etc.

##### **PO7. Research-related Skills**

CO7. Learn the techniques in plants.

<b>Name of the Programme :</b>	<b>B. Sc. Botany</b>
<b>Program Code :</b>	<b>USBOT</b>
<b>Class :</b>	<b>S. Y. B. Sc.</b>
<b>Semester :</b>	<b>II</b>
<b>Course Type :</b>	<b>Major Mandatory (Practical)</b>
<b>Course Code :</b>	<b>BOT-204-MJM</b>
<b>Course Title :</b>	<b>Practical I</b>
<b>No. of Credits :</b>	<b>02</b>
<b>No. of Teaching Hours :</b>	<b>30</b>

#### **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:**

**At 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.

<b>Practicals</b>	<b>(15P)</b>
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 families. (any 4)	
Myrtaceae.	1P
Rubiaceae.	1P
Euphorbiaceae.	1P
Amaryllidaceae.	1P
5) Study of plasmolysis in suitable plant material.	1P
6) Determination of Diffusion Pressure Deficit (DPD).	1P
7) Determine rate of transpiration in different conditions: Sunlight, Shade and wind.	1P
8) Physiological Instruments; Spectrophotometer, Portable leaf area meter, Conductivity meter, Centrifuge.	1P

- |   |    |
|---|----|
| 9) Assessing seed viability by TTC method.                          | 1P |
| 10) Study of sterilization techniques and preparation of MS Medium. | 1P |
| 11) Callus Induction using maize embryo.                            | 1P |
| 12) Study of methods of gene transfer through photographs.          | 1P |

**References :**

1. R. C. Dube (2008). A Text Book of Biotechnology, S. Chand.
2. P.K. Gupta (2019). Elements of Biotechnology.
3. U. Satyanarayana (2017). Biotechnology.
4. Kalyan Kumar De (2020). An introduction to Plant tissue culture.
5. Pal J.K. and Ghaskadabi S.S. (2008). Fundamentals of Molecular Biology.
6. Verma and Agrawal (2010). Molecular Biology.
7. Devi P (2008). Principle and Methods of plant Molecular Biology, Biochemistry and Genetics Agrobios, Jodhpur, India.
8. Kumar H.D. (2002) A Text Book of Biotechnology 2nd Edn. Affiliated Easyt- West Pres Private Ltd New Delhi.
9. Ramawat K.G. (2003). Plant Biotechnology, S. Chand & Co. Ltd. Ramnagar NewDelhi.
10. Trivedi P.C. (2000). Plant Biotechnology, Panima Publishing Carpation, New Delhi.
11. Razdan M K (2019). Introduction to Plant tissue culture.

**Note :**

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

Choice Based Credit System Syllabus (NEP Pattern)

**Mapping of Program Outcomes with Course Outcomes**

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

**Subject:** Botany

**Course:** Practical I

**Course Code:** BOT- 204-MJM

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

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

## **Justification of Mapping**

### **PO1. Comprehensive Knowledge and Understanding**

CO1. Expertise in plant taxonomy.

### **PO2. Practical, Professional, and Procedural Knowledge**

CO4. Make use to for handling of Instruments.

### **PO4. Specialized Skills and Competencies:**

CO3. Aware on enhancing yield with the use of green house.

CO6. Expertise in different plant tissue culture techniques.

CO7. Well known about different gene transfer methods.

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

CO2. Prepare critical thinking for identification and classification of plant.

<b>Name of the Programme</b>	<b>: B.Sc. Botany</b>
<b>Program Code</b>	<b>: USBOT</b>
<b>Class</b>	<b>: S. Y. B. Sc.</b>
<b>Semester</b>	<b>III</b>
<b>Course Type</b>	<b>: Minor - Theory</b>
<b>Course Code</b>	<b>: BOT-241-MN</b>
<b>Course Title</b>	<b>: Floriculture-I</b>
<b>No. of Credits</b>	<b>02</b>
<b>No. of Teaching Hours</b>	<b>30</b>

#### **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 during flower arrangement.  
 CO7. Develop industry or self-employment in the field of floriculture.

