Syllabus on Vocational Education and Training Course (VTC)

Paper Title	**: Beekeeping -I**
CODE	**: VTC: 240.3**
Number of Credits	**: 4**
Semester	**: III**
No. of Theory Hours Per Week	**: One (1 hour)**
No. of Practical Hours per Week	**: Three (3 Hours)**

Outline of the Paper:

Type of Course	Units in the VTC	Hours	Credits	Total Marks	Distribution of Marks (as per OC-8)			
					In-Semester		End-Semester	
					Theory	Practical	Theory	Practical
Beekeeping-I	Unit-I Theory (25 Marks)	15	4	100	25			
	Unit-II to IV Theory (75 Marks)	90				15		60

Marks Distribution	**: Internal Assessment: 40** **: External Assessment: 60**
Course Objectives	1. For identification of bees, bee biology, behaviour and importance of bee keeping. **2.** Explain the different requirements for bee farming establishment and to identify different equipment's, accessories and handling.
Course Learning Outcome	At the end of the course students will able to: 1. describe the basic concepts of apiculture, tools and equipment of beekeeping 2. identify different bee species, bee products and handling of bee hives 3. choose the basic requirements for beekeeping establishment 4. explain the scientific care and management of bees.
Unit I: (Theory) **15 Hours**	• Introduction to apiculture/beekeeping; Scope and importance of beekeeping; • Bee biology; Morphology and anatomy of bee; • Classification of bees; • How, when and where to start bee-keeping; • Caste determination and their specific role; Age related activities of workers; Communication in honeybees; swarming and its prevention; robbing and its prevention
UNIT-II: (Practical) **30 Hours**	• Identification of honeybee species • Identification of different castes of honeybee • Dissection of worker bees to study different morphological and anatomical characteristics. • Comb structure and stages.

	• Handling of bee colony and colony inspection.
UNIT-III: (Practical) 30 Hours	• Bee keeping accessories and equipments • Handling of bee colonies. • Collection and preservation of bee pasture. • Seasonal management.
UNIT-IV: (Practical) 30 Hours	• Identification of different types of bee hives. • Identification of bee flora. • Identification of bee products. • Visit to important apiaries and bee keeping societies around the region.
Suggested Readings	1. Atwal AS. 2000. Essentials of Beekeeping and Pollination. Kalyani Publishers, New Delhi Ludhiana, India. 2. Atwal AS. 2001. World of Honey Bees. Kalyani Publishers, New Delhi- Ludhiana, India. 3. Cramp, D. 2008. Practical manual of beekeeping. Little, Brown Book Group, United Kingdom. 4. Rahman, A. 2017. Apiculture in India, ICAR, New Delhi 5. Sardar Singh. 1962. Beekeeping in India. ICAR, New Delhi, India (Reprint: 1982) 6.
Requirements	**Classroom Facilities** **Apiary** **Beekeeping Equipment** 1. Protective Gear 2. Beekeeping Tools: Such as hive tools, smokers, bee brushes, and queen catchers. **Specialized Labs and Facilities** 1. Honey Processing Unit 2. Bee Product Laboratory 3. Pest and Disease Management Lab **Storage and Preservation Facilities** 1. Cold Storage 2. Library and Resource Center **Field and Outdoor Facilities** 1. Bee Flora Garden

	2. Field Visit Coordination Office **Miscellaneous Facilities** 1. **Supplementary Feeding Facility** **2. Swarm Management Area** **Safety and Compliance** 1. **Safety Equipment**: Including first aid kits, emergency response kits, and safety protocols for handling bees and bee products **Any other item as required**
Qualified Instructors	Instructors with experience in Bee-keeping Certifications or relevant qualifications in Bee-keeping.

Paper Title	**: Beekeeping-II**
CODE	**: VTC: 260.3**
Number of Credits	**: 4**
Semester	**: IV**
No. of Theory Hours Per Week	**: One (1 hour)**
No. of Practical Hours per Week	**: Three (3 Hours)**

Outline of the Paper:

Type of Course	Units in the VTC	Hours	Credits	Total Marks	Distribution of Marks (as per OC-8)			
					In-Semester		End-Semester	
					Theory	Practical	Theory	Practical
Beekeeping-II	Unit-I Theory (25 Marks)	15	4	100	25			
	Unit-II to IV Theory (75 Marks)	90				15		60

Marks Distribution	**: Internal Assessment: 40** **: External Assessment: 60**
Course Objectives	To impart knowledge about the honey bees, and their behaviour and activities; bee husbandry, bee multiplication, bee enemies and diseases and their management; management of bees during different seasons; study on queen and its rearing.
Course Learning Outcome	After completion of the course students are able to: 1. identify, diagnose and manage the bee pests and diseases 2. handle the rearing of queen, workers and other bees and their management 3. manage beehives for honey production and pollination 4. describe the process of scientific care and management of bees
Unit I: (Theory) **15 Hours**	• Study of pests and diseases of honeybees and their management; Bee pasturage and pollination; • Honey bee nutrition and artificial diets; • Seasonal management of honey bees: Honey bees on Canola, Spring management of bees, Wintering bees, Apiary management for winter/early spring pollination. Summer management of honey production; • Queen rearing and colony multiplication; Queenless colonies and their rectification; Methods of rearing queens; Pesticides effect and bee health.
UNIT-II: (Practical) **30 Hours**	• Identification, diagnosis and management of bee pests. • Identification, diagnosis and management of bee diseases.

