

## Apiculture

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
<b>Apiculture</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>Class XII</b>	<b>NA</b>

#### Learning Objectives

The Learning Objectives of this course are as follows:

- To help the student to become familiar with the significance of beekeeping as an economically viable industry.
- To help the student to understand the different species of honeybees, their biology, behaviour and role in pollination.
- To train the students to learn the techniques of honey bee rearing, optimization of techniques based on climate and geographical regions, and various measures to be taken to maximize the benefits.
- To understand the significance of beekeeping in the diversification of agriculture for the rural communities to increase their income and create employment opportunities and at the same time to develop entrepreneurial skills required for self-employment in the beekeeping sector.

#### Learning Outcomes

After studying this course, the students will be able to:

- Comprehend the various species of honey bees in India, their social organization and its importance.
- Appreciate the opportunities and employment in apiculture – in public, private and government sector.
- Gain thorough knowledge about the techniques involved in bee keeping and honey production.
- Make various products and by-products obtained from beekeeping sector and their importance.
- Develop entrepreneurial skills necessary for self-employment in beekeeping sector.
- Enhance collaborative learning and communication skills through practical sessions, teamwork, group discussions, assignments and projects.

#### Skill development and job opportunities

- After completion of this course students would obtain the training in collection, identification, and various ways/aspects of bee rearing.
- The students can also take a job as an apiary worker, often called a beekeeper, manage colonies of honeybees for the production of honey as well as pollination services.
- The course would also provide a basic training to enable the students to construct hives and replace combs.
- Enhance entrepreneurial skills by collecting and packaging hive products including honey, beeswax and pollen.
- Make decisions on yards, treatment, splits, honey harvesting and all other beekeeping decisions.
- Identify and report hive health concerns.

## **SYLLABUS (Practical)**

### **Unit 1: Biology of Bees**

**16 hours**

Historical background of apiculture, classification and biology of honey bees, Social organization of bee colony, behavioral patterns (bee dance, swarming).

#### **Practical Exercises:**

1. Study of the life history of honey bees: *Apis cerana indica*, *Apis mellifera*, *Apis dorsata*, *Apis florea*, *Melipona* sp. from specimen/ photographs - Egg, larva, pupa, adult (queen, drone, worker).
2. Study of morphological structures of honey bees through permanent slides/photographs—mouthparts, antenna, wings, sting apparatus and temporary mount of legs (antenna cleaner, mid leg, pollen basket).
3. Study of natural beehive and identification of queen cells, drone cells and brood.

### **Unit 2: Rearing of Bees**

**18 hours**

Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth; Bee Pasturage; Selection of bee species for apiculture –*Apis cerana indica*, *Apis mellifera*; Bee keeping equipment methods of extraction of honey (Indigenous and Modern) & processing; Apiary management - Honey flow period and lean period, effects of pollutants on honeybees.

#### **Practical Exercises:**

1. Distinguishing characters of workers of three bee species.
2. Importance of site selection for bee keeping.
3. Study of an artificial hive (Langstroth/Newton), its various parts and beekeeping equipment: draw diagrams of bee boxes proportionate to the body size and measure the body length and wing size.
4. Preparation of mount of pollen grains from flowers.

### **Unit 3: Diseases and Enemies**

**10 hours**

Bee diseases control and preventive measures: enemies of bees and their control.

#### **Practical Exercises:**

1. Diagnosis of honeybee diseases: Protozoan diseases, Bacterial diseases, Viral diseases (one each)- symptoms, nature of damage and control.
2. Identification of honeybee enemies: Predators-Insects and non-insects.

### **Unit 4: Bee Economy**

**8 hours**

Products of apiculture industry (Honey, Bees Wax, Propolis, Royal jelly, Pollen etc.) and their uses; Modern methods in employing artificial Beehives for cross pollination in horticultural gardens- stationary and migratory bee keeping.

#### **Practical Exercises:**

1. Video demonstration of wax extraction and preparation of comb foundation sheets.
2. Analysis of honey – purity, physical and biochemical parameters (any two constituents).
3. Study of bee pasturage – visit to fields/gardens/orchards for studying the bee activity (role in pollination, nectar collection, videography of honeybee activity) and preparation of herbarium of nectar and pollen yielding flowering plants (floral mapping).

### **Unit 5: Entrepreneurship in Apiculture**

**8 hours**

Bee keeping industries – Recent advancements, employment opportunities, economics in small and large-scale beekeeping, scope for women entrepreneurs in beekeeping sector, study of development programs and organizations involved in beekeeping in India.

#### **Exercise:**

1. Visit to an apiary/honey processing unit/institute and submission of a report.

**Essential/Recommended readings**

Singh, S. (1962). Beekeeping in India, Indian Council of Agricultural Research, New Delhi.

Mishra, R.C. (1995). Honeybees and their management in India. Indian Council of Agricultural Research, New Delhi.

Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.

Rahman, A. (2017). Beekeeping in India. Indian Council of Agricultural Research, New Delhi.

Gupta, J.K. (2016). Apiculture, Indian Council of Agricultural Research, New Delhi.

**Examination scheme and mode:**

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi.