



Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Four Year B. Sc. Degree Program in Botany

(Faculty of Science and Technology)

CBCS Syllabus

F. Y. B. Sc. (Botany) Semester -I

For Department of Botany

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2023 Pattern)

(As Per NEP 2020)

To be implemented from Academic Year 2023-2024

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

Preamble

AES's Tuljaram Chaturchand College of Arts, Science and Commerce (Autonomous) has made the decision to change the syllabi of across various faculties from June, 2023 by incorporating the guidelines and provisions outlined in the 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. By establishing a nationally accepted and internationally comparable credit structure and courses framework, the NEP 2020 aims to promote educational excellence, facilitate seamless academic mobility, and enhance the global competitiveness of Indian students. It fosters a system where educational achievements can be recognized and valued not only within the country but also in the international arena, expanding opportunities and opening doors for students to pursue their aspirations on a global scale.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Botany and related subjects, the Board of Studies in Botany at Tuljaram Chaturchand College of Arts, Science and Commerce (Autonomous), Baramati - Pune, has developed the curriculum for the first semester of F.Y. B.Sc. Botany which goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, LOCF (UGC), NCrf, NHEQF, Prof. R.D. Kulkarni's Report, Government of Maharashtra's General Resolution dated 20th April and 16th May 2023, and the Circular issued by SPPU, Pune on 31st May 2023.

A Botany Post Graduates degree equips students with the knowledge and skills necessary for a diverse range of fulfilling career paths. Post 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 the can earn the knowledge to produce natural remedies for varies 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.

Anekant Education Society's
Tuljaram Chaturchand College, Baramati
(Autonomous)

Board of Studies (BOS) in Botany

From 2022-23 to 2024-25

Sr. No.	Name	Designation
1.	Prof. Dr. Bhagwan Mali	Chairman
2.	Prof. Dr. Mahadev Kanade	Member
3.	Prof. Dr. Ajit Telave	Member
4.	Dr. Rupali Chitale	Member
5.	Dr. Madhuri Patil	Member
6.	Mr. Sauraj N. Torane	Member
7.	Ms. Ashwini B. Dudhal	Member
8.	Mr. Prasad J. Bankar	Member
9.	Mr. Sourabh R. Chandankar	Member
10.	Prof. Dr. B. M. Gaykar	Expert from SPPU, Pune
11.	Prof. D. K. Gaikwad	Expert from other university
12.	Dr. Jay Chavan	Expert from other university
13.	Dr. S. Gurumurthy	Expert from allied area
14.	Mr. Gore Nitin Anil	Meritorious Student
15.	Ms. Ligade Komal Sambhaji	Meritorious Student
16.	Mr. Zodage Ram Sanjay	Meritorious Student
17.	Ms. Gargade Rutuja Hanumant	Meritorious Student

Credit Distribution Structure for F.Y. B.Sc. -2023-2024 (Botany)

Level	Semester	Major		Minor	GE/OE	VSC, SEC (VSEC)	AEC, VEC, IKS	OJT, FP, CEP, CC, RP	Cum. Cr./Sem.	Degree/Cum. Cr.
		Mandatory	Electives							
4.5	I	BOT-101-MJM: Diversity of Cryptogams BOT-102-MJM: Industrial Botany-I BOT-103-MJM: Botany Practical-I Credits-2+2+2	-	--	BOT-116-OE: Horticulture BOT-117-OE: Floriculture	BOT-121-VSC: Organic Farming BOT-126-SEC: Fruit Processing	ENG-131-AES: Functional English-I BOT-135-VEC: Environmental Science BOT-137- IKS: Botany in Ayurveda	Co-curricular Course (CC) Credit- 2	22	UG Certificate 44
	II	BOT-151-MJM: Diversity of Phanerogams BOT-152-MJM: Industrial Botany-II BOT-153-MJM: Botany Practical-II Credits-2+2+2	-	BOT-161-MN: Gardening and Nursery Management Credits-2	BOT-166-OE: Economic Botany BOT-167-OE: Seed Technology Credit- 2+2	BOT-171-VSC: Plant Tissue Culture BOT-176-SEC: Mushroom Cultivation Credit- 2+2	ENG-181-AEC: Functional English – II BOT-185-VES: Digital and Technological Solutions Credit- 2+2	Co-curricular Course (CC) Credit- 2	22	
	Cum Cr.	12	-	2	8	8	10	4	44	
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										

