*Rayat Shikshan Sanstha's*

# R. B. Narayanrao Borawake College, Shrirampur (Autonomous)

**(Affiliated to Savitribai Phule Pune University, Pune)**

## Department of Botany

# FYUG (Botany) Syllabus as per NEP-2020

***Implemented***

***From***

**Academic Year: 2023-24**

# F. Y. B. Sc. (Botany) Core Subjects (Semester-I)

| Year | Semester | Course Type | Course Code | Course Title | Theory/ Practical | Credits | No. of Theory/ Practical to be conducted | Page No. |
|---|---|---|---|---|---|---|---|---|
| 1st | I | DSC (Major) | BO-MJ-111T | Plant Life and Utilization-I | Theory | 2 | 30L | **4-6** |
| | | | BO-MJ-112T | Plant Morphology and Anatomy | Theory | 2 | 30L | **7-9** |
| | | | BO-MJ-113P | Practical based on BO-MJ-111T and BO-MJ-112T | Practical | 2 | 15P | **10-11** |
| | | VSC | BO-VSC-114T | Plant Nursery and management | Theory | 2 | 30L | **12-14** |
| | | SEC | BO-SEC-115P | Fruit and Vegetable Processing Technology | Practical | 2 | 15P | **15-16** |
| | | IKS | BO-IKS-116T | Medicinal Botany and Indigenous Medicinal System | Theory | 2 | 30L | **17-18** |

# F. Y. B. Sc. (Botany) Core Subjects (Semester-II)

| Year | Semester | Course Type | Course Code | Course Title | Theory/ Practical | Credits | No. of Theory/ Practical to be conducted | Page No. |
|---|---|---|---|---|---|---|---|---|
| 1st | II | DSC (Major) | BO-MJ-121T | Plant Life and Utilization II | Theory | 2 | 30L | **20-21** |
| | | | BO -MJ-122T | Principles of plant science | Theory | 2 | 30L | **22-24** |
| | | | BO -MJ-123P | Practical based on BO-MJ-121T and BO-MJ-122T | Practical | 2 | 15P | **25-26** |
| | | **VSC** | BO-VSC-124P | Plant Nursery and management | Practical | 2 | 15P | **27-28** |
| | | **SEC** | BO-SEC-125P | Herbal cosmetology | Practical | 2 | 15P | **29-30** |

# Syllabus for F. Y. B. Sc. (Botany)

## Semester- I

# DISCIPLINE SPECIFIC CORE COURSE (BO-MJ-111T):
## Plant Life and Utilization – I

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-MJ-111T – Plant Life and Utilization-I | 2 | 2 | --- |

### LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- To provide throughout knowledge about various Plant groups from primitive tohighly evolved.
- To equipped the students with skills related to laboratory as well as field-based studies.
- To make the students aware about conservation and sustainable use of plants.
- To create foundation for further studies in Botany.
- To address the socio-economic challenges related to plant sciences.
- To facilitate students for taking up and shaping a successful career in Botany.
- To make the students aware of applications of different plants in various industries.

### COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1:** The students will develop understanding about the diversity, identification, classification and economic importance of lower plants.
**CO-2:** To Understand the characters and classification of Algae, Fungi, Lichen and Bryophytes.
**CO-3:** To Know the Economic Importance and Utilization of Algae, Fungi, Lichen and Bryophytes.
**CO-4:** To Understand the life cycle pattern of Algae, Fungi, Lichen and Bryophytes.
**CO-5:** To Know the systematic, morphology and structure, of Algae, Fungi, Lichen and Bryophytes.
**CO-6:** Student will get Knowledge and understanding of the range of plant diversity in terms of structure and function.
**CO-7:** To Understand the reproduction of Algae, Fungi, Lichen and Bryophytes.
**CO-8:** To study the role of plants in functioning of global ecosystem.
**CO-9:** To study the evolutionary importance of Algae as progenitors of land plants.

### SYLLABUS OF BO-MJ-111T: [30 Hours]

**Unit-I: INTRODUCTION [4 Hours]**

1. General outline of Plant kingdom.
2. Lower Cryptogams: Thallophytes-Algae, Fungi & Lichens.
3. Higher Cryptogams: Bryophytes and Pteridophytes.
4. Phanerogams: Gymnosperms and Angiosperms, Dicotyledons and Monocotyledons.

Distinguishing characters of these groups and mention few common examples from each.

**Unit-II: ALGAE** **[8 Hours]**

**Introduction**

1. General Characters
2. Classification (R.E. Lee's 2008) up to classes with reasons.
3. Life Cycle of *Spirogyra* w.r.t. Habit, Habitat, Structure of thallus, Structure of typical cell, Reproduction- Vegetative, Asexual and Sexual, Systematic position with reason.
4. Utilization of Algae in Biofuel Industry, Agriculture, Pharmaceuticals, Food and Fodder.

**Unit-III: LICHENS** **[3 Hours]**

1. Introduction
2. General Characters
3. Nature of Association, forms- Crustose, Foliose and Fruticose.
4. Utilization of Lichens.

**Unit-IV: FUNGI** **[7 Hours]**

1. Introduction
2. General Characters
3. Classification-Outline of classification according to Hibbet *et.al.* (2011)
4. Reproduction- Asexual and sexual, Systematic position.
5. Life Cycle of *Mucor*- *Mucor* w.r.t. Habit, Habitat, Occurrence, Sign, and symptoms.
6. Utilization of Fungi in Industry, Agriculture, Food and Pharmaceuticals.

**Unit-V: BRYOPHYTES** **[8 Hours]**

1. Introduction
2. General Characters
3 Classification-outline of classification according to G.M. Smith (1955) up to classes with reasons.
4. Life Cycle of *Riccia* w.r.t. habit, habitat, external and internal structure of thallus,
5. Reproduction- vegetative, asexual, and sexual, Structure of sex organs, fertilization, Structure of mature sporophyte, Structure of spore, Systematic position with reasons.
6. Utilization: Bryophytes as ecological indicators, agriculture, fuel industry and medicine.

