

**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**

**VOCATIONAL SKILL COURSE (VSC)**

**Semester I to VI courses  
in Botany**

**Syllabus under Autonomy**

# MUSHROOM CULTIVATION

[15L + 30 P]

[ Credits 2]

**Course Description:** The course includes an overview of mushrooms, types, nutritional benefits, and techniques involved in mushroom cultivation.

**Course Objectives:** To impart knowledge to students about the diversity and identification of mushrooms growing in the region and to acquaint them about the nutritional, medicinal value of mushrooms and cultivation of some mushrooms.

**Course learning outcomes:** Students will learn the nutritional, medicinal value, cultivation practices of mushrooms and their economic importance.

## **Unit I: Introduction** [5 Hrs.]

Overview of mushroom, characteristics, and types (Poisonous and non-poisonous mushrooms). Mushroom ecology: Habitat, nutrition, life cycle, diversity; nutritional and medicinal importance of mushrooms.

## **Unit II: Mushroom Cultivation** [5 Hrs.]

Mushroom cultivation: (science and art, waste to wealth), round the year mushroom cultivation, life cycle, reproduction of mushrooms. Mushroom hunting, prerequisite, collection, description, and description of mushrooms.

## **Unit III: Techniques and Practices** [5 Hrs.]

Cultivation practices of *Pleurotus* (Dhingari oyster mushroom), Button Mushroom, Milky Mushroom.

## **Practicals:** [30 Hrs.]

- Acquaintance with laboratory equipment.
- Culture media preparation and sterilization techniques, isolation of pure cultures.
- Mushroom collection from their natural habitat, isolation, and preservation.
- Identification and preservation of mushroom specimens.
- Identification of different types of mushrooms.
- Materials required for Cultivation of Mushrooms.
- Demonstration of cultivation of Mushroom.

## **REFERENCE BOOKS:**

- Nadiad Marimuthu, T. Krishnamoorthy, A. S. Sivaprakasam, K. and Jayarajan. R (1991): Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Nita Bahl (1984-1988): Handbook of Mushrooms, II Edition, Vol. I & Vol. II.
- Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.

## **Mode of Evaluation:**

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

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

**Total Mark: 50**

# PLANT BREEDING

[15L + 30 P]

[ Credits 2]

**Course description:** The course comprises the science of maximizing plants' positive genetic traits to produce desirable effects in agricultural production.

**Course Objectives:** To acquaint students with the foundation (concepts, terminology, and tools) of plant breeding, explain and demonstrate various breeding techniques to improve plant traits. **Course learning outcomes:** The student will develop knowledge and skills of methods of plant breeding and Locate, analyze, evaluate and synthesize information relevant to plant breeding.

## Unit I: Plant Breeding

[5 Hrs.]

Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding. Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.

## Unit II: Methods of crop improvement

[5 Hrs.]

Selection methods: For self-pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages, and limitations. Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.

## Unit III: Quantitative Inheritance, Inbreeding depression and Heterosis

[5 Hrs.]

Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance. History, genetic basis of inbreeding depression and heterosis; Applications.

## Practical:

[30 Hrs.]

- Study of megasporogenesis and microsporogenesis, Fertilization and life cycle of angiospermic plant
- Plant breeder's kit
- Hybridization techniques and procedures
- Study of male sterility and incompatibility in field plots
- Handling of segregating generations
- Problems on Hardy-Weinberg law
- Back cross methods
- Field layout of experiments, field trials and maintenance of records and registers
- Estimation of heterosis and inbreeding depression, Heritability, GCA and SCA
- Estimation of variability parameters

## REFERENCE BOOKS:

- Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2<sup>nd</sup> edition.
- Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7<sup>th</sup> edition.

## Mode of evaluation:

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

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**Total Mark: 50**

# PLANT MICROTÉCHNIQUES

[15L + 30 P]

[ Credits 2]

**Course Description:** This course will discuss the microscope, to obtain an overview of the internal structure of organs or the structure of cells and tissues and their use.

**Course Objectives:** To acquaint students with Managing the techniques of microscopic slides making, microscopic measurements and methods of identification of tissues in plants.

**Course Learning Outcomes:** The student will develop knowledge of stains, classification, staining equipment's and staining procedures, preparation of microscopic samples, preparing the tissues for microtomy through various processes of tissue preparation.

## Unit I: Staining Plant Materials

[3 Hrs.]

Staining procedures, classification, principles, and chemistry of stains. Cytogenetic techniques with squashed and smeared plant materials. Preparation of microscopic samples: Whole mount, Maceration, Sectioning.

## Unit II: Sample Preparation for Light Microscopy

[6 Hrs.]

Maceration, squash and clearing techniques. Sample preparation for light microscopy. Classification of fixatives, formulas', (Plant and animal samples). Sample preparation for light microscopy: Fixation, dehydration and infiltration procedures. Embedding media for light microscopy. Stains and staining procedures- negative and positive staining procedures. Microtomes: Rotary, sliding, cryostat.

## Unit III: Sample Preparation for Electron Microscopy

[6 Hrs.]

Freeze etching and freeze fracturing. Sample preparation for Electron microscope: Fixatives, double fixation, dehydration and infiltration procedures, embedding media for electron microscopy. Fixation and embedding of particulate samples like bacteria, virus etc. ultramicrotome and freezing ultramicrotome semi thin sectioning, ultrathin sectioning, grids, formavar coating, Staining for electron microscopy.

## Practical:

[30 Hrs.]

- To prepare different laboratory stains.
- To study different staining equipment.
- To study the procedure for staining different plant materials.
- Demonstration and hands on training of brightfield microscopes.
- Slide preparation based on maceration, squash and whole mount.
- To study methods of fixation preservation and clearing.
- Fixation and processing for paraffin embedding of plant/animal tissues.
- Rotary microtome sectioning of infiltrated materials and staining.

## REFERENCE BOOKS:

- Berlyn, G. P. (1976). Botanical microtechnique and cytochemistry.
- Johansen, D. A. (1940). Plant microtechnique. McGraw-Hill Book Company, Inc: London; 530p.
- Marimuthu, R. (2019). Microscopy and Microtechnique. MJP Publisher.
- O'Brien, T. P., & McCully, M. E. (1981). The study of plant structure principles and selected methods (No. 581.4 O2).
- Ruzin, S.E. (1999). Plant micro technique and microscopy. Oxford University Press, New York, U.S.A.

## Mode of evaluation:

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**Total Mark: 50**

# ESSENTIAL OILS AND PERFUMERY

[15L + 30 P]

[ Credits 2]

**Course Description:** This course includes the role of essential oils and other fragrance chemicals in various types of alcoholic and nonalcoholic perfumes, various fragrance notes like top note, middle note and base note.

**Course Objectives:** To make students competent in processing aroma bearing plant to distilled/ extract to get essential oil and can get a job in essential oils industry or become an entrepreneur.

**Course Learning Outcomes:** The student will Acquire knowledge about essential oils, their extraction through different techniques like hydro distillation and steam distillation. They will also learn about various analytical techniques like gas chromatography mass spectrometry.

## Unit I: Essential Oils and their Extraction

[5 Hrs.]

Essential oils, chemical composition, methods of extraction, hydro distillation, steam distillation, Solvent Extraction, CO<sub>2</sub> Extraction, Maceration, Enfleurage, Cold Press Extraction. Analytical methods for essential oil analysis; Gas chromatography mass spectrometry. Economically important essential oils, their quality profile and market value.

## Unit II: Value Addition of Essential Oils

[10 Hrs.]

Role of essential oils in perfumery. National and international markets. Ingredients used for the preparation of alcoholic and non-alcoholic perfumes. Solid and gel perfumes. Basic techniques of essential oil blending, base note, middle note and top notes. Use of following essential oils in perfumery: lavender, rosemary, geranium, rose, lemon, orange, vanilla, patchouli, vetiver, basil, bergamot, cardamom, clove oil, eucalyptus, fennel, frankincense, ginger, jasmine, lemon grass. Use of essential oils in aromatherapy, classification of aromatherapy; Cosmetic, massage, medical and olfactory aromatherapies.

## Practical:

[30 Hrs.]

- To study the various essential oils obtained from natural sources.
- To perform hydro distillation of essential oils.
- Extraction of essential oils by solvent extraction method.
- To study different essential oils used in perfumery.
- Preparation of various perfumes using natural sources.  
Preparation of alcoholic and non-alcoholic perfumes.
- To prepare different blends using essential oils.
- To prepare solid and gel perfumes.

## REFERENCE BOOKS:

- Handbook Of Essential Oils Science Technology And Applications; Baser K H C, Taylor & Francis, 3rd Edn; 2020.
- Essential Oils for Beginners: The Guide to Get Started with Essential Oils and Aromatherapy, Althea Press (26 September 2013).
- Essential Oils, Vol. I-V. Guenther.
- The Essential Oil Book, Edited by Colleen, K. Dodt
- Cosmetics Formulation- Principles and practice, Edited by Heather A.E. Benson, Michael S. Roberts, V.R. Leite-Silva, Kenneth A Walters.
- Manufacture of perfume cosmetics and detergents by Prasad Giri Raj.

## Mode of evaluation:

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

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**Total Mark: 50**