



University of Kerala

Discipline	ZOOLOGY				
Course Code	UK4DSEZOO202				
Course Title	Entomology II-Industrial Entomology				
Type of Course	DSE				
Semester	IV				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4
Pre-requisites	Pass in Class XII				
Course Summary	After completion of the course the students will be acquainted with apiculture, sericulture and lac culture. This course also provides the students with entrepreneurial opportunities in entomology and provides information on productive insects and their products. Apart from these the students will learn about the methods of pest management in residential places and public buildings and insect pests of public health and their management.				

Module	Unit	Content	60 hrs
I		Apiculture	14
	1.1	Introduction to apiculture and Bee biology, Honey bee species occurring in India, Morphological features for identification of different bee species(Related activity- Poster presentation depicting different bee species of India)	8
	1.2	Bee keeping - General colony management during different seasons, Managing colonies for honey production and pollination.	3

	1.3	Bee keeping equipment, honey extraction and bee products. Diseases of bee colonies– preventive and curative measures(Related Activity- Visit to a bee keeping facility and submission of report on honey extraction process and bee products).	3
II	Sericulture		11
	2.1	History, development and organization of silk industry, Study of different species of silkworms - (1) Mulberry silk worm- <i>Bombyx mori</i> and <i>Bombyx mandarina</i> . (2) Tasar silk worm - <i>Antheraea paphia</i> and <i>Antheraea pernyi</i> (3) Muga Silkworm- <i>Antheraea assama</i> (4) Eri silk worm- <i>Philosamia ricini</i> (Brief description)	5
	2.2	Moriculture (Brief description) Silk and its uses, Rearing of mulberry silkworm (Brief description).	4
	2.3	Pests and diseases of silkworms and management of silkworms(Related Activity- Quiz).	5
III	Lac culture		13
	3.1	History of lac culture, Morphology and biology of lac insect.	3
	3.2	Different strains of Lac insect- Kusumi and Rangeeni. Lac cultivation- Propagation, inoculation and harvesting.	5
	3.3	Lac processing- Stick lac, Seed lac and Shellac.	2
	3.4	Lac products and their uses- Lac dye, Lac wax and Aleuritic acid (Related Activity- Powerpoint presentation.	3
	Methods of pest management in residential places and public buildings		11
IV	4.1	Insecticides for domestic use and their safety, Pre and post construction termite proofing of buildings, Appliances for domestic pest control	6
	4.2	Rodent control methods, Organic methods of domestic pest management Related Activity- <i>Field study and Report submission.</i>	5
	Insect pests in human habitation		11
V	5.1	Public health importance of insect pests in human habitation.	5
	5.2	Biology, damage and control of mosquitoes, houseflies, bed bugs, ants, termites and cockroaches(Related activity- Powerpoint presentation).	6

References

1. Aruga H. 1994. Principles of Sericulture. Oxford & IBH, New Delhi.
2. Atwal AS. 2006. The World of the Honey Bee. Kalyani Publ., New Delhi.
3. Ganga G. 2003. Comprehensive Sericulture. Vol. II. Silkworm Rearing and Silk Reeling. Oxford & IBH, New Delhi.

4. Partiban S & David BV. 2007. Management of Household Pests and Public Health Pests. Namratha Publ., Chennai.
5. Singh S. 1975. Beekeeping in India. ICAR, New Delhi.

Web resources

1. <https://indiaagronet.com> › Moriculture
2. <https://www.niti.gov.in/honeyed>
3. <https://www.embibe.com/>

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the basics about beekeeping tools, equipment, and honey extraction.	U	PSO-1,2
CO-2	Acquire knowledge and understand practices in moriculture, silkworm rearing, lac culture, lac products and their uses.	R, U	PSO-1,2
CO3	Analyze the economic importance of Apiculture, Sericulture and Lac culture.	An	PSO-1,2
CO4	Apply the knowledge on disease management in residential places and public buildings through the control of insect pests in human habitation.	Ap	PSO-1,2
CO5	Apply the knowledge on biology and damage caused by insect pests for their effective control...	Ap	PSO-2,5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

**Name of the Course: Entomology II – Industrial Entomology
Credits: 4:0:0 (Lecture: Tutorial: Practical)**

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1.	Understand the basics about beekeeping tools, equipment, and honey extraction.	PO 1, PO2/ PSO-1,2	U	F, C	L	

2.	Acquire knowledge and understands practices in moriculture, silkworm rearing, lac culture, lac products and their uses.	PO 1, PO 2/ PSO-1,2	U, R	F, C	L	
3.	Analyze the economic importance of Apiculture, Sericulture and Lac culture.	PO 3/ PSO-1,2	An	P	L	
4.	Apply the knowledge on disease management in residential places and public buildings and in the control of insect pest in human habitation.	PO 3/ PSO-1,2	Ap	C. P	L	
5.	Apply the knowledge on biology and damage caused by insect pests for their effective control	PO 1,2,6/PSO – 2,5	Ap	C,P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of Cos with PSOs and Pos:

	PS O1	PS O2	PS O3	PSO 4	PS O 5	PS O6	PS O 7	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	1	2	-	-	-	-	-	2	2	-	-	-	-	-	-
CO 2	2	3	-	-	-	-	-	3	1	-	-	-	-	-	-
CO 3	1	2	-	-	-	-	-	-	-	2	-	-	-	-	-
CO 4	2	1	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 5	-	2	-	-	3	-	-	1	3	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:**Assignment/ Seminar topics/Field study report**

1. Beekeeping as industry in India
2. Preparation of bee-keeping projects.
3. Bio-ecology of mulberry silkworm.
4. Natural enemies of lac insect and their management
5. Insect pests of pet animals and their management.

Continuous Comprehensive Assessment

1. Assignments
2. Seminar
3. Submission of report
4. Submission of Field report
5. Test
6. Quiz/Debate

End Semester Evaluation

1. Multiple Choice Questions
2. Very Short Answer Questions
3. Short Answer Questions
4. Essay Type Questions

Mapping of Cos to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4		✓		✓
CO 5	✓	✓		✓