**[Note**: -Development of sex organs not expected for all the above-mentioned life cycles.]

## ESSENTIAL/RECOMMENDED READINGS:


1) Ainswarth, Sussman and Sparrow (1973).The Fungi. Vol. IV-A and IV-B. Academic Press.
2) Bilgrami, K. S. and Saha, L. C.(1992)A Textbook of Algae. CBS Publishers and Distributors, Delhi.
3) Gangulee, Das, and Dutta (2002).College Botany. Vol. I, New Central Book Agency (P) Ltd.
4) Dube, H. C. (1990).An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.
5) Krishnamurty, V.(2000).Algae of India and neighboring countries, Chlorophyta, Oxford and IBH, New Delhi.
6) Parihar, N. S.(1980).Bryophyta, An Introduction of Embryophyta. Vol. I. Central Book Distributors, Allahabad.
7) Puri, P.(1980).Bryophyta: Broad prospective. Atma Ram &Sons, Delhi.
8) Smith, G. M.(1971).Cryptogamic Botany. Vol. I: Algae & Fungi. Tata Mc Graw Hill
9) Publishing Co., New Delhi.
10) Smith, G. M.(1971).Cryptogamic Botany. Vol. II: Bryophytes & Pteridophytes. Tata Mc Graw Hill Publishing Co., New Delhi.
11) Vashista, B. R., Sinha A. K. and Singh, V. B.(2005).Botany for degree students-Algae, S. Chand Publication.
12) Vashista B. R., Sinha A. K. and Singh, V. B. (2005). Botany for degree students Fungi, S. Chand Publication.
13) Vashista B. R., Sinha, A. K. and Singh, V. B. (2005). Botany for degree students- Bryophytes. S. Chand Publication.

# DISCIPLINE SPECIFIC CORE COURSE (BO-MJ-112T):

## Plant Morphology and Anatomy

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-MJ-112T – Plant Morphology and Anatomy | 2 | 2 | --- |

## LEARNING OBJECTIVES:

**The Learning objectives of this course are as follows:**

- To make the students aware of applications of different plants in various industries.
- To provide thorough knowledge about various plant groups from primitive to highly evolve.
- To make the students aware about conservation and sustainable use of plants.
- To facilitate students for taking up and shaping a successful career in Botany.
- To create foundation for further studies in Botany.
- To equipped the students with skills related to laboratory as well as field-based studies.

## COURSE OUTCOMES:

**After completion of this course student will able to:**

**CO-1:** Understanding of Plant morphology terminologies and identifying morphological peculiarities.

**CO-2:** Recognize members of the major angiosperm families by identifying their diagnostic features.

**CO-3:** The students will gain ability to apply the acquired knowledge and skills in the field of plant morphology and anatomy.

**CO-4:** Provide lab-based training in writing short species description and illustration.

**CO-5:** This course aims to impart an insight into the internal structure of Dicot and Monocot plants.

**CO-6:** The students will learn about the basic concepts in Morphology and anatomy.

**CO-7:** Acquire practical skills to gather information, assess, create, and execute new ideas to develop entrepreneurial skill.

## SYLLABUS OF BO-MJ-112T: [30 Hours]

**Unit-I: MORPHOLOGY [2 Hours]**

1. Introduction, definition, descriptive and interpretative Morphology.
2. Importance in identification, nomenclature, classification, phylogeny and Plant breeding.

**Unit-II: Morphology Of Vegetative Parts: Root, Stem And Leaf [2 Hours]**

1. Introduction, Morphology of Root: Types and Functions.
2. Morphology of Stem: Types and Function.
3. Morphology of Leaf: Types and Function.

**Unit-III: MORPHOLOGY OF REPRODUCTIVE PARTS [11 Hours]**

**Inflorescence –**

Introduction and Definition, Types: Racemose - Raceme, Spike, Spadix, Corymb, Umbel, Catkin and Capitulum Cymose - Solitary, Monochasial, -Helicoid and scorpiod, Dichasial Polychasial. Special types - Verticillaster, Cyathium, Hypanthodium Significance.

1. **Flower –**
   Introduction and definition.
   **Parts of a typical flower:** Bract, Pedicel, Thalamus- forms, Perianth –Calyx and Corolla, Androecium and Gynoecium.
   **Symmetry:** Actinomorphic and zygomorphic, Sexuality- Unisexual and bisexual, Insertion of floral whorls on thalamus- Hypogyny, Epigyny and perigyny, Merous condition-Trimerous, tetramerous and pentamerous.
   **Floral whorls-Calyx:** Nature- Polysepalous, Gamosepalous; Aestivation- types, Modifications of Calyx- Pappus, Petaloid and Spurred. Corolla: Forms of Corolla- Polypetalous- Cruciform and Papilionaceous.Gamopetalous- Infundibuli form, Bilabiate, Tubular and Campanulate.Aestivation-types and significance.Perianth: Nature- Polytepalous, Gamotepalous.
   **Androecium:** Structure of typical stamen, Variations- cohesion and adhesion.Gynoecium: Structure of typical carpel, number, position, cohesion and adhesion,placentation- types and significance.
2. **Fruits** - Introduction and definition, Types of fruits: Simple: Indehiscent Achene, Cypsela, Nut and Caryopsis. Dehiscent- Legume, Follicle and Capsule. Fleshy: Drupe, Berry, Hesperidium and Pepo. Aggregate: Etaerio of Berries and Etaerio of Follicles. Multiple fruits: Syconus and Sorosis

**Unit-IV: ANATOMY: [2 Hours]**

Introduction and Definition.

1. Importance in Taxonomy, Physiology, Ecological interpretations, Pharmacognosy and Wood identification.

**Unit-V: TYPES OF TISSUES [8 Hours]**

1. Meristematic tissues: Meristem, characters and types based on origin, position and plane of division, functions
2. Permanent tissue: Simple tissues - parenchyma, collenchyma, chlorenchyma and sclerenchyma.
3. Complex/Vascular tissues: Components of xylem and phloem, types of vascular bundles and functions.

4. Epidermal tissues: Epidermis, structure of typical stomata, trichomes, motor cells; functions.

**Unit-V: INTERNAL ORGANIZATION OF PRIMARY PLANT BODY [5 Hours]**

1. Internal structure of dicotyledon and monocotyledon root.
2. Internal structure of dicotyledon and monocotyledon stem.
3. Internal structure of dicotyledon and monocotyledon leaf.