Course Structure for F.Y. B. Sc. (Botany) (2023 Pattern)

Sem	Course Type	Course Code	Title of Course	Theory/ Practical	No. of Credits
I	Major Mandatory	BOT-101-MJM	Diversity of Cryptogams	Theory	02
	Major Mandatory	BOT-102-MJM	Industrial Botany - I	Theory	02
	Major Mandatory	BOT-103-MJM	Botany Practical - I	Practical	02
	Open Elective (OE)	BOT-116-OE	Horticulture	Theory	02
	Open Elective (OE)	BOT-117-OE	Floriculture	Practical	02
	Vocational Skill Course (VSC)	BOT-121-VSC	Organic Farming	Theory	02
	Skill Enhancement Course (SEC)	BOT-126-SEC	Fruit Processing	Practical	02
	Ability Enhancement Course (AEC)	ENG-131-AEC	Functional English -1	Theory	02
	Value Education Course (VEC)	BOT-135-VEC	Environmental Science	Theory	02
	Indian Knowledge System (IKS)	BOT-137-IKS	Botany in Ayurveda	Theory	02
	Co- curricular Course (CC)	--	To be selected from the Basket	Theory	02
Total Credit Semester - I					22
II	Major Mandatory	BOT-151-MJM	Diversity of Phanerogams	Theory	02
	Major Mandatory	BOT-152-MJM	Industrial Botany - II	Theory	02
	Major Mandatory	BOT-153-MJM	Botany Practical - II	Practical	02
	Minor	BOT-161-MN	Gardening and Nursery Management	Theory	02
	Open Elective (OE)	BOT-166-OE	Economic Botany	Theory	02
	Open Elective (OE)	BOT-167-OE	Seed Technology	Practical	02
	Vocational Skill Course (VSC)	BOT-171-VSC	Plant Tissue Culture	Practical	02
	Skill Enhancement Course (SEC)	BOT-176-SEC	Mushroom Cultivation	Practical	02
	Ability Enhancement Course (AEC)	ENG-181-AEC	Functional English -1	Theory	02
	Value Education Course (VEC)	BOT-185-VEC	Digital and Technological Solutions	Theory	02
	Co- curricular Course (CC)	--	To be selected from the Basket	Theory	02
Total Credit Semester - II					22
Cumulative Credits Semester I + Semester II					44

CBCS Syllabus as per NEP 2020 for F.Y. B. Sc. Botany (2023 Pattern)

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: Major Mandatory (Theory)
Course Code	: BOT-101-MJM
Course Title	: Diversity of Cryptogams
No. of Credits	: 02
No. of Teaching Hours	: 30

Course Objectives:

1. To know the basics of cryptogams.
2. To understand the plant diversity with special reference to cryptogams diversity.
3. To give knowledge of identification of cryptogams.
4. To understand the scope of the cryptogams diversity with special reference Algae, Fungi, Bryophytes and Pteridophytes.
5. To give knowledge about economic importance of cryptogams.
6. Give an idea about need of habitat conservation of cryptogams diversity.
7. To impart the basic skills in the conservation diversity of cryptogams.

Course Outcomes:

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

- CO1. Identify, describe and study in detail life cycle of cryptogams.
- CO2. Provide plant description, describe the morphology and reproductive structure of cryptogams.
- CO3. Gain the proficiency in the identification of cryptogams.
- CO4. Knowledge of comparison between cryptogams and other plant groups.
- CO5. Knowledge of scope of the cryptogams diversity.
- CO6. Knowledge about habitat conservation of cryptogams diversity.
- CO7. Knowledge about the applications of cryptogams.