#### **Credit-I**

**Unit - I** (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 and Foliage crops used in floriculture. **4L**

#### **Credit -II**

**Unit – II** (15L)

- 2.1** Types of flower arrangement - Official: Western and Eastern type and Social type. **1L**  
**2.2** Official: Western type: Symmetrical, Asymmetrical, Vertical, Round, Cascade, Hogarth. **3L**  
**2.3 Eastern type:** Ikebana - Shohin and Moribana. **2L**  
**2.4 Social :** Bouquet, Floral Rangoli, Flower basket, Garland, Flower wheel, button hole. **3L**  
**2.5 Dry flower arrangement** - Methods of drying flowers and the types of dry flower arrangement. **6L**



## 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). Floriculture in India, Allied Publishers.
5. Vishnu Swarup (2008). Garden Flowers, ICAR Publications, New Delhi.

### Choice Based Credit System Syllabus (2023 Pattern)

#### Mapping of Program Outcomes with Course Outcomes

Class: S. Y. B. Sc. (Sem. III)

Subject: Botany

Course: Floriculture-I

Course Code: BOT -241-MN

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

Course Outcomes	Programme Outcomes (POs)												
	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												
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 Mindset and Knowledge

- CO7. Develop industry or self-employment in the field of floriculture.

##### PO4. 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.

<b>Name of the Programme</b>	<b>: B. Sc. Botany</b>
<b>Program Code</b>	<b>: USBOT</b>
<b>Class</b>	<b>: S. Y. B. Sc.</b>
<b>Semester</b>	<b>III</b>
<b>Course Type</b>	<b>: Minor - Practical</b>
<b>Course Code</b>	<b>: BOT-242-MN</b>
<b>Course Title</b>	<b>: Floriculture-I</b>
<b>No. of Credits</b>	<b>02</b>
<b>No. of Teaching Hours</b>	<b>60</b>

#### **(A) 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 crops used in flower arrangement.
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 impart the basic skills in the field of floriculture.

#### **(B) Course Outcomes:**

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

- CO1. Understand the importance of studying floriculture and usage of floricultural crops.  
 CO2. Get knowledge of different 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 flower arrangement.  
 CO5. Create different types of flower arrangement or floral designs.  
 CO6. Take care and precautions during flower arrangement.  
 CO7. Develop industry or self-employment in the field of floriculture.

#### **Practicals**

**(15P)**

1. Study of natural plant propagation methods (Rhizome, Bulb, Sucker, Runners). 1P
2. Study of artificial plant propagation methods - Part I (Cutting and Grafting). 1P
3. Study of artificial plant propagation methods - Part II (Air layering and Budding). 1P
4. Study of flower and foliage plants used in flower arrangement. 1P
5. Study of different methods of storage and packaging of flowering crops - Part I 1P
6. Study of different methods of storage and packaging of flowering crops - Part II 1P
7. Study of different materials used in flower arrangement (Floral foames, Vase, Floral pins). 1P
8. Preparation of flower arrangement - Part I (Western type: Round, Symmetrical and Asymmetrical) 1P
9. Preparation of flower arrangement - Part II (Western type: Hogarth, Cascade and Vertical). 1P
10. Preparation of flower arrangement (Eastern type: Ikebana). 1P
11. Preparation of garlands, bouquets, floral wheel, floral rangoli, floral basket

- and button holes. 1P
12. Study of techniques of drying flowers and foliage. 1P
13. Preparation of dry flower arrangement. 1P
14. Submission of any one floral craft. 1P
15. Visit to any floriculture industry or field. 1P

**Choice Based Credit System Syllabus (NEP Pattern)**  
**Mapping of Program Outcomes with Course Outcomes**

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

**Subject:** Botany

**Course:** Floriculture-I

**Course Code:** BOT-242-MN

**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													
CO 2	3													
CO 3	3													
CO 4	3													
CO 5		3						3						
CO 6				2										
CO 7			3						2					

**Justification for the mapping**

**PO1. Comprehensive Knowledge and Understanding:**

- CO1. Understand the importance of studying floriculture and usage of floricultural crops.
- CO2. Get knowledge of different 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 flower arrangement.