## ESSENTIAL/RECOMMENDED READINGS:


1) Chandurkar, P. J. (1989).Plant Anatomy. Oxford and IBH Publishing Co. Pvt. Ltd. ,New Delhi.
2) Dutta, A.C. (2003). Botany for Degree students. Oxford University Press, New Delhi.
3) Eames, J. and Mc. Daniels (1994). An Introduction to Plant Anatomy. Tata McGraw Hill Publishing Comp., New Delhi.
4) Esau, K.(1993). Plant Anatomy. Wiley Eastern Ltd. New Delhi.
5) Esau, K.(2006).Anatomy of seed plants. John Wiley and Sons, New York. Fahn, A.(1974).Plant Anatomy. Pergamum Press Oxford.
6) Gangulee, Das and Dutta (2002). College Botany. Vol. I. New Central Book Agency, Kolkata.
7) Lawrence, G.H.M. (2012). Taxonomy of vascular Plants. Scientific Publishers (India)Jodhpur.
8) Naik, V.N. (1994).Taxonomy of Angiosperms. Tata Mc Graw Hill Publishing Comp., New Delhi.
9) Pandey, B. P.(2007).Plant Anatomy. S. Chand and Co. Ltd. New Delhi.
10) Pandey, B.P. (2009). A Text Book of Botany- Angiosperms. S. Chand and Co. Ltd. New Delhi.
11) Radford, Albert E. (1986). Fundamentals of Plant Systematics. Publ. Harper and Row, New York.
12) Saxena, A.K. and Sarabhai, R.P. (1968). A Text Book of Botany. Vol. III. Ratan Prakashan mandir, Agra.
13) Sharma, O.P. (1993). Plant Taxonomy. 2nd Edition, McGraw Hill Education, New Delhi.
14) Singh, Gurucharan (2005). Systematics- Theory and Practice. Oxford IBH.
15) Sutaria, R.N.A. Text Book of Systematic Botany. 17. Tayal, M.S. (2012). Plant Anatomy. Rastogi Publication.

# DISCIPLINE SPECIFIC CORE COURSE (BO-MJ-113P):
## Practical Based On BO-MJ-111T & BO-MJ-112T

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-MJ-113P – Practical Based On BO-MJ-111T & BO-MJ-112T | 2 | --- | 2 |

### LEARNING OBJECTIVES:

- **The Learning Objectives of this course are as follows:**
- To make them skilled in practical work, experiments, laboratory equipment and to interpret
- correctly on biological materials and data.
- Topics include the study of plant form, function and reproduction, and an overview of plant
- diversity including Algae, Fungi, Bryophytes.
- To acquaint the students about the morphology, characters and importance of different
- Microorganisms.
- To acquaint the students about the morphology, biology and importance of algal organisms,
- Fungi Bryophytes
- To equipped the students with skills related to laboratory as well as field-based studies.
- To Acquire practical skills to gather information, assess, create, and execute new ideas to
- develop entrepreneurial skill.

### COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1:** Learn the algal diversity, their systematic position and morphology of commonly found algae.

**CO-2-** Study the life cycle patter on different members of Algae.

**CO-3:** Know botanical sources, characteristics, and utilities of Plants/ plant product

**CO-4:** Study of fungal diversity w. r. t Systematic position and morphology and life cycle of different fungal members.

**CO-5:** Get knowledge about the diversity of Bryophytes, their systematic position and morphology and life cycle pattern of some members.

**CO-6:** Study of Lichens and its types and their common and medicinal, pharmaceutical uses.

**CO-7:** Will get practical knowledge regarding plant section cutting, staining and mounting and its microscopic studies.

**CO-8:** Learn about morphology, anatomy and reproduction of Angiosperm.

**CO-9:** Study the transport system in plants, vascular tissues and tissues of plants.

**CO-10:** Acquire practical skills to gather information, assess, create, and execute new ideas to develop entrepreneurial skills which is dependent on medicinal, pharmaceuticals values of algae, fungi, lichens and angiospermic plants and their production and marketing.

## SYLLABUS OF BO-MJ-113P:

## PRACTICALS [60 Hours]

1. Study of microscope, staining technique, Slide preparation. **[1 P]**
2. Study of Life Cycle of *Spirogyra.* **[1 P]**
3. Study of Life Cycle of *Riccia.* **[1 P]**
4. Study of Life Cycle of *Mucor* **[1 P]**
5. Study of forms of Lichens-Crustose, Foliose and fruticose. **[1 P]**
6. Study of different types of Inflorescence. **[1 P]**
7. Study of different modification roots, stem, leaves. **[1 P]**
8. Study of flower with respect to Calyx, Corolla and Perianth, Androecium and Gynoecium. **[2 P]**
9. Study of different types of fruits with suitable examples. **[2 P]**
10. Study of internal primary structure of dicotyledonous root, stem and leaves.e.g. Sunflower. **[2 P]**
11. Study of internal primary structure of monocotyledonous root, stem and leaves e.g. Maize**.** **[2 P]**

**Note:** Excursion tour report with Wild collection/ Geotag Photograph collection.

## ESSENTIAL/ RECOMMENDED READINGS:


1. College Botany Practical Volume2- Santra Das & Chatterjee.
2. A text book of Practical volume 2 Dr. Ashok bendre.
3. Gangulee, Das and Dutta (2002). College Botany. Vol. I. New Central Book Agency, Kolkata.
4. Lawrence, G.H.M. (2012). Taxonomy of vascular Plants. Scientific Publishers (India)Jodhpur.
5. Naik, V.N. (1994).Taxonomy of Angiosperms. Tata Mc Graw Hill Publishing Comp., New Delhi.
6. Pandey, B. P.(2007).Plant Anatomy. S. Chand and Co. Ltd. New Delhi.
7. Pandey, B.P. (2009). A Text Book of Botany- Angiosperms. S. Chand and Co. Ltd. New Delhi.
8. Ainswarth, Sussman and Sparrow(1973).The Fungi. Vol. IV-A and IV-B. Academic Press.
9. Bilgrami, K. S. and Saha, L. C.(1992)A Textbook of Algae. CBS Publishers and Distributors, Delhi.
10. Gangulee, Das, and Dutta (2002).College Botany. Vol. I, New Central Book Agency (P) Ltd.
11. Dube, H.C.(1990).An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.
12. Krishnamurty, V.(2000).Algae of India and neighboring countries, Chlorophyta, Oxford and IBH, New Delhi.
13. Parihar, N.S.(1980).Bryophyta, An Introduction of Embryophyta. Vol.I. Central Book Distributors, Allahabad.