Topics and Learning Points:

UNIT: 1

(10 L)

1.1 **Introduction** : General outline of plant kingdom, introduction to lower cryptogams and higher cryptogams and their scope and importance, awareness and need of conservation. (04L)

1.2 **Algae** : Introduction, habitat, thallus diversity, pigments, reserve food and types of reproduction, Life cycle of *Spirogyra*, Economic importance of algae. (06L)

UNIT: 2 (10 L)

2.1 **Fungi** : General characters, thallus structure, mode of nutrition and types of reproduction, pathogenic importance of fungi, Life cycle of *Rhizopus*, Economic importance of fungi. (06L)

2.2 **Lichens**: General characters, Types of Lichens on the basis of thallus morphology, Economic importance of Lichens. (04L)

UNIT: 3 (10 L)

3.1 **Bryophytes**: Occurrence and Salient features, Life cycle of *Riccia*, Economic importance of Bryophytes. (05L)

3.2 **Pteridophytes** : Occurrence and Salient features, Life cycle of *Selaginella*, Economic importance of Pteridophytes. (05L)

References:

1. Bellinger E.G. and Sigeo D.C. (2010): Freshwater algae: Identification and use as bio indicators, Willey-Blackwell, UK.
2. Krishnamurthy V. (2000) : Algae of India and neighboring countries I. Chlorophycota, Oxford and IBH, New Delhi.
3. Lee R.E. (2008) : Phycology. Cambridge University Press.
4. Vashista B.R, Sinha A.K. and Singh V.P. (2005): Botany for degree students – Algae, S. Chand Publication.
5. Ainsworth, Sussman and Sparrow (1973) : The fungi. Vol IV A & IV B. Academic Press.
6. Alexopolous C.J., Minms C.W. and Blackwell M. (1999): (4th Ed.) Introductory Mycology. Willey, New York, Alford R.A.
7. Deacon J. W. (2006): Fungal Biology (4th Ed.) Blackwell Publishing.
8. Mehrotra R.S. and Aneja K. R. (1990): An introduction to mycology. New Age Publishers.
9. Miguel U., Richard H., and Samuel A. (2000) : Illustrated dictionary of the Mycology. Elvira Aguirre Acosta, Publisher: St. Paul, Minn: APS press, ISBN 0890542570.
10. Webster J. and Rpland W. (2007) : Introduction to fungi (3rd Edn) Cambridge University Press.
11. Dube H.C. (2004) : An Introduction to fungi. Vikas Publishers.
12. Sharma O.P. (2010) : A text book of fungi. S.Chand Publication.
13. Vashista B.R and Sinha A.K (2008): Botany for degree students – Fungi, S.Chand Publication.
14. Vashista B.R., Sinha A.K., Kumar A. (2008) : Botany for degree students – Bryophyta, S.Chand Publication.
15. Rashid A. (1999): An Introduction to Pteridophyta. Vikas Publishing House Pvt. Ltd. New Delhi.
16. Smith G. M. (1955): Cryptogamic Botany Vol II. McGraw Hill.
17. Sporne K. R. (1986): The morphology of Pteridophytes. Hutchinson University Library, London.

Choice Based Credit System Syllabus (2023 Pattern)
Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Diversity of Cryptogams

Course Code: BOT 101 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
CO 1	3		2						3
CO 2	3								
CO 3		3							
CO 4	3								
CO 5				3					
CO 6		2	3					3	
CO 7	2	1		2					

Justification for the mapping

PO1: Disciplinary Knowledge

CO1. Identify, describe and study in detail life cycle of Phanerogams.

CO2. Provide plant description, describe the morphology and reproductive structure of cryptogams.

CO4. Knowledge of comparison between cryptogams and other plant groups.

CO7. Knowledge about the applications of cryptogams.

PO2: Critical Thinking and Problem Solving

CO3. Gain the proficiency in the identification of cryptogams.

CO6. Knowledge about habitat conservation of cryptogams diversity.

CO7. Understand the local flora with respect to Phanerogams.

PO 3: Social competence

CO1. Identify, describe and study in detail life cycle of Phanerogams.

CO6. Knowledge about habitat conservation of cryptogams diversity.

PO 4: Research-related skills and Scientific temper

CO5. Knowledge of scope of the cryptogams diversity.

CO7. Knowledge about the applications of cryptogams

PO 8: Environment and Sustainability

CO6. Knowledge about habitat conservation of cryptogams diversity.

PO 9: Self-directed and Life-long Learning

CO1. Identify, describe and study in detail life cycle of cryptogams.

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: Major Mandatory (Theory)
Course Code	: BOT-102-MJM
Course Title	: Industrial Botany - I
No. of Credits	: 02
No. of Teaching Hours	: 30

Course Objectives:

- 1.To know about plant resource based industries.
- 2.To give knowledge about natural and artificial propagation methods.
- 3.To give idea about different types of nurseries and its commercial applications.
- 4.To understand the scope of floriculture industry.
- 5.To impart the career opportunities in plant tissue culture industry.
- 6.To give knowledge about different agro based industries.
- 7.To impart the basic skills in the field of Industrial development.

