

**Shiksha Mandal's  
Bajaj College of Science, Wardha**

**Proposed Syllabus for Four Year Multidisciplinary UG  
Program with DSC as Major  
(Four Year B.Sc. Honors/Research Program)**

**Program: B.Sc.  
(Academic Session 2023-24 onwards)**

**Syllabus**

**SKILL ENHANCEMENT COURSE (SEC)**

**Semester I to VI courses in  
Botany**

**Syllabus under Autonomy**

# HORTICULTURE

[15L + 30 P]

[ Credits 2]

**Course description:** The course focuses on the sustainable development of food and ornamental plants, reducing the degradation of the environment, and gardening.

**Course Objectives:** To acquaint students' scope and importance horticulture, its branches, its role in rural economy, and techniques involved.

**Course learning outcomes:** The student will be able to understand different branches of horticulture and demonstrate advanced technologies in horticulture.

## Unit I: Introduction

[5 Hrs.]

Scope and importance, Branches of horticulture; Role in rural economy and employment generation; Importance in food and nutritional security; Urban horticulture and ecotourism.

## Unit II: Ornamental Plants

[5 Hrs.]

Types, classification (annuals, perennials, climbers and trees); Identification and salient features of some ornamental plants [Rose, Marigold, *Gladiolus*, *Tuberose*, Cacti and Succulents (*Opuntia* and *Agave*)] Ornamental flowering trees (*Amaltas*, *Gulmohar*, *Jacaranda*, *Lagerstroemia*, Palms).

## Unit III: Fruit, Vegetables and Techniques

[5 Hrs.]

Production, origin, distribution, management and marketing of vegetable and fruit crops; Identification of some fruits and vegetable varieties (Citrus, Banana, Mango, Chillies and Cucurbits). Application of manure, fertilizers, nutrients and PGRs; Weed control; Biofertilizers, biopesticides; Irrigation methods (drip irrigation, surface irrigation, furrow, and border irrigation)

## Practical:

[30 Hrs.]

- Visit to a garden.
- Visit to an orchard.
- Visit to a vegetable farm.
- Propagation of flower crops, vegetable crops and fruit crops through seeds.
- Preparation of pot for planting, cleaning, and filling.
- Identification of different fertilizers.
- Identification of organic manures (FYM, Vermicompost, cakes)

## REFERENCE BOOKS:

- NIIR Board (2005). Cultivation of Fruits, Vegetables and Floriculture. National Institute of Industrial Research Board, Delhi.
- Singh, D. & Manivannan, S. (2009). Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India.
- Swaminathan, M.S. and Kochhar, S.L. (2007). Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India. Macmillan Publishers, India.

## Mode of evaluation:

**Continuous Internal Assessment (No end semester examination)**

**(Poster presentation / Project/ Presentation/ Assignment/ Quiz)**

**Total Mark: 50**

## **SOIL LESS FARMING**

[15L + 30 P]

[ Credits 2]

**Course description:** The course provides foundational knowledge on soil less crop production practices and management.

**Course Objectives:** The students will be introduced to soilless growing substrates, nutrient solution preparation and management, crop response to aerial environmental factors, new technologies and their manipulation in agriculture.

**Course learning outcomes:** The student will develop a theoretical knowledge and practical understanding of the science and techniques of soil less crop production; an understanding of the basic plant mineral nutrient requirements and nutrition solution monitoring procedures in a hydroponics system.

### **Unit I: Modern Farming Technology**

[5 Hrs.]

Scope, branches and importance of modern farming technology, role in urban and rural economy and employment generation.

### **Unit II: Hydroponics: Commercial Aspects and Recent Advancements**

[5 Hrs.]

Hydroponics: Commercial Aspects and Recent Advancements. Advantages and disadvantages of hydroponics, Application of hydroponics in agriculture.

### **Unit III: Hydroponics: Techniques and Media**

[5 Hrs.]

Techniques in Hydroponics – Static solution culture, Continuous –flow, Solution culture, NFT, Aeroponics, Passive sub-irrigation, Ebb and flow, Dutch bucket, Deep water culture, Bubbleponics. Media used for Hydroponics: Clay, Rock wool, cocopeat, Perlite, Pumice, Vermiculite, Sand, Gravel, Hydroton, Polystyrene packing peanuts, wood fiber.

### **Practicals:**

[30 Hrs.]