# VOCATIONAL SKILL COURSE (BO-VSC-114T):
## Plant Nursery and Management

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-VSC-114T- Plant Nursery and Management | 2 | 2 | --- |

### LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- To provide the unit with appropriately trained personnel for the promotion of plant cultivation in the country.
- To increase the cultivation of plant.
- It plays important role in horticultural/ forestry industry and in the development of gardens and landscape.
- To propagate and grow plants for sale to public.
- To introduce exotic species.
- It is the safest method artificially regenerating poor and barren sites.

### COURSE OUTCOMES:

**After completion of this course student will able to:**

**CO-1:** Understand the importance of a plant nursery and basic infrastructure Establish it.
**CO-2:** Explain the basic material, tools and techniques required for nursery.
**CO-3:** Demonstrate expertise related to various practices in a nursery. Comprehend knowledge and skills to get an employment or to become an entrepreneur in Plant Sciences.
**CO-4:** Introduction with climatic requirements of nursery plant cultivation.
**CO-5:** Learning value of nursery plant.

### SYLLABUS OF BO-VSC-114T: [30 Hours]

**Unit-I: INTRODUCTION TO PLANT NURSERY [5 Hours]**

1. Plant nursery: Definition and importance.
2. Different types of nurseries–on the basis of duration, plants produced, structure used.
3. Basic facilities for a nursery; layout and components of a good nursery.
4. Plant propagation structures.
5. Bureau of Indian Standards (BIS-2008) related to nursery.

**Unit-II: NURSERY [5 Hours]**

1. Seed structure, dormancy, methods of breaking dormancy, seed viability, seed testing and certification.
2. Basic nursery methods and green house techniques- construction and types, mist chambers, shade houses and glass houses, Importance of green house in plant propagation.

**Unit- III: NECESSITIES FOR NURSERY [5 Hours]**

1. Growing media, nursery tools and implements, and containers for plant nursery.
2. Seeds and other vegetative material used to raise nursery.
3. Techniques to produce planting materials, sowing methods of seeds and planting material.

**Unit-IV: NURSERY TECHNIQUES [5 Hours]**

1. Rooting media, planting, grading types, and methods. Advantages of plant propagation.
2. Gardening – definition and scope, types, landscape and home gardening, gardening operations, management of pests and diseases.
3. Study of cultivation of vegetables and fruits, storage and marketing.

**Unit-V: MANAGEMENT OF NURSERY [5 Hours]**

1. Seasonal activities and routine operations in a nursery.
2. Nursery management–watering, weeding and nutrients; pests and diseases.
3. Common possible errors in nursery activities.
4. Economics of nursery development, pricing and record maintenance.
5. Online nursery in formation and sales systems.

**Unit-VI: PROPAGATION OF NURSERY PLA [5 Hours]**

Propagation practices:

a. Sexual and Asexual propagation. Seed sowing and transplantation of seedlings, advantages and disadvantages of sexual propagation.
b. vegetative Propagation.
   i. Cutting – Definition, stem cutting (hard wood and soft wood cutting), use of PGR's for rooting. Layering – Definition, Simple layering, Air layering.
   ii. Grafting – Definition, Whip grafting, Approach grafting.
   iii. Budding – Definition, T-budding, Patch budding.

**ESSENTIAL / RECOMMENDED READINGS:**

1) Ratha Krishnan, M., et.al.(2014)Plant nursery management: Principles and practices, Central Arid Zone Research Institute (ICAR), Jodhpur, Rjasthan
2) Kumar N.,(1997)Introduction to Horticulture, Rajlakshmi Publications, Nagercoil.
3) Kumar Mishra, K., N. K. Mishraand Satish Chand (1994)Plant Propagation, John Wiley & Sons, New Jersey.

4) Acharya, N.K., (2001) Textbook on intellectual property rights, Asia Law House. (Unit I)
5) Bose, T.K., Mukherjee, D., (1972) Gardening in India. Oxford & IBH Publishing Co., New Delhi. (Unit IV)
6) Dawson, C. (2002) Practical research methods. UBS Publishers, New Delhi. (Unit II)
7) Edmond, M., Andres, Fundamentals of Horticulture. McGraw Hill Book Co., New Delhi. (Unit III)
8) Ganguli, P., (2001) Intellectual Property Rights: Unleashing the Knowledge Economy, Tata McGraw-Hill. (Unit I)
9) Guru, M., Rao, M.B., (2003) Understanding Trips: Managing Knowledge in Developing Countries, Sage Publications. (Unit I)
10) Kumar, N., (1997) Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. (Unit III)
11) Lancaster, P., (1997) Gardening in India. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. (Unit IV) 9. Laurie, A., Ries, V.C., (2003) Floriculture: Fundamentals & Practices. (Unit III)
12) Miller, A.R., Davis, M.H., (2000) Intellectual Property: Patents, Trademarks and Copyright in a Nutshell, West Group Publishers. (Unit I)
13) Randhawa, G.S., Mukhopadhyay, A., (1986) Floriculture in India. Allied Publishers. (Unit III) 12. Sandhu, M.K., (1989) Plant Propagation. Wile Eastern Ltd., Bangalore. (Unit IV)
14) Stapleton, P., Yondeowei, A., Mukanyange, J., Houten, H. (1995). Scientific writing for agricultural research scientists – a training reference manual. West Africa Rice Development Association, Hong Kong. (Unit II)

# SKILL ENHANCEMENT COURSE (BO-SEC-115P):
## Fruit and Vegetable Processing Technology

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-SEC-115P- Fruit and Vegetable ProcessingTechnology | 2 | --- | 2 |

### LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- To focuses on the cultivation, production, harvest and storage of fruits and vegetables and their processing.
- To provide farmers, growers and students with valuable information on how to maximize yields.
- To focuses on fruit tree and vegetables improvement to increase production, yield and quality.
- To incorporates the creation, preparing and advertising of organic products and their development.
- To provide the thorough knowledge about preservation of the colour, flavour, texture and nutrition.
- To prepare fruit and vegetable products so that they can be available off season.
- To provide knowledge about principles and procedures involved in fruit and vegetable processing.
- To make the students aware about microbial infections to the fruits and vegetables and how to eliminate the micro-organisms and to extend shelf life of fruits and processed materials.
- To ensure fruit products safety, storage and marketing.

### COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1:** Students will get scientific knowledge and skills about fruit and vegetable farming and technologies for fruit and vegetables processing and preservation.

**CO-2:** Students will be encouraged to develop new cultivars, improved fruit and vegetable varieties and disease resistant varieties of fruits.

**CO-3:** students will be able to study and find out most effective strategies keeping fruit trees and vegetables healthy and productive.

**CO-4:** Students will get practical knowledge and information for fruit and vegetable preservation.

**CO-5:** Students will get information about fermented fruit and vegetables products and by product

waste utilization.

**CO-6:** Students will acquire knowledge that enables them to identify the main key processing steps used during fruit and vegetables transformation, understand the main effect of the processing on the quality characteristics of processed fruits and vegetables.

**CO-7:** Students will acquire knowledge that enables them to identify the main key processing steps used during fruit transformation, understand the main effect of the processing on the quality characteristics of processed fruits and vegetables.

**CO-8:** Students will get knowledge about job and entrepreneurial opportunities related to fruit and vegetable farming and processing.

## SYLLABUS OF BO-SEC-115P - PRACTICALS [60 Hours]

1. Performance of Drying operations of fruits and vegetables using different dryers. **[1 P]**
2. Preparation of Jam from seasonal fruits. **[1 P]**
3. Preparation of Jelly from seasonal fruits. **[1 P]**
4. Preparation of Marmalade from seasonal fruits. **[1 P]**
5. Preparation of Squash, Syrup and Juice from seasonal fruits. **[2 P]**
6. Preparation of any two processed food product using dry fruits. **[2 P]**
7. Preparation of Candy from any two locally available fruits. **[2 P]**
8. Preparation of any two processed food products form tomatoes. **[2 P]**
9. Preparation of Kimchi and Kanji. **[2 P]**
10. Packing, labelling and sealing of prepared fruit products. **[1 P]**

**Note:**

1) Visit to fruit and vegetable market and prepare report.
2) Visit to the orchard in nearby area and prepare report.
3) Visit to fruit processing industry and prepare report.

## ESSENTIAL/RECOMMENDED READINGS:

1) D. P Singh 2015. Fruit Crops : Published by Agrotech Press, Jaipur & New Delhi
2) Jitendrasingh 2014. Basic Horticulture, Published by Kalyani Publishers
3) S. N Gupta 2015. Instant Horticulture, 11th Edition, published by Jain Brothers.
4) Kunte Y. N, M. P Kawthalkarand K.S Yawalkar, 2005, Principles of Horticulture and Fruit Growing 10th edition, published by Agro-horticulture Publishing House,New Delhi
5) George Acquaah, 2009. HORTICULTURE: Principles & Practices, published by PHI Learning Pvt. Ltd.

# INDIAN KNOWLEDGE SYSTEM (BO-IKS-116T): Medicinal Botany and Indigenous Medicinal System

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-IKS-116T- Medicinal Botany and Indigenous Medicinal System | 2 | 2 | --- |

## LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- Students knows economic importance of various plant products
- Students acquire fundamental Botanical knowledge.
- The application of plants as medicines date back to prehistoric period.
- To create awareness about cultivation, conservation, andsustainable utilization of biodiversity.
- Knowledge about the healing properties, from earliest times to provide health and predates all other medical treatment.
- The collection and processing of medicinal plants and plant products.

## COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1.** Understand scope and importance of Medicinal Botany.
**CO-2.** Know the cultivation, collection, processing & importance of various herbal drugs.
**CO-3.** Understand the scope of Indigenous Medicinal System.
**CO-4**. Know the botanical resources like non-wood forest products.
**CO-5.** Understand the concept of Ayurvedic pharmacy.

## SYLLABUS OF BO-IKS-116T: [30 Hours]

**Unit -I - AYURVEDA** **[5 Hours]**

1. Introduction – Ayurveda.
2. Origin of Ayurveda.
3. History of Ayurveda.
4. Basic Principals of Ayurveda.
5. Plant used in Ayurvedic Treatments.

**Unit-II - OTHER SYSTEMS OF MEDICINES** **[10 Hours]**

1. Siddha - Introduction, Origin and History of Siddha

2. Basis of siddha Systems
3. Plants used in siddha Medicine
4. Unani-Introduction, Origin and History of Unani
5. Basis of Unani Systems
6. Plants used in Unani Medicine

**Unit-III – HERBAL MEDICINES** **[8 Hours]**

1. Herbal medicines: Introduction, Definition.
2. Herbal medicines: History and Scope.
3. Herbal preparations: safety, modern herbal medicine.
4. Benefits of herbal medicine.
5. Preparations, formulations, and herbal utilization, compounding of drugs.
6. Storage of medicinal plants for crude drugs.

**Unit-V - INDIGENOUS TRIBE** **[7 Hours]**

1. Miracle Herbs in Tribal Tradition.
2. Indigenous Medicinal Sciences.
3. Remedy from Medicinal herbs.
4. Some of the important herbs used by the indigenous Tribe.

**NOTE:** Any one Visit to Tribal area / Herbal Garden/ Herbal Industry/ Pharmaceutical Industry.

**ESSENTIAL/RECOMMENDED READINGS:**

1) Indigenous medicinal Plants and their Practical Utility- H.C. Lakshman and R.K. Inchal
2) Medicinal Plants: Ethnobotanical Approach, Trivedi P C, 2006. Agrobios, India.
3) The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine, Vasant Lad, David Frawley.
4) Indian Medicinal Plants- Prakash Paranjpe.
5) Medicine and Athavaveda: Dr. C. K. Ramachandran, Mathrubhumi books.
6) Hand Book of Ayurvedic medicinal plants Herbal (Kapoor).
7) Medicinal Plants -P.C. Trivedi.
8) Medicinal Herbs for Pharma Industry: Dr. Datta A. Dhale.
9) Ethnobotany: S.K. Jain and Ashok Jain.
10) Introduction to Spices, Plantation Crops: N. Kumar.

