INSTITUTE	**FACULTY OF AGRICULTURE**
PROGRAM	**BACHELOR OF SCIENCE (Hons.) AGRICULTURE**
SEMESTER	**3**
COURSE TITLE	**FUNDAMENTALS OF ENTOMOLOGY**
COURSE CODE	**16AS0303**
COURSE CREDITS	**3**

Objective:

1 To get acquainted with history of entomology in India along with basic aspects of anatomy of different systems, physiology, classification and identification of insects up to family level.

Course Outcomes: After completion of this course, student will be able to:

1 Students will gain the basic concept of entomology, insect collection and preservation.

2 Students will gain knowledge on external morphology of insects, appendages and functions.

3 Students will understand relationship of class insecta with other classes of arthropoda along with harmful and useful insects.

4 Students will develop the understanding of anatomy and physiology of class insecta.

Pre-requisite of course: To aware about the morphology of insects.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**History of Entomology in India. Factors for insect's abundance. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda up to classes. Relationship of class Insecta with other classes of Arthropoda. Harmful and useful insects.** History of Entomology in India. Factors for insect's abundance. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda up to classes. Relationship of class Insecta with other classes of Arthropoda. Harmful and useful insects.	2

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Contents : Unit	Topics	Contact Hours
2	**Morphology: Structure and functions of insect cuticle, moulting and body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, wing venation, modifications and wing coupling apparatus. Metamorphosis and diapause in insects. Types of larvae and pupae.** Morphology: Structure and functions of insect cuticle, moulting and body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, wing venation, modifications and wing coupling apparatus. Metamorphosis and diapause in insects. Types of larvae and pupae.	3
3	**Structure of male and female genital organs. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs** Structure of male and female genital organs. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs	3

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Contents : Unit	Topics	Contact Hours
4	**Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta up to Orders. Major characteristics of orders. Basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.** Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta up to Orders. Major characteristics of orders. Basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.	5
Total Hours		**13**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Methods of collection and preservation of insects including immature stages** Methods of collection and preservation of insects including immature stages	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
2	**External features of Insects (Grasshopper/Blister beetle/Cockroach etc)** External features of Grasshopper/Blister beetle/Cockroach	2
3	**Insect antennae and their modifications** Insect antennae and their modifications	2
4	**Insect mouthparts and their modifications** Insect mouthparts and their modifications	2
5	**Insect legs and their modifications** Insect legs and their modifications	2
6	**Insect wings and their modifications** Insect wings and their modifications	2
7	**Metamorphosis and diapause in insects** Metamorphosis and diapause in insects	2
8	**Insect larvae and pupae** Insect larvae and pupae	2
9	**Dissection of digestive system of insects (Grasshopper/ Cockroach)** Dissection of digestive system of insects (Grasshopper/ Cockroach)	2
10	**Dissection of male and female reproductive system of insects (Grasshopper/ Cockroach)** Dissection of male and female reproductive system of insects (Grasshopper/ Cockroach)	2
11	**Study the characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera and their families of agricultural importance** Study the characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera and their families of agricultural importance	2
12	**Study the characters of orders Lepidoptera, Coleoptera, Neuroptera, Hymenoptera, Diptera and their families of agricultural importance** Study the characters of orders Lepidoptera, Coleoptera, Neuroptera, Hymenoptera, Diptera and their families of agricultural importance	2
Total Hours		**24**

Textbook :

1 A Text Book of Entomology, RosS H H, John Wiley And Sons, 2013

2 A textbook of Agricultural Entomology, Alford D V, Blackwell Science Ltd, 1999

References:

1 The insects: an outline of entomology, The insects: an outline of entomology, Gullan PJ, Cranston PS, John Wiley & Sons, 2014

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Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking**
25.00	25.00	20.00	10.00	10.00	10.00

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board may also use any of tools such as demonstration, role play, quiz, brain storming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

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