- Study of techniques used in hydroponics (Circulating methods such as Nutrient Film Technique (NFT), Deep Flow Technique (DFT), Dutch bucket; Non circulating methods such as Root dipping, Floating, Capillary action; Aeroponics such as root mist and fog feed techniques).
- Study of various instruments used in hydroponics (Pressure gauge, Filters, PVC Tanks, Venturi/Reciprocating Pump/Mixing tank, EC meter, pH meter, TDS meter, water pump, net cups, air pump, thermometer, lux meter, drip irrigation system).
- Construction of sustainable hydroponic and aeroponic units (including greenhouse facilities)
- Preparation of growth media for Hydroponics
- Growing a leafy vegetable/fruity vegetable/medicinal herb /aromatic plant in Hydroponics /Aeroponic solution.
- Study of safety measures, certification standards and government policies.
- Visit to Hydroponic/Aquaculture/Aeroponic farm/Institute.

### **REFERENCE BOOKS:**

- Goddek, S., Joyce, A., Kotzen, B., Burnell, G.M. (2019). Aquaponics Food Production Systems. Springer, Cham.
- Hasan, M.; Sabir, N.; Singh, A.K.; Singh, M.C.; Patel, N.; Khanna, M.; Rai, T.; and Pragnya, P. (2018). Hydroponics Technology for Horticultural Crops, Tech. Bull. TBICN 188/2018.Publ. by I.A.R.I., New Delhi.
- Meier Schwarz. (1995). Soilless Culture Management. Advanced Series in Agricultural Sciences, vol 24.Springer, Berlin.
- Misra, R.L., Misra S. (2017). Soilless Crop production. Daya Publishing House, Astral

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## **ANALYTICAL PHARMACOGNOSY**

[15L + 30 P]

[ Credits 2]

**Course description:** The course involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

**Course Objectives:** The students will know the techniques in the cultivation and production of crude drugs, their uses and chemical nature, and the evaluation techniques for the herbal drugs.

**Course learning outcomes:** The student will develop recognition of medicinal plants, identification of adulteration and contamination, and preparation of crude drugs for the market.

### **Unit I: Introduction to Pharmacognosy**

[8 Hrs.]

Definition, history, scope and development of Pharmacognosy. Sources of Drugs – Plants, Animals, Marine and Tissue culture. Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). Classification of crude drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological classification of drugs

### **Unit II: Quality control of Drugs of Natural Origin**

[7 Hrs.]

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants (stomata, trichomes, xylem, phloem, ergastic substances), camera lucida.

### **Practicals:**

[30 Hrs.]

- Analysis of crude drugs by chemical tests: (i) *Acacia* (ii) Starch (iii) Honey (iv) Castor oil.
- Determination of stomatal number and index.
- Determination of trichomes over leaf surface.
- Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer.
- Determination of Ash value.
- Determination of Extractive values of crude drugs.
- Determination of moisture content of crude drugs.

### **REFERENCE BOOKS:**

- Anatomy of Crude Drugs by M.A. Iyengar.
- Essentials of Pharmacognosy, Dr. S. H. Ansari, II<sup>nd</sup> edition, Birla publications, New Delhi, 2007
- Herbal drug industry by R.D. Choudhary (1996), I<sup>st</sup> Edition, Eastern Publisher, New Delhi.
- Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
- Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae.
- Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37<sup>th</sup> Edition, Nirali Prakashan, New Delhi.
- Textbook of Pharmacognosy by T.E. Wallis
- Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
- W. C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.

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## **HERBAL TECHNOLOGY**

[15L + 30 P]

[ Credits 2]

**Course description:** The course covers all the myriads of ways of utilizing the various potentialities of plants for human welfare.

**Course Objectives:** The students will be aware about herbal medicines, herbal techniques and understand different aspects herb and its utility.

**Course learning outcomes:** The student will be able to understand raw material as source of herbal drugs from cultivation to develop herbal drug product.

### **Unit I: Herbal Medicines**

[5 Hrs.]

History and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

### **Unit II: Pharmacognosy and Phytochemistry**

[10 Hrs.]

Systematic position and medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. Active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster).

### **Practicals:**

[30 Hrs.]

- To study the methods of biological testing of herbal drugs.
- To study the screening tests for secondary metabolites.
- Identification of useful herbal plants.
- To perform herbal preparations  
Identification and utilization of the medicinal herbs.
- To study the active principles of herbal drugs with paper chromatography and thin layer chromatography.

### **REFERENCE BOOKS:**

- Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
- Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH - publishing Co.
- Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
- Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
- Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
- The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book - Distributors.

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