# Syllabus for F. Y. B. Sc. (Botany)

## Semester -II

# DISCIPLINE SPECIFIC CORE COURSE (BO-MJ-121T): Plant Life and Utilization - II

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-MJ-121T - Plant Life and Utilization-II | 2 | 2 | --- |

## LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- To provide thorough knowledge about various plant groups from primitive to highly Evolved.
- To highlight the potential of these studies to become an entrepreneur and to equipped the students with skills related to laboratory as well as field based studies
- To make the students aware about conservation and sustainable use of plants.
- To facilitate students for taking up and shaping a successful career in Botany.
- To make the students aware of applications of different plants in various industries.
- To get aware about the criteria used for classification, phases of plant classification and brief history on account.
- To study Botanical Nomenclature: Concept of nomenclature, Binomial nomenclature, and its Advantages and Taxonomic literatures and Use of computers in angiosperms taxonomy.

## COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1**: The students will develop understanding about the diversity, identification, classification And economic importance of lower plants.

**CO-2:** Understand the characters and classification of Pteridophytes.

**CO-3:** Know the Economic Importance and Utilization of Pteridophytes, Angiosperms and Gymnosperms.

**CO-4:** Understand the life cycle pattern of Pteridophytes, Angiosperms and Gymnosperms.

**CO-5:** Know the systematic, morphology and structure, of Pteridophytes, Angiosperms and Gymnosperms.

**CO-6**: Knowledge and understanding of the range of plant diversity in terms of structure and function.

**CO-7:** Understand the reproduction of Pteridophytes, Angiosperms and Gymnosperms.

**CO-8:** The role of plants in functioning of global Ecosystem.

**CO-9:** Understand the habit of the Angiosperm plant body.

## SYLLABUS OF BO-MJ-121T: [30 Hours]

**Unit-I: INTRODUCTION** **[3 Hours]**

1. Introduction to plant diversity.
2. Pteridophytes, Gymnosperms and Angiosperms w. r. t. vascular plants.

**Unit-II: PTERIDOPHYTES** **[10 Hours]**

1. Definition, meaning and general characters.
2. Outline of classification according to Reimer (1954) up to classes with reasons.
3. Reproduction – vegetative and sexual.
4. Life cycle of *Nephrolepis* w.r.t. Habit, habitat, distribution, morphology, anatomy of stem and leaf, Reproduction.
5. Pteridophytes in India.
6. Utilization and economic importance of Pteridophytes.

**Unit-III: GYMNOSPERMS** **[10 Hours]**

1. Definition and Meaning, General characters.
2. Outline classification according to Christenhusz *et al.* (2011). up to classes with reasons.
3. Life cycle of *Cycas* w.r.t. Habit, Habitat, Distribution, Morphology and Anatomy of Stem, leaf.
4. Reproductive organs-Male cone, Microsporophyll, microspores and megasporophyll, megaspore; structure of seed.
5. Gymnosperm in India.
6. Utilization and economic importance of gymnosperms.

**Unit-IV: ANGIOSPERM** **[7 Hours]**

1. Definition and Meaning, General characters.
2. General character Outline of classification of Bentham and Hooker's system up to series.
3. Reproduction and Fertilization.
4. Comparative account of monocotyledons and dicotyledons.
5. Utilization and economic importance of Angiosperms.

**ESSENTIAL/RECOMMENDED READINGS:**

1) Bendre, Ashok and Kumar, Ashok (1993).A Text Book of Practical Botany, Rastogy Publications, Meerut.
2) Chamberlain, C.J.(1934).Gymnosperms-Structure and Evolution. Chicago.
3) Coulter, J.M. and Chamberlain, C.J.(1917). Morphology of Gymnosperms. Chicago.
4) Davis, P. H. and Heywood, V.H.(1963). Principles of Angiosperms taxonomy. Oliverand Boyd Publ. London.
5) Dutta, S.C.(1988). Systematic Botany. Wiley Eastern Ltd.,New Delhi.
6) Eames, E.J.(1983).Morphology of Vascular Plants.Standard University Press.
7) Gangulee and Kar (2006). College Botany. New Central Book Agency (P.) Ltd.Kolkata.
8) Naik, V.N. (1994).Taxonomy of Angiosperms. Tata Mc Graw Hill Publishing Comp.,New Delhi

# DISCIPLINE SPECIFIC CORE COURSE (BO-MJ-122T):

## Principles of Plant Sciences

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-MJ-122T – Principles of Plant Sciences | 2 | 2 | --- |

### LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- To illustrate the knowledge regarding basics of plants, their fundamental processes and their importance.
- To deal with study of plant growth, phases of growth and factors affecting plant growth.
- To study various plant growth regulators and their effect on plant.
- To understand structures and purposes of basic components of prokaryotic and eukaryotic cells, especially cytoplasm, membranes and cell organelles.
- To study cellular events under laying mitotic and meiotic cell divisions.
- To provide a foundation and background in plants in relation to their genetic material, structure and functions of DNA, RNA.
- To understand basic stages, enzymes and their roles in prokaryotic DNA replication**.**

### COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1:** Develop a strong fundaments basics for further detailed molecular, cellular and physiological study.

**CO-2:** Develop the understanding of plant growth, development, metabolic and physiological processes in plants.

**CO-3:** Gain about basic information about prokaryotic and eukaryotic cells, structure and functions about cells, cell organelles, genetic material.

**CO-4:** Understand cell cycle and division patterns of plant cells.

### SYLLABUS OF BO-MJ-122T: [30 Hours]

**PLANT PHYSIOLOGY AND CELL BIOLOGY** **[15 Hours]**

**Unit-I: INTRODUCTION** **[1 Hours]**

1. Introduction, definition and scope of plant physiology.

**Unit-II: DIFFUSION, OSMOSIS, PLASMOLYSIS** [**3 Hours]**

1. Diffusion: definition, importance of diffusion in plants, imbibition as a special type of diffusion.
2. Osmosis – definition, types of solutions (hypotonic, isotonic, hypertonic), endosmosis, ex-osmosis, osmotic pressure, turgor pressure, wall pressure, importance of osmosis in plants.
3. Plasmolysis – definition, mechanism and significance.

**Unit-III: PLANT GROWTH** **[3 Hours]**

1. Plant growth - introduction, phases of growth, factors affectingGrowth.
2. Plant growth regulators.

**Unit IV: PLANT CELL** **[4 Hours]**

1. Structure of plant cell, differences between prokaryotic and eukaryotic cell.
2. Plant cell wall – components of primary cell wall, structure and functions.
4. Plasma membrane- structure and functions.
5. Ultrastructure and functions of chloroplast and Mitochondrion.