Course Outcomes:

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

- CO1. Understand basics of plant resource based industries.
- CO2. Knowledge about natural and artificial propagation methods.
- CO3. Knowledge about different types of nurseries and its commercial applications.
- CO4. Develop floriculture industries on their own.
- CO5. Develop plant tissue culture industry.
- CO6. Get expertise to develop agro based industries.
- CO7. Get expertise in field of Industrial Botany.

Topics and Learning Points:

UNIT: 1 (10L)

1.1 Introduction to Industrial Botany: Concept of Industrial Botany. Plant resources and industries: Food, fodder, fibers, medicines, timber, dyes, gum, tannins. (Two examples of each resource and the relevant industries. (04L)

1.2 Floriculture Industry: Introduction, Scope, Important floricultural crops, Open cultivation practices- harvesting and marketing of Tuberose. Concept of green house, Indoor cultivation practices-harvesting and marketing of *Gerbera*. (06L).

UNIT: 2 (10L)

2.1 Plant Nursery Industry: Concept and types of nurseries: ornamentals, fruit plants, medicinal plants, vegetables, orchids, forest nursery, commercial applications. (04L)

2.2 Propagation methods: Seed propagation, natural vegetative propagation and artificial vegetative propagation (Cutting: Stem, Layering: Air layering, Grafting: Stone grafting and Approach grafting, Budding: T-budding). **(06L)**

UNIT: 3 **(10L)**

3.1 Plant Tissue Culture Industry: Concept, culture techniques: Types of explants, preparation of media, methods of sterilization, inoculation techniques, incubation and hardening w.r.t. sugarcane, Commercial significance. **(04L)**

3.2 Agro Industries: Organic Farming: Concept and need, types of organic fertilizers, advantages and limitations. Fruit processing industries: Importance of fruit processing and Marketing, Major fruit processing industries in India. **(06L)**

References:

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. Gurcharan Singh Randhawa and Amitabha Mukhopadhyay (1986) : Floriculture in India, Allied Publishers.
5. Debashish Sengupta and Raj Kamal (2009) : Floriculture Marketing in India, , Excel Books.
6. Floriculture Hand Book, Eiri, Engineers India Research in Publication.
7. John Mason (2004) : Nursery Management, Land links Press Publisher.
8. Ray, P.K. (2012) : Plant Nursery Management: How to Start and Operate a Plant Nursery, Scientific Publishers.
9. Razdan M. K. (2017) : Introduction to Plant Tissue Culture (2 Ed.), Science Publishers.
10. Vasil K. (1994) : Plant Cell and Tissue Culture, Indra, (Ed. - Indra K. Vasil, Trevor A. Thorpe), Springer Publication.
11. The Complete Book on Organic Farming and Production of Organic Compost (2008) : NPCS Board of Consultants & Engineers, Asia Pacific Business Press Inc.
12. Hand Book of Mushroom Cultivation, Processing and Packaging (2007) : Engineers India Research In Publishers.
13. Paul Stamets (2011) : Growing Gourmet and Medicinal Mushrooms, Ten Speed Press Publishers.
14. Amarjit S. Basra (2006): Handbook of Seed Science and Technology: Seed biology, Production, and Technology, Food Products Press publishers.

Choice Based Credit System Syllabus (2023 Pattern)

Mapping of Program Outcomes with Course

Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Industrial Botany - I

Course Code: BOT 102 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
CO 1	3						3		
CO 2	3								
CO 3	3								
CO 4				3					
CO 5				3					
CO 6				3	3	2		2	
CO 7				3		1			

Justification for the mapping

PO1: Disciplinary Knowledge

- CO1. Understand basics of plant resource based industries.
- CO2. Knowledge about natural and artificial propagation methods.
- CO3. Knowledge about different types of nurseries and its commercial applications.

PO 4: Research-related skills and Scientific temper

- CO4. Develop floriculture industries on their own.
- CO5. Develop plant tissue culture industry.
- CO6. Get expertise to develop agro based industries.
- CO7. Get expertise in field of Industrial Botany.

PO5: Trans-disciplinary Knowledge

- CO6. Get expertise to develop agro based industries.