**PO2. Practical, Professional, and Procedural Knowledge:**

- CO5. Create different types of flower arrangement or floral designs

**PO3. Entrepreneurial Mindset and Knowledge:**

- CO7. Develop industry or self-employment in the field of floriculture.

**PO4. Specialized Skills and Competencies**

- CO6. Take care and precautions during flower arrangement.

**PO8. Learning How to Learn Skills**

- CO5. Create different types of flower arrangement or floral designs.

**PO9. Digital and Technological Skills**

- CO7. Develop industry or self-employment in the field of floriculture.

<b>Name of the Programme</b>	<b>: B. Sc. Botany</b>
<b>Programme code</b>	<b>: USBOT</b>
<b>Class</b>	<b>: S.Y.B.Sc.</b>
<b>Semester</b>	<b>: III</b>
<b>Course Type</b>	<b>: Open Elective (OE) (Theory)</b>
<b>Course Code</b>	<b>: BOT-216-OE</b>
<b>Course Title</b>	<b>: Bio-fertilizers</b>
<b>No. of Credits</b>	<b>:02</b>
<b>No. of Teaching Hours</b>	<b>:30</b>

#### **A) Course Objectives:**

1. To understand the concept of Bio-fertilizers and their role in sustainable agriculture.
2. To understand the concept of algal Bio-fertilizers and their role in agriculture.
3. To understand the concept of bacterial Bio-fertilizers and their importance in sustainable agriculture.
4. To introduce students to the concept of phosphate-solubilizing microbes and their importance in nutrient cycling and plant nutrition.
5. To understand the concept of fungal Bio-fertilizers and their role in enhancing soil fertility.
6. To understand the concept of organic manure and its importance in sustainable agriculture.
7. To know the importance of quality control measures in ensuring the efficacy and safety of Bio-fertilizers.

#### **B) Course Outcomes:**

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

- CO1.** Define Bio-fertilizers and their significance in sustainable agriculture.
- CO2.** Understand the concept of algal Bio-fertilizers and their significance in modern agriculture.
- CO3.** Define bacterial Bio-fertilizers and explain their significance in sustainable agriculture.
- CO4.** Understand the significance of phosphate-solubilizing microbes in soil ecosystems and their role in nutrient availability.
- CO5.** Explain the concept of fungal Bio-fertilizers and their significance in sustainable agriculture.
- CO6.** Define organic manure and explain its significance in promoting sustainable agriculture practices.
- CO7.** Understand the importance of quality control measures in ensuring the effectiveness and safety of Bio-fertilizers for agricultural use.

#### **Credit-I**

**Unit - 1** **(15L)**

##### **1.1 Introduction to Bio-fertilizers:**

Concept, Introduction and Scope of Bio-fertilizers, Microbes used in Bio-fertilizers, benefits and limitations of Bio-fertilizers. **3L**

##### **1.2 Algal Bio-fertilizers:** Cyanobacteria (BGA): Biological Nitrogen fixation,

Applications of BGA in a rice cultivation and Azolla - Anabaena relationship. **5L**

##### **1.3 Bacterial Bio-fertilizers:**

Isolation, Identification, Mass multiplication and applications of *Rhizobium*, *Azospirillum* and *Azotobacter*. **5L**

##### **1.3 Phosphate solubilizing microbes:**

Occurrence and their field application, crop response to phosphate solubilizing

microorganisms. 2L

**Credit-II**

**Unit-2** (15L)

**2.1 Fungal Bio-fertilizers:**

Introduction and types of Mycorrhizal association, Mycorrhizal applications in agriculture, significance of mycorrhizae in forestry. 3L

**2.2 Organic Manure:**

Concept and benefits of organic Farming, Green manure, Farm Yard Manure, Methods of vermicomposting and their benefits. 3L

**2.3 Liquid organic manure:**

Concept and benefits of liquid organic manure, Preparation methods of Panchgavya, Jeevamruta and vermiwash. 5L

**2.4 Quality control of Bio-fertilizers:** Standard parameters for quality control, quality management procedures, storage conditions and shelf life of Bio-fertilizers. 4L