**Unit V: PLANT CELL CYCLE** **[4 Hours]**

1. Cell Cycle in plants and its importance.
2. Cell Division-divisional stages of mitosis and meiosis.

**MOLECULAR BIOLOGY** [**15 Hours]**

**Unit I: INTRODUCTION** **[2 Hours]**

1. Introduction and scope of Molecular Biology, Central dogma of Molecular Biology.

**Unit II: DNA - GENETIC MATERIAL** **[8 Hours]**

1. DNA as a genetic material, structure, function and components of DNA, nucleoside and nucleotide.
2. Watson Crick model of DNA and its characteristic features, types of DNA (A, B and Z DNA).
3. Gene structure and function.
4. Prokaryotic and Eukaryotic Chromosome, structure, types of Chromosomes.
5. Chromosome organization and functions of chromosomes.

**Unit III: RNA** **[3 Hours]**

Types of RNA, structure and functions of different types of RNA.

**Unit IV: PROTEIN** **[2 Hours]**

Classification and types of proteins, structure and functions of protein.

## ESSENTIAL/RECOMMENDED READINGS:


1) Buchanan, B.B, Gruissem, W. and Jones, R.L (2000). Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists Maryland, USA.
2) Cooper, G.M. and Hausman, R.E. (2007). The Cell: Molecular Approach 4th Edition, Sinauer Associates, USA.
3) David, Nelson and Cox, Michael (2007). Lehninger Principles of Biochemistry.W.H. Freeman and Company. New York.
4) Devlin, R.M. (1983). Fundamentals of Plant Physiology. Mc. Millan, NewYork.
5) Dutta, A.C. (2000). A Class Book of Botany. Oxford University Press, UK.
6) Hopkins, William G. (1995). Introduction to Plant Physiology. Publ. JohnWiley and Sons, Inc.
7) Lewin, Benjamin (2011). Genes. X Jones and Bartlett.
8) Lincolin, Taiz and Eduardo, Zeiger (2010). Plant Physiology. 5th Edition.Sinauer Associates, Inc. Publishers. Sunder land, USA.
9) Opik, Helgi, Rolfe, Stephen A. and Willis, Arthur J. (2005). The Physiology ofFlowering Plants. Cambridge University Press, UK.
10) Pal, J.K. and Ghaskadbi, Saroj (2009). Fundamentals of Molecular Biology.Oxford University Press. India.
11) Pandey, S.N. and Sinha, B.K. (2014). Plant Physiology. Vikas PublishingHouse Pvt. Ltd., India.
12) Salisbury, F.B. and Ross, C.B. (2005). Plnt Physiology. 5th Edition.Wadsworth Publishing Co.Belmont California, USA.
13) Watson, James D., Baker, Tania; Bell, Stephen P.; Alexander Gann; Levine, Michael and Lodwick, Richard (2008). Molecular Biology of the Gene. 6th Edition, Pearson Education, Inc. and Dorling Kindersley Publishing, Inc. USA.
14) Weaver, R. (2011). Molecular Biology. 5th Edition, Publisher- McGrew Hill Science. USA.

## DISCIPLINE SPECIFIC CORE COURSE (BO-MJ-123P): Practical Based On BO-MJ-121T AND BO-MJ-122T

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| **BO-MJ-123P – Practical based on BO-MJ-121T and BO-MJ 122T** | 2 | --- | 2 |

### LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- To illustrate the knowledge regarding basics of plants, their fundamental processes and their importance.
- To study of the life cycle of members of Pteridophytes, Gymnosperms and Angiosperms.
- To understand the differences between Prokaryotic and Eukaryotic cells.
- To study cellular events underlaying mitotic and meiotic cell divisions.
- To provide a foundation and background regarding dicot and monocot plants.

### COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1:** Develop a strong fundamental and practical basics for plant physiological and molecular processes.

**CO-2:** Gain basic information about structure and functions of prokaryotic and eukaryotic cells.

**CO-3:** Understand cell cycle and division patterns of plant cells.

**CO-4:** Understand cellular events in plants.

**CO-5:** Gain idea about diversity of vegetation.

### SYLLABUS OF BO-MJ-123P:

**PRACTICALS** **[60 Hours]**

1. Study of life cycle of *Nephrolepis* **[1 P]**
2. Study of life cycle of *Cycas*. **[1 P]**
3. Study of utilization and economic importance of Pteridophytes and Gymnosperms. **[1 P]**
4. Study of comparative account of Dicotyledonous and Monocotyledonous plants w.r.t. external morphological and reproductive characters. **[1 P]**
5. Study of double fertilization and observation of ovule, ovary and endosperm of Angiosperm **[1 P]**
6. Study of utilization and economic importance of Angiosperms. **[1 P]**
7. To observe characteristic features of prokaryotic and eukaryotic plant cell. **[1 P]**

8. Study of mitosis- preparation of slides using onion root tips to observe divisional stages. **[1 P]**
9. Study of meiosis- preparation of slides using *Tradescantia*/ *Rhoeo*/ *Maize* / Onion flower buds to observe divisional stages. **[1 P]**
10. Estimation of chlorophyll-a and chlorophyll-b by using suitable plant material. **[2 P]**
11. Plasmolysis- endosmosis, ex-osmosis, incipient plasmolysis using *Rhoeo* leaf peeling. **[2 P]**
12. Demonstration of Osmosis by curling experiment. **[1 P]**
13. Study of plant growth regulators. **[1 P]**

**Note :** Preparation of DNA Paper model.

**Note :** Excursion Tour Report with wild collection/ Geo-tag photos to study diversity of vegetation.

## ESSENTIAL/RECOMMENDED READINGS:


1) Tuwar A. R. et al. (2019). Practical Handbook of Botany. Success Publication.
2) Buchanan, B.B, Gruissem, W. and Jones, R.L (2000). Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists Maryland, USA.
3) Cooper, G.M. and Hausman, R.E. (2007). The Cell: Molecular Approach 4thEdition, Sinauer Associates, USA.
4) David, Nelson and Cox, Michael (2007). Lehninger Principles of Biochemistry.
5) W.H. Freeman and Company. New York.
6) Devlin, R.M. (1983). Fundamentals of Plant Physiology. Mc. Millan, New York.
7) Pal, J.K. and Ghaskadbi, Saroj (2009). Fundamentals of Molecular Biology.
8) Oxford University Press. India.
9) Pandey, S.N. and Sinha, B.K. (2014). Plant Physiology. Vikas Publishing House Pvt. Ltd., India.
10) Salisbury, F.B. and Ross, C.B. (2005). Plant Physiology. 5th Edition.Wadsworth Publishing Co. Belmont California, USA.
11) Weaver, R. (2011). Molecular Biology. 5th Edition, Publisher- Mc Grew Hill Science. USA.