PO6: Personal and Professional Competence

- CO6. Get expertise to develop agro based industries.
- CO7. Get expertise in field of Industrial Botany.

PO 7: Effective Citizenship and Ethics

- CO1. Understand basics of plant resource based industries.

PO 8: Environment and Sustainability

- CO6. Get expertise to develop agro based industries.

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B.Sc.
Semester	: I
Course Type	: Major Mandatory
Course Code	: BOT-103-MJM
Course Name	: Botany Practical - I
No. of Credits	: 02
No. of Teaching Hours	: 60

Course Objectives:

- 1.To give knowledge about handling of microscope.
- 2.To give the practical knowledge about morphological and anatomical variations in cryptogams.
- 3.To give practical knowledge about identification of cryptogams.
- 4.To give hands-on training of production of agro products.
- 5.To expertise in artificial plant propagation.
- 6.To impart the career opportunities in plant based industries
- 7.To impart the basic skills in the field of Industrial Botany.

Course Outcomes:

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

- CO1. Expertise in handling of microscope.
- CO2. Knowledge of morphological and anatomical variations in cryptogams.
- CO3. Identify the cryptogams.
- CO4. Develop entrepreneurship in agro products.
- CO5. Expertise in artificial plant propagation.
- CO6. Get knowledge of career opportunities in plant based industries.
- CO7. Expertise in the field of Industrial Botany.

Practicals

- 1.Study of *Spirogyra*. (1P)
- 2.Study of *Rhizopus*. (1P)
- 3.Study of Lichen diversity. (1P)
- 4.Study of *Riccia*. (1P)
- 5.Study of *Selaginella*. (1P)
- 6.Study of plant resources in industries: food, fodder and fiber (one example of each) (1P)
- 7.Study of plant resources in industries:medicine, timber and gum (one ex. of each). (1P)
- 8.Study of artificial plant propagation: Stem cutting and Air layering. (1P)
- 9.Study of artificial plant propagation: Approach grafting and T- budding. (1P)
10. Demonstration of micro propagation methods- Part I (1P)
11. Demonstration of micro propagation methods- Part II (1P)
12. Preparation of organic fertilizers (Panchgavya, Dashparni ark) (1P)
13. Preparation of Tamarind candy and Avala supari. (1P)
14. Submission of five specimens of Cryptogams. (1P)
15. Visit of Agro based Industry (visit report is compulsory). (1P)

Choice Based Credit System Syllabus (2023 Pattern)

Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Botany Practical - I

Course Code: BOT 103 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
CO 1									
CO 2	3	2							
CO 3	3	3							3
CO 4			3					2	
CO 5									
CO 6									
CO 7				2					

Justification for the mapping

PO1: Disciplinary Knowledge

CO2. Knowledge of morphological and anatomical variations in cryptogams.

CO3. Identify the cryptogams.

PO2: Critical Thinking and Problem Solving

CO2. Knowledge of morphological and anatomical variations in cryptogams.

CO3. Identify the cryptogams.

PO 3: Social competence

CO4. Develop entrepreneurship in agro products.

PO 4: Research-related skills and Scientific temper

CO7. Expertise in the field of Industrial Botany.

PO 8: Environment and Sustainability

CO4. Develop entrepreneurship in agro products.

PO 9: Self-directed and Life-long Learning

CO3. Identify the cryptogams.

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: OE – Open Elective
Course Code	: BOT-116-OE
Course Title	: Horticulture
No. of Credits	: 02
No. of Teaching Hours	: 30

Course Objectives:

1. To understand scope of horticulture with special reference to production, export and import of fruits and vegetables.
2. To give knowledge of preparation of nursery beds.
3. To give knowledge of use of fertilizers and pesticides.
4. To give idea about basics and types of fruit gardening.
5. To know the basics of pomiculture.
6. To aware use of growth regulators in horticulture.
7. To impart the basic skills in the field of horticulture.

Course Outcomes:

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

- CO1. Understand plants used in horticulture.
- CO2. Knowledge about the plan and preparation of nursery beds.
- CO3. Use fertilizers and pesticides in orchards.
- CO4. Design orchards.
- CO5. Knowledge of pomiculture.
- CO6. Use growth regulators in horticulture.
- CO7. Develop entrepreneurship in horticulture.