	• Study of pesticide effects on bees. 4. Abiotic stress study on bees.
UNIT-III: (Practical) 30 Hours	• Formulation of supplementary/artificial feeding and water supply. • Swarm management. • Hiving of colony. • Management practices like feeding, dividing, uniting, prevention of swarming, robbing and absconding.
UNIT-IV: (Practical) 30 Hours	• Rearing of queen and other bees. • Multiplication of colony. • Fixing comb foundation sheet, providing of super chamber. • Visit to Apairy and Bee research Institute.
Suggested Readings	1. Abrol DP and Sharma D. 2009. Honey Bee Mites and Their Management. Kalyani Publishers, New Delhi, India 2. Abrol DP. 2009. Honey bee Diseases and Their Management. Kalyani Publishers, New Delhi, India. 3. Abrol DP. 2010. Bees and Beekeeping in India. Kalyani Publishers, New Delhi, India. 4. Atwal AS. 2000. Essentials of Beekeeping and Pollination. Kalyani Publishers, New Delhi Ludhiana, India. 5. Bailey L and Ball BV. 1991. Honey Bee Pathology. Academic Press, London. 6. Cramp, D. 2008. Practical manual of beekeeping. Little, Brown Book Group, United Kingdom. 7. Crane Eva and Walker Penelope. 1983. The Impact of Pest Management on Bees and Pollination. Tropical Development and Research and Institute, London 8.
Requirements	**Apiary** **Beekeeping Equipment** 1. Protective Gear 2. Beekeeping Tools: Such as hive tools, smokers, bee brushes, and queen catchers. **Specialized Labs and Facilities** 1. Honey Processing Unit 2. Bee Product Laboratory 3. Pest and Disease Management Lab **Storage and Preservation Facilities**

	1. Cold Storage 2. Library and Resource Center **Field and Outdoor Facilities** 1. Bee Flora Garden 2. Field Visit Coordination Office **Miscellaneous Facilities** 1. Supplementary Feeding Facility 2. Swarm Management Area **Any other item as required**
Qualified Instructors	• Instructors with experience in Bee-keeping • Certifications or relevant qualifications in Bee-keeping

Paper Title	**: Beekeeping-III**
CODE	**:VTC: 360.3**
Number of Credits	**: 4**
Semester	**:VI**
No. of Theory Hours Per Week	**: One (1 hour)**
No. of Practical Hours per Week	**: Three (3 Hours)**

Outline of the Paper:

Type of Course	Units in the VTC	Hours	Credits	Total Marks	Distribution of Marks (as per OC-8)			
					In-Semester		End-Semester	
Beekeeping-III					Theory	Practical	Theory	Practical
	Unit-I Theory (25 Marks)	15			25			
	Unit-II to IV Theory (75 Marks)	90	4	100		15		60

Marks Distribution	**: Internal Assessment: 40** **: External Assessment: 60**
Course Objectives	**1.** To develop entrepreneurial skill enhancement on bee farming, understand the bee hive products, value added products; quality parameter of bee products. **2.** To explain on Marketing and economical study of beekeeping. **3.** To identify the management systems of bee pollination of crops
Course Learning Outcome	After completion of the course students are able to: 1. identify the different bee products extraction and processing 2. describe the quality parameters and testing of bee products 3. choose the packaging and marketing of various bee products 4. explain the economic aspects on beekeeping.
Unit I: (Theory) 15 Hours	• Bee products – An introduction, honey, pollen, royal jelly, bees wax, propolis & venom; Significance of bee products; • Value added honey products; Properties of honey products; Nutritional value and composition of honey; Acid content and flavor effects; Types of value-added honey products; • Economics of bee keeping: Economics in small scale and large-scale bee keeping. Economic value of commercial beekeeping. • Marketing of bee products: Case study on economic aspects of bee farmers.
UNIT-II:	• Honey extraction, processing, bottling.

(Practical) **30 Hours**	• Bees wax rendering and purification. • Royal jelly preparation • Bee pollen, propolis extraction. • Value added honey product preparation.
UNIT-III: **(Practical)** **30 Hours**	• Hive products and their uses. • Quality testing of honey. • Testing of other products. • Visit to honey testing and other products testing laboratories.
UNIT-IV: **(Practical)** **30 Hours**	• Value addition of hive products. • Economic study of small, medium and large-scale beekeeping. • Visit to the progressive bee farmers, research station, co-operative societies working on beekeeping.
Suggested Readings	1. Abrol DP and Sharma D. 2009. Honey Bee Mites and Their Management. Kalyani Publishers, New Delhi, India 2. Abrol DP. 2009. Honey bee Diseases and Their Management. Kalyani Publishers, New Delhi, India. 3. Abrol DP. 2010. Bees and Beekeeping in India. Kalyani Publishers, New Delhi, India. 4. Atwal AS. 2000. Essentials of Beekeeping and Pollination. Kalyani Publishers, New Delhi Ludhiana, India. 5. Bailey L and Ball BV. 1991. Honey Bee Pathology. Academic Press, London. 6. Cramp, D. 2008. Practical manual of beekeeping. Little, Brown Book Group, United Kingdom. 7. Crane Eva and Walker Penelope. 1983. The Impact of Pest Management on Bees and Pollination. Tropical Development and Research and Institute, London
Requirements	**Beekeeping Equipment** 1. Protective Gear 2. Beekeeping Tools: Such as hive tools, smokers, bee brushes, and queen catchers. **Specialized Labs and Facilities** 1. Honey Processing Unit 2. Bee Product Laboratory 3. Pest and Disease Management Lab **Storage and Preservation Facilities** 1. Cold Storage 2. Library and Resource Center

	Field and Outdoor Facilities 1. Bee Flora Garden 2. Field Visit Coordination Office **Miscellaneous Facilities** 1. Supplementary Feeding Facility 2. Swarm Management Area **Any other item if required**
Qualified Instructors	• Instructors with experience in Bee-keeping • Certifications or relevant qualifications in Bee-keeping