# VOCATIONAL SKILL COURSE (BO-VSC-124P): Plant Nursery and Management

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-VSC-124P - Plant Nursery and Management | 2 | --- | 2 |

## LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows**:

- To provide the unit with appropriately trained personnel for the promotion of Plant production in the country.
- To increase awareness about the various methods in cultivation of plant.
- To propagate and grow plants for sale to public.
- To introduce exotic species.
- It is the safest method artificially regenerating poor and barren sites.

## COURSE OUTCOMES:

**After completion of this course student will able to**

**CO-1:** Understand the importance of a plant nursery and basic infrastructure to establish it.

**CO-2:** Get knowledge about basic material, tools and techniques required for nursery.

**CO-3:** Get thorough information about the climatic requirements of nursery plant for their proper cultivation.

**CO-4:** Learn value of nursery plants

## SYLLABUS OF BO-VSC-124P:

**PRACTICALS:** **[60 Hours]**

1. Study of Nursery tools and Implements, garden containers and filling of pots. **[1 P]**
2. Preparation of beds for nursery and seed sowing. **[1 P]**
3. Study of methods of breaking seed dormancy. **[1 P]**
4. Study of different methods of seed germination. **[1 P]**
5. Preparation of growing media for Container seedlings. **[1 P]**
6. Study of plant propagation by Budding and Grafting. . **[2 P]**
7. Study of plant propagation by Cutting and Layering. **[2 P]**
8. Identification of weeds and herbarium preparation. **[1 P]**
9. Study of media preparation and PGR for propagation of nursery plants. **[1 P]**
10. Marigold- Identification and description of species/varieties, propagation and planting, pruning management. **[1 P]**

11. Methods of harvesting of cut flowers and their preservation methods. **[1 P]**
12. Study of important pests and diseases of nursery plants and their control measure. [**1 P]**
13. Demonstrative study of erection of fencing. [**1 P]**

**Note: -** Visit to nursery and submission of report.

## ESSENTIAL / RECOMMENDED READINGS:


1) Adam C.R. (2004). Principles of Horticulture. Elsevier Butterworth-Heinemann.
2) Peter K. V. (2015). Basics of Horticulture. New India Publishing Agency, New Delhi.
3) Gupta S.N. (2016). Instant Horticulture. Jain Brothers, New Delhi.
4) Tiwari A.K. and R. Kumar (2012). Fundamentals of Ornamentals, Horticulture and Landscape Gardening. New India Publishing Agency, New Delhi.
5) Acharya, N.K., (2001) Textbook on intellectual property rights, Asia Law House. (Unit I)
6) Bose, T.K., Mukherjee, D., (1972) Gardening in India. Oxford & IBH Publishing Co., New Delhi. (Unit IV)
7) Dawson, C. (2002) Practical research methods. UBS Publishers, New Delhi. (Unit II)
8) Edmond, M., Andres, Fundamentals of Horticulture. McGraw Hill Book Co., New Delhi. (Unit III)
9) Ganguli, P., (2001) Intellectual Property Rights: Unleashing the Knowledge Economy, Tata McGraw-Hill. (Unit I)
10) Guru, M., Rao, M.B., (2003) Understanding Trips: Managing Knowledge in Developing Countries, Sage Publications. (Unit I)
11) Laurie, A., Ries, V.C., (2003) Floriculture: Fundamentals & Practices. (Unit III)

## SKILL ENHANCEMENT COURSE (BO-SEC-125P): Herbal Cosmetology

| Course Code &Title | Credits | Credit Distribution of the Course | |
|---|---|---|---|
| | | Theory | Practical |
| BO-SEC-125P - Herbal Cosmetology | 2 | --- | 2 |

### LEARNING OBJECTIVES:

**The Learning Objectives of this course are as follows:**

- This is a skill course which will help students in preparation of cosmetic products.
- This course will elucidate the students about formulations in detail such that can innovate new products of similar health care objectives.
- Students will be aware about benefits of herbal products and adverse effect of synthetic cosmetic products.

### COURSE OUTCOMES:

**After completion of this course student will able to;**

**CO-1:** Students will be aware of local herbs and plants that are useful in the preparation of herbal cosmetics.

**CO-2:** Through this course students will be able to manufacture herbal cosmetic products.

### SYLLABUS OF BO-SEC-125P:

**PRACTICALS** **[60 Hours]**

1) Demonstrative study of the Skin, Hair and Nail Structure and Functions. **[1P]**
2) Study of adverse effects of synthetic cosmetic products on health and beauty. **[1P]**
3) Demonstration of herbal creams, shampoo, lotions and other cosmetics available in market and their uses. **[1P]**
4) To study the plants and their parts commonly used in the preparation of herbal cosmetics. **[1P]**
5) Preliminary phytochemical screening of aqueous extracts of any two local plants/herbs used in the herbal cosmetics. **[2P]**
6) Preparation of Herbal Shaving cream and Hair oil. **[2P]**
7) Preparation of Herbal Face wash and Face pack. **[1P]**
8) Preparation of Herbal Shampoo and Herbal hair pack. **[2P]**
9) Preparation of Herbal Lipstick and Herbal soap. **[2P]**
10) Preparation of Herbal Toothpaste and Mouthwash. **[2P]**

## ESSENTIAL/ RECOMMENDED READINGS:

1) Handbook of Cosmetic Science and Technology –edited by Andre O. Barel et al.,
2) Publisher: Informa Healthcare.
3) The Chemistry and Manufacture of Cosmetics-edited by Mitchell L. Schlossman, Allured Publishing Corporation.
4) Harry's Cosmeticology – edited by Meyer R. Rosen
5) Textbook of Herbal Cosmetics Paperback -by Vimaladevi M.
6) Herbal Cosmetics Handbook- by H Panda
**7)** International Cosmetic Ingredient Dictionary & Handbook- by The Personal Care Products Council**.**