Topics and Learning Points:

UNIT: 1

(10 L)

- 1.1 Scope and importance, classification of horticultural crops and nutritive values, area and production, exports and imports, fruit and vegetable zones of India. **(06L)**
- 1.2 Nursery techniques and their management, garden implements, soil and climate, vegetable gardens, nutrition and kitchen garden and other types of gardens. **(04L)**

UNIT: 2

(10L)

- 2.1 Production and practices for fruit crops. Principles, objectives, types and methods of pruning and training of fruit crops. **(04L)**
- 2.2 Types and use of growth regulators in horticulture, water management– irrigation methods, merits and demerits, weed management, fertigation management in horticultural crops (manures and fertilizers). **(06L)**

UNIT:3

(10L)

- 3.1** Classification of bearing habits of fruit trees, factors influencing the fruitfulness and unfruitfulness (root-microbe association). Rejuvenation of old orchards, top working and frame working. **(06L)**
- 3.2** Principle and concept of organic farming, market chain management, model of organic farming (1lac) **(04L)**

References:

- 1.Arora J. S. (2014): Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
- 2.Augé R andVidalie H. (1995): In Vitro Culture and Its Applications in Horticulture. Science Publishers Incorporated, USA.
- 3.Sheela V. L. (2011): Horticulture. MJP Publishers, New Delhi.
- 4.Bhojwani S. S., Razdan M. K. (1996): Plant tissue culture: Theory and Practice. Revised edition, Elsevier, Amsterdam.
- 5.Duryea M. L. (1984): Nursery cultural practices: Impacts on seedling quality. In forest nursery manual: Production of Bareroot seedlings.
- 6.Duryea M. L. and Thomas, D. L. (Ed.) (1975): Fundamentals of Horticulture. McGraw-Hill, USA.
- 7.Prasad S. (1999):Agros Dictionary of Horticulture. Agrobios, Jodhpur.
- 8.Rao K. M. (2005): Textbook of Horticulture. McMillan India Ltd, New Delhi.
- 9.Sanders T. W. (2006): Encyclopedic Dictionary of Horticulture. Bio Green Books, Delhi.

Choice Based Credit System Syllabus (2023 Pattern)

Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Horticulture

Course Code: BOT 116 OE

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
CO 1	3								
CO 2	3								
CO 3			3						
CO 4						3			
CO 5	2								
CO 6	3	3							
CO 7	3								3

Justification for the mapping

PO1: Disciplinary Knowledge

- CO1. Understand plants used in horticulture.
- CO2. Knowledge about the plan and preparation of nursery beds.
- CO5. Knowledge of pomiculture.
- CO6. Use growth regulators in horticulture.
- CO7. Develop entrepreneurship in horticulture.

PO2: Critical Thinking and Problem Solving

- CO6. Use growth regulators in horticulture.

PO 3: Social competence

- CO3. Use fertilizers and pesticides in orchards.

PO6: Personal and Professional Competence

- CO4. Design orchards.

PO 9: Self-directed and Life-long Learning

- CO7. Develop entrepreneurship in horticulture.

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: OE- Open Elective
Course Code	: BOT-117-OE
Course Title	: 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 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 plant used in flower arrangement - Part I (Cut flowers).
(01P)
5. Study of flower and foliage plant used in flower arrangement- Part II (loose flowers).
(01P)
6. Study of different method of storage and packaging of flowering crop - Part I (01P)
7. Study of different method of storage and packaging of flowering crop- Part II (01P)
8. Study of different materials used in flower arrangement (Floral foames, 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)
12. Preparation of garlands, bouquets and button holes. (01P)
13. Preparation of floral wheel and Rangoli. (01P)
14. Study of techniques of preparation of dry flower arrangement - Part I (01P)
15. Study of techniques of preparation of dry flower arrangement - Part II (01P)

Choice Based Credit System Syllabus (2023 Pattern)
Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Floriculture

Course Code: BOT 117 OE

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
CO 1	3								
CO 2	3								
CO 3	3								
CO 4	3								
CO 5						3			
CO 6		2							
CO 7			3						

Justification for the mapping

PO1: Disciplinary Knowledge

- 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: Critical Thinking and Problem Solving

- CO6. Take care and precautions during flower arrangement.

PO 3: Social competence

- CO7. Develop entrepreneurship in floriculture.

PO6: Personal and Professional Competence

- CO5. Create different floral designs.

