

**Department of Entomology  
Faculty of Agricultural Sciences  
University of the Punjab, Lahore  
Course Outline**



Programme	B.Sc. (Hons) Agriculture (Major: Entomology)	Course Code	ENT-414	Credit Hours	3 (2-1)
Course Title	APICULTURE				
Course Introduction					
Bee-keeping is one of most ancient and important entomological cottage industry. This course aims to provide the concepts of different species of bees, their behavior and to provide awareness of bee keeping, diseases of bees and their management. Students will learn about the scope of apiculture, types of bee species being used in the world in this industry, their biological and ecological characteristics and about their better management strategies for enhancing their productivity. Moreover, students will be practically demonstrated all the beekeeping activities including season management, queen and colony management and honey extraction protocols etc.					
Learning Outcomes					
On the completion of the course, the students will have gained the ability to:					
1. Describe the importance, biology and management of bees.					
2. Demonstrate bee keeping management skills					
3. Apply the knowledge on bee biology and management to the development of the bee industry in tropical environments.					
4. Evaluate beekeeping project for cost-effectiveness and sustainability.					
Course Content (Theory)				Assignments/Readings	
Week 1	Unit-I				
	1.1. Introduction and Economic importance of bees				
	1.1.1. Definitions				
	1.1.2. History of beekeeping				
	1.1.3. Economic importance of bees				
	1.1.4. Systems of beekeeping				
	1.2. Bee Taxonomy				
	1.2.1. Races of bees in Pakistan				
	1.2.2. Races of economic importance				
	1.2.3. Distinctive features of bee races				
Week 2	Unit-II				
	2.1. Life History and Caste development				
	2.1.1. Reproduction in honey bees				

	2.1.2. Caste development in bees	
	2.2. Bee Anatomy 2.2.1. Definitions 2.2.2. External features of bees 2.2.3. Digestive system	
<b>Week 3</b>	<b>Unit-III</b> 3.1. Communication in honeybees 3.1.1. Physical communication 3.1.2. Hormones and pheromones	
	3.2. Division of labor activities 3.2.1. Sociality in organisms 3.2.2. Age polyethism 3.2.3. Division of labor duties	
<b>Week 4</b>	<b>Unit-IV</b> 4.1. Bee Behavior	
	4.2. Bee keeping Equipment 4.2.1. Hives - traditional, improved 4.2.2. Protective 4.2.3. Bee keeping tools 4.2.4. Equipment sources, handling and maintenance	
<b>Week 5</b>	<b>Unit-V</b> 5.1. Apiary Management 5.1.1. Apiary Site Selection 5.1.2. Hive siting and baiting 5.1.3. Sources of starter colonies, catching swarms	
	5.2. Apiary Management (Cont....) 5.2.1. Routine apiary management activities 5.2.2. Forage types and seasonality 5.2.3. Records and Record keeping 5.2.4. Gender roles and issues in Beekeeping	
<b>Week 6</b>	<b>Unit-VI</b> 6.1. Bee/Hive products and by-products 6.1.1. Honey, wax, propolis, and pollen harvesting	
	6.2. Bee/Hive products and by-products (Cont....) 6.2.1. Product composition and utilization	
<b>Week 7</b>	<b>Unit-VII</b> 7.1. Bee/Hive products and by-products (Cont....) 7.1.1. Quality control of bee products	
	7.2. Bee/Hive products and by-products (Cont....) 7.2.1. By-products of beekeeping – Pollination	
<b>Week 8</b>	<b>Unit-VIII</b> 8.1. Bee/Hive products and by-products (Cont....) 8.1.1. Bee product processing and packaging	
	8.2. Bee/Hive products and by-products (Cont....) 8.2.1. Human therapy based on bee products	

<b>Week 9</b>	<b>MIDTERM EXAM</b>	
<b>Week 10</b>	<b>Unit-IX</b> 9.1. Uniting, dividing and preparation for shifting colonies	
	9.2. Uniting, dividing and preparation for shifting colonies (Cont....)	
<b>Week 11</b>	<b>Unit-X</b> 10.1. Pests and Diseases 10.2.Hive and apiary inspection	
	10.3. Bee pests, 10.4.Diseases and predators 10.5.Occurrence, effects, control and prevention	
<b>Week 12</b>	<b>Unit-XI</b> 11.1. Marketing of bees, bee products and equipment 11.1.1. Ethical issues in bee products and equipment 11.1.2. Types of honey markets	
	11.2. The export market – opportunities, challenges and current efforts	
<b>Week 13</b>	<b>Unit-XII</b> 12.1. Beekeeping service providers in Uganda	
	12.2. Seasonal management	
<b>Week 14</b>	<b>Unit-XIII</b> 13.1. Seasonal management (off season management)	
	13.2. Seasonal management (Moon soon)	
<b>Week 15</b>	<b>Unit-XIV</b> 14.1. Dividing and preparation for shifting colonies	
	14.2. Queen rearing and swarming	
<b>Week 16</b>	<b>Unit-XV</b> 15.1. Honey extraction	
	15.2. Factors affecting honey yield	
	15.3. Importance of bees in pollination	
<b>Course Content (Practical)</b>		<b>Assignments/Readings</b>
<b>Week 1</b>	Practical demonstration of bee colonies,	
<b>Week 2</b>	observation of colonies and different casts	
<b>Week 3</b>	beekeeping equipment's	
<b>Week 4</b>	preparation of frames and comb foundation for their hives	
<b>Week 5</b>	colony inspection	
<b>Week 6</b>	visit to apiaries	
<b>Week 7</b>	Hive Production System and Frames	
<b>Week 8</b>	Tools & PPE's	

<b>Week 9</b>	<b>MIDTERM EXAM</b>		
<b>Week 10</b>	Hive inspection looking for signs of diseases and predators		
<b>Week 11</b>	How to prepare feed, and when to feed		
<b>Week 12</b>	Field assignments		
<b>Week 13</b>	Honey Extraction		
<b>Week 14</b>	Preparation of honey bee hive		
<b>Week 15</b>	Maintenance of honey bee colonies		
<b>Week 16</b>	Food availability		
<b>Textbooks and Reading Material</b>			
<ol style="list-style-type: none"> <li>1. Ahmad, R. 1979. A Guide to Bee Keeping in Pakistan. Extension Book.</li> <li>2. Devillers, J., Phame, M. and Delege, M. 2002. Honey Bees.</li> <li>3. Goodwin, R.N. and Van Eaton, C. 1999. Elimination of American Foulbrood without the use of Drugs. A Practical Manual for Bee Keepers. National Bee Keepers Association of New Zealand, Napier, New Zealand.</li> <li>4. Hooper, T. 1991. Guide to Bees and Honey. BAS Printers Ltd. Hampshir, UK.</li> </ol> <p><b>Note:</b></p> <ol style="list-style-type: none"> <li>1. It is preferable to use latest available editions of books. Mention the publisher &amp; year of publication.</li> <li>2. The References/ bibliography may be in accordance with the typing manual of the concerned faculty/subject. Preferably follow APA 7<sup>th</sup> Edition publication manual.</li> </ol>			
<b>Teaching Learning Strategies</b>			
<ol style="list-style-type: none"> <li>1. Multimedia</li> <li>2. White Board</li> <li>3. Group discussion</li> <li>4. Quiz/Assignments</li> <li>5. Demonstration/Activity</li> </ol>			
<b>Assignments: Types and Number with Calendar</b>			
<b>Assessment</b>			
<b>Sr. No.</b>	<b>Elements</b>	<b>Weightage</b>	<b>Details</b>
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.

2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.