

Course Objectives:

The objectives of the course are:-

1. To provide the concepts of different species of bees.
2. To provide awareness about bee keeping their behavior.
3. To provide knowledge about diseases of bees and their management.

Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

1. **ACQUIRE** basic knowledge of apiculture economics in relation to Zoology.
2. **UNDERSTAND** the concepts of the maintenance of honey bee colonies.
3. **SOLVE** the problems related to bee production by applying theoretical knowledge with practical efficiency.
4. **ANALYZE** bee products of the hive including beeswax, propolis, pollen, and royal jelly.
5. **EVALUATE** the growing market potential for honey and its products.
6. **DEMONSTRATE** practical information on various aspects of apiculture.

Course Contents:

The significance of Apiculture; Types of honeybees and their distribution, endemic and exotic species; Honeybee structure, functions and special organs; The colony and its organization; Biology of the honeybee, life history, placement of colonies, moving and transporting bees; Beekeeping equipment and fundamental tools for bee breeding, honey production and harvesting/ processing of honey and

beeswax; Major honey flows in different ecological areas; How to start, installing a bee hive and establishment of an apiary; Inspection techniques, introducing a queen, handling queens; control of robbing; Supplemental feeding for queen breeding and stimulative brooding rearing; sources of nectar and pollen; Products from apiculture; Honey production, harvesting, processing and uses; Beeswax production, extraction, processing and its uses; Swarming, its prevention and control. Modern and traditional methods for honeybee breeding, merits of frame hive beekeeping and top bar hives; Migratory beekeeping; Seasonal management of colonies; Integrated management of honeybees for higher honey yield; Natural enemies of honeybees, and control; American foulbrood disease of honeybee brood and its remedies; Mite diseases of honeybees and their control; Other diseases of honeybees and cures; Preparation of colonies for honeybee queen breeding, queen management, Commercial queen rearing, improvement of stock and package bees; Conservation of indigenous honeybees and issues facing apiculture; Honeybees as pollinators; Honeybee pollinated crops and fruit trees; Preparation and management of colonies for pollination.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos /films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work:	25 marks
Midterm Exam:	35 marks
Final term Exam:	40 marks

Books Recommended:

1. Ahmad, R. and Muzaffar, N. 1984. Modern beekeeping (Urdu version). Pak. Agric. Res. Council, 350 pp.
2. Atwal, A.S. 2000. Essentials of beekeeping and pollination. Kalyani Publishers, India, 393 pp.
3. Blackiston, 2001. Beekeeping for dummies. Wiley Publishing Inc., USA, 303, pp.
4. Crane, E. 1976. Honey- A comprehensive survey. Inter. Bee Res. Assoe. Heinemann, London, 608 pp.
5. Dadant, C. 1986. The hive and the honeybee. Dadant and Sons, Hamilton, Illinois, USA, 740 pp.
6. Phillips, E.F. 2006. Beekeeping. Ithaca, New York Agrobios Press, India, 490 pp.

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6. **DEMONSTRATE** practical information on various aspects of apiculture.

Course Contents:

1. Watching for the natural nest, contents of the cells, arrangement of the nest, colour of the combs.
2. Preparation of hive with frames and top bars.
3. Wiring frames, fixing foundations.
4. Use of bee veil, smoker, hive tool and other appliances.
5. Handling bees, stings, cleaning hives and ventilation.
6. Inspection of bees: opening bee hives, organization within the colony, removing frames, handling frames, fanning and food transmission.
7. Identification of queens, workers, drones, brood comb formation/ structure, honey and pollen stores, propolis and royal jelly.
8. Transferring bees in Langstroth hives, Observation hives and nuclei.
9. Removing honey crop, uncapping, handling cappings, honey extraction modern and traditional methods and preparation of honey for market.
10. Inspection of colonies: watching for diseases, pests, predators, their diagnosis and control.
11. Supplemental/ emergency feeding and making candy for queen breeding.
12. Moving colonies: Packing hives for transportation.
13. Queen rearing: preparation of colonies and queen cells.
14. Selection and breeding, grafting larvae, dry and wet methods.
15. Requeening of colonies, caging of queens and queen introduction.
16. Uniting colonies, harvesting pollen, propolis and royal jelly.
17. Recognizing robber bees, control of robbing.
18. Production of beeswax, harvesting and processing.