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: SEC (Skill Enhancement Course)
Course Code	: BOT-126-SEC
Course Title	: Fruit Processing Industries
No. of Credits	: 02
No. of Teaching Hours	: 60

Course Objectives:

1. To learn the techniques of storage of Fruits.
2. To understand importance of value addition Fruit products.
3. To give knowledge of preparation of natural scented oils.
4. To equip the students with practical knowledge Fruit processing.
5. To give knowledge of Jam and Jelly preparation.
6. To impart the basic skills in the field of Fruit processing.
7. To give knowledge of care and precautions taken fruit processing.

Course Outcomes:

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

- CO1. Understand techniques of storage of Fruits.
- CO2. Get importance of value addition Fruit products.
- CO3. Get knowledge of preparation of natural scented oils.
- CO4. Get idea about the practical knowledge of Fruit processing.
- CO5. Get knowledge of preparation of Jam and Jelly.
- CO6. Develop entrepreneurship in Fruit processing
- CO7. Take care and precautions to setup Fruit processing industry.

Practicals

- | | |
|--|-------|
| 1. Demonstration of fruit processing units. | (01P) |
| 2. Preparation of Jam. | (01P) |
| 3. Preparation of Tamarind syrup. | (01P) |
| 4. Preparation of Jelly. | (01P) |
| 5. Preparation of Wood Apple (Kavath) Vadi. | (01P) |
| 6. Preparation of Squash. | (01P) |
| 7. Preparation of Juice. | (01P) |
| 8. Preparation of Pickles. | (01P) |
| 9. Preparation of Muramba. | (01P) |
| 10. Preparation of Ketchup. | (01P) |
| 11. Preparation of Mango Papad and Jackfruit Papad. | (01P) |
| 12. Preparation of Potato Wafers and Banana Wafers. | (01P) |
| 13. Preparation of Gulkand. | (01P) |
| 14. Preparation of Scented oils (Jasmine, <i>Geranium</i>) | (01P) |
| 15. Preparation of essential oils (<i>Eucalyptus</i> , <i>Lavang</i>). | (01P) |

Choice Based Credit System Syllabus (2023 Pattern)

Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Fruit Processing Industries

Course Code: BOT 126 SEC

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
CO 1				3					
CO 2	3								
CO 3	3								
CO 4	3								
CO 5	3								
CO 6									3
CO 7	2	3							

Justification for the mapping

PO1: Disciplinary Knowledge

- CO2. Get importance of value addition Fruit products.
- CO3. Get knowledge of preparation of natural scented oils.
- CO4. Get idea about the practical knowledge of Fruit processing.
- CO5. Get knowledge of preparation of Jam and Jelly.
- CO7. Take care and precautions to setup Fruit processing industry.

PO2: Critical Thinking and Problem Solving

- CO7. Take care and precautions to setup Fruit processing industry.

PO 4: Research-related skills and Scientific temper

- CO1. Understand techniques of storage of Fruits.

PO 9: Self-directed and Life-long Learning

- CO6. Develop entrepreneurship in Fruit processing.

Name of the Programme	: B.Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: VSC (Vocational Skill Course)
Course Code	: BOT-121-VSC
Course Title	: Organic Farming
No. of Credits	: 02
No. of Teaching Hours	: 30

Course Objectives:

- 1.To inculcate the importance of Organic Farming.
- 2.To equip the students with practical knowledge of different bio pesticides and weedicides.
- 3.To give knowledge of inorganic and organic fertilizers.
- 4.To give idea about nutrient deficiency symptoms of crop plants.
- 5.To give knowledge of different types of Manures.
- 6.To give knowledge of preparation of botanical pesticides.
- 7.To impart the basic skills in the field of Organic Farming.

Course Outcomes:

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

- CO1. Understand applications of Organic Farming.
- CO2. Get expertise in preparation of bio pesticides and weedicides.
- CO3. Get knowledge of inorganic and organic fertilizers based industries.
- CO4. Get idea about nutrient deficiency symptoms of crop plants.
- CO5. Create different types of Manures.
- CO6. Get knowledge of preparation of botanical pesticides.
- CO7. Develop entrepreneurship in Organic Farming.