**References:**

1. Vyas, S.C., Vyas, S. and Modi, H.A. 1998. *Bio-fertilizers and Organic Farming*. Akta Prakashan, Nadiad.
  2. NIIR Board. 2004. *The Complete Technology Book on Bio-fertilizer and Organic Farming*. 2<sup>nd</sup> revised edition.
  3. Panda, H. 2011. *Manufacture of Bio-fertilizer and Organic Farming*. NIIR Board.
  4. Sathe, T.V. 2004. *Vermiculture and Organic Farming*. Daya Publishers.
  5. Subha Rao, N.S. 2000. *Soil Microbiology*. Oxford & IBH Publishers, New Delhi.
  6. Dubey, R.C. 2005. *A Text Book of Biotechnology*. S. Chand & Company, New Delhi.
  7. John Jothi Prakash, E. 2004. *Outlines of Plant Biotechnology*. Emkay Publication, New Delhi.
  8. Kumaresan, V. 2005. *Biotechnology*. Saras Publications, New Delhi.
  9. Rai, M.K. 2006. *Handbook of Microbial Bio-fertilizers*. Food Products Press, New York.
  10. Gupta, P.K. 1999. *Soil, Plant, Water and Fertilizer Analysis*. Agro Botanica, Bikaner.
  11. Bisen, P.S. 2014. *Laboratory Protocols in Applied Life Sciences*. CRC Press, Boca Raton.
  12. Sharma, K. 2007. *Manual of Microbiology: Tools and Techniques*. 2<sup>nd</sup> edition. Anne BooksPvt. Ltd., New Delhi.
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**Choice Based Credit System Syllabus (NEP Pattern)**  
**Mapping of Program Outcomes with Course Outcomes**

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

**Subject:** Botany

**Course:** Bio-fertilizers (Theory)

**Course Code:** BOT-216-OE

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

Course Outcomes	Programme outcomes(POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1											03		
CO2											03		
CO3											03		
CO4											02		
CO5											03		
CO6											03		
CO7		02											

**Justification for the mapping**

**PO1. Practical, Professional and procedural knowledge**

CO7. Understand the importance of quality control measures in ensuring the effectiveness and safety of Bio-fertilizers for agricultural use.

**PO11. Value Inculcation and Environmental Awareness:**

CO1. Define Bio-fertilizers and their significance in sustainable agriculture.

CO2. Understand the concept of algal Bio-fertilizers and their significance in modern agriculture.

CO3. Define bacterial Bio-fertilizers and explain their significance in sustainable agriculture.

CO4. Understand the significance of phosphate-solubilizing microbes in soil ecosystems and their role in nutrient availability.

CO5. Explain the concept of fungal Bio-fertilizers and their significance in sustainable agriculture.

CO6. Define organic manure and explain its significance in promoting sustainable agriculture practices.

<b>Name of the Programme</b>	<b>: B. Sc. Botany</b>
<b>Program Code</b>	<b>: USBOT</b>
<b>Class</b>	<b>: S.Y.B.Sc.</b>
<b>Semester</b>	<b>: III</b>
<b>Course Type</b>	<b>: Vocational Skill course, VSC (Theory)</b>
<b>Course Code</b>	<b>: BOT-221-VSC</b>
<b>Course Title</b>	<b>: Herbal Cosmetics</b>
<b>No. of Credits</b>	<b>: 02</b>
<b>No. of Teaching Hours</b>	<b>:30</b>

### **Course Objectives:**

1. To understand the concept of herbal cosmetics.
2. To explore the classification and categories of herbal cosmetics
3. To gain insights into the historical development of herbal cosmetics.
4. To explore plants utilized in the formulation of hair care products.
5. To examine the properties of these plants and their efficacy in hair care.
6. To acquire practical knowledge in the preparation of various skin care products.
7. To understand the formulation processes and techniques.

### **A)Course Outcomes:**

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

- CO1. Develop a comprehensive understanding of herbal cosmetics and their classification.
- CO2. Analyze the historical evolution of herbal cosmetics and its impact on the modern industry.
- CO3. Evaluate the differences between herbal and synthetic cosmetic products, recognizing the benefits of herbal alternatives.
- CO4. Demonstrate proficiency in selecting and handling raw materials, machinery, and equipment for herbal cosmetic preparation.
- CO5. Apply knowledge of specific plants in formulating effective skin and hair care products.
- CO6. Overcome challenges associated with the formulation of herbal cosmetics.
- CO7. Gain practical skills in the preparation of a variety of herbal cosmetic products, enhancing hands-on expertise in the field.

#### **Credit-I**

#### **UNIT: 1 (10L)**

- 1.1 Cosmetics- Introduction of herbal cosmetics, Classification and categories, Brief history of herbal cosmetics. **4L.**
- 1.2 Difference between herbal and synthetic cosmetic products, benefits of herbal cosmetic products, Challenges in formulating herbal cosmetics. **6L**

#### **UNIT: 2 (10L)**

- 2.1 Raw materials, Machinery and Equipments used in preparation of herbal cosmetics. **4L**
- 2.2 Plants used in skin care products like scrub, 'ubtan', packs, moisturizer etc. **3L**
- 2.3 Plants used in hair care products like oil, shampoo, conditioner hair tonic etc. **3L**

#### **UNIT:3 (10L)**

- 3.1 Preparation of-Scrub, Face packs, Vanishing cream, Face wash, Soap, Moisturizer, Talcum powder, Sunscreen. **6L**
- 3.2 Preparation of Shampoo, Hair oil, Hair conditioners, Hair dye. **4L**

**References:**

1. Classification of cosmetic raw materials and adjuncts IS3958 of Indian Standard
2. Smith R.V., Stewart J.T. Text book of Bio pharmaceutical analysis, Lia and Febiger, Philadelphia (1982).
3. Behl P.N.Srivastava G. Herbs useful in dermatological therapy, CBS (2002).
4. Karnik C.R. Pharmacopoeia standards of herbs, Sri Sat guru Publications Delhi (1994).
5. Bore P. Cosmetics analysis: Selective methods with techniques, Marcel Dekker (1985).

CBCS Syllabus as per NEP 2020 for S.Y. B. Sc. Syllabus (NEP Pattern)

**Mapping of Program Outcomes with Course Outcomes**

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

**Subject:** Botany

**Course:** Vocational Skill course, VSC (Theory)

**Course Code:** BOT-221-VSC

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

Course Outcomes	Programme outcomes(POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	03												
CO2							02						
CO3				03									
CO4		03											
CO5				03									
CO6						02							
CO7			03										

**Justification for the mapping**

**PO1: Comprehensive Knowledge and Understanding:**

CO1. Developing a comprehensive understanding of herbal cosmetics and their classification.

**PO2: Practical, Professional, and Procedural Knowledge:**

CO4. Demonstrating proficiency in selecting and handling raw materials, machinery, and equipment for herbal cosmetic preparation.

**PO3: Entrepreneurial Mindset and Knowledge:**

CO7. Gaining practical skills in the preparation of a variety of herbal cosmetic products and enhancing hands-on expertise in the field demonstrates effective citizenship and ethics.

**PO4: Specialized Skills and Competencies:**

CO3. Evaluate the differences between herbal and synthetic cosmetic products, recognizing the benefits of herbal alternatives.



CO5. Apply knowledge of specific plants in formulating effective skin and hair care products.

**PO6: Communication Skills and Collaboration:**

CO6. Overcome challenges associated with the formulation of herbal cosmetics.

**PO7: Research-related Skills:**

CO2. Analyze the historical evolution of herbal cosmetics and its impact on the modern industry.

<b>Name of the Programme</b>	<b>: B. Sc. Botany</b>
<b>Program Code</b>	<b>: USBOT</b>
<b>Class</b>	<b>: S.Y.B.Sc.</b>
<b>Semester</b>	<b>: III</b>
<b>Course Type</b>	<b>: Field Project - Practical</b>
<b>Course Code</b>	<b>: BOT-235-FP</b>
<b>Course Title</b>	<b>: Project</b>
<b>No. of Credits</b>	<b>: 02</b>
<b>No. of Teaching Hours</b>	<b>: 60</b>

#### **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.

Choice Based Credit System Syllabus (NEP Pattern)

#### **Mapping of Program Outcomes with CourseOutcomes**

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

**Subject:** Botany

**Course:** Field Project – Practical

**Course Code:** BOT-235-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.