UNIT: 1 (10 L)

1.1 Concept and development of organic farming, principles of organic farming, types of organic farming, need of organic farming, difference in conventional farming and organic farming, Scope of organic farming. **(06L)**

1.2 Organic farming systems, soil tillage, land preparation and mulching, Green manuring, composting - principles, stages and types, Vermi composting. **(04L)**

UNIT: 2 (10 L)

2.1 Bio-fertilizers - types, methods of application, advantages and disadvantages. **(04L)**

2.2 Plant protection - cultural, mechanical, botanical pesticides, control agents, Weed management. **(06L)**

UNIT: 3

(10 L)

3.1 Farm economy: Basic concept of economics - demand & supply, economic viability of a farm. Terrace farming and its types (Aeroponic, Aquaponics, Hydroponics). **(04L)**

3.2 Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production. **(06L)**

References:

1. Palaniappan SP & Anandurai K. (1999): Organic Farming- Theory and Practice. Scientific Publishers, Jodhpur.
2. Joshi, M. (2014): New Vistas of Organic Farming 2nd Ed. Scientific Publishers, Jodhpur.
3. S.A.Solaimalai (2010): Farming system: Theory and Practice.
4. S.P.Palaniappan and K.A. Annadurai (2019): Organic Farming: Theory and Practice.
5. A.K.Sharma (2015): A hand book of Organic Farming.

Choice Based Credit System Syllabus (2023 Pattern)
Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Organic Farming

Course Code: BOT 121 VSC

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
CO 1		3							
CO 2									3
CO 3	3								
CO 4	3								
CO 5								3	
CO 6				3					
CO 7			2						

Justification for the mapping

PO1: Disciplinary Knowledge

CO3. Get knowledge of inorganic and organic fertilizers based industries.

CO4. Get idea about nutrient deficiency symptoms of crop plants.

PO2: Critical Thinking and Problem Solving

CO1. Understand applications of Organic Farming.

PO 3: Social competence

CO7. Develop entrepreneurship in Organic Farming.

PO 4: Research-related skills and Scientific temper

CO6. Get knowledge of preparation of botanical pesticides.

PO 8: Environment and Sustainability

CO5. Create different types of Manures.

PO 9: Self-directed and Life-long Learning

CO2. Get expertise in preparation of bio pesticides and weedicides.

Name of the Programme	: B. Sc. Botany
Program Code	: USBT
Class	: F. Y. B. Sc.
Semester	: I
Course Type	: IKS – Indian Knowledge System
Course Code	: BOT-137-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 for the 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.

UNIT: 1 (10L)

- 1.1 Definition, aim of Ayurveda, Brief description of Samhita and Ashtang. (06L)
- 1.2 Introduction to department of AYUSH, CCIM, CCRAS, RAV. (04L)

UNIT: 2 (10L)

- 2.1 Ancient Bhartiya Contribution in Environment & Health Ethnic Studies, Life Science in Plants, Anatomy, Physiology, Agriculture, Ecology and Environment. (5L)
- 2.2 Integrated Approach to Healthcare, Medicine, Microbiology, Medicine, Surgery and Yoga, etc. (5L)

UNIT: 3

(10L)

3.1 Study on following dravyas with respect to Sanskrit name, Common name, Botanical name, Family, habit, parts used Amalaki, Arjuna, Ashoka, Bhallataka, Bilva, Brahmi, Chandandravya, Chitraka, Daruharidra, Durva, Eranda, Gokshura, Guduchi, Nimba, Nirgudi, Punarnava, Shatavari, Tulsi, Lavangakeshara. **(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.

Choice Based Credit System Syllabus (2023 Pattern)

Mapping of Program Outcomes with Course Outcomes

Class: F.Y. B. Sc. (Sem. I)

Subject: Botany

Course: Botany in Ayurveda

Course Code: BOT 137 IKS

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
CO 1	3								
CO 2									3
CO 3	3								
CO 4				2					
CO 5	2								
CO 6			3						
CO 7								3	

Justification for the mapping

PO1: Disciplinary Knowledge

- CO1. Aware the importance of Ayurveda and its principles.
- CO3. Understand the medicinal plant parts and their description.
- CO5. Identify plants and environment for the benefit of human beings,

PO 3: Social competence

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

PO 4: Research-related skills and Scientific temper

- CO4. Conscious and aware of natural resources and environment.

PO 8: Environment and Sustainability

- CO7. Use raw materials in ayurvedic formulations and drugs.

PO 9: Self-directed and Life-long Learning

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