

ENTOMOLOGY

Sr. No.	Course code	Semester	Name of papers	Credit hrs.
1	AG-203	II	Fundamentals of Entomology-I (Insect Morphology and Taxonomy)	3 (2+1)
2	AG-312	III	Fundamentals of Entomology-II (Insect Ecology and concept of IPM)	2 (1+1)
3	AG-503	V	Pests of Field crops & Stored Grain and their Management	3 (2+1)
4	AG-608	VI	Beneficial insects and Pest of Horticultural Crops and their Management	3 (2+1)

1. Fundamentals of Entomology-I
(Insect Morphology and Taxonomy)

3(2+1) AG-203

Theory:

Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, wing venation, modifications and wing coupling apparatus. Structure of male and female genital organs. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes and chemoreceptors.

Systematics: Taxonomy--importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae. Dictyoptera: Mantidae, Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae. Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidac, Alcuroidac;; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae;; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidac, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages: External features of Grasshopper: Types of insect antennae. mouth parts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

2. Fundamentals of Entomology-II
(Insect Ecology & concept of IPM)

2(1+1)AG-312

Theory

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors-temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors - food competition, natural and environmental resistance.

IPM:

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control-importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Plant protection appliances and application technique of pesticides. Symptoms of poisoning, first aid and antidotes. Survey, surveillance and forecasting of insect pests. Safety issues of pesticides uses.

Practical

Sampling techniques for estimation of insect population and damage. Insecticides and their formulations. Pesticide appliances and their maintenance. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides.

3. Pests of field crops, Stored grains and their management

3(2+1)AG-503

Theory

General account on nature and type of damage by following insect pests and arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage and management practice of major pests and other important arthropod pests (mites) of various field crops. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Paddy: *Leptocorisa varicroms*, *Hieroglyphus Spp.*, *Nilaparvata lugens*, *Nephotetix spp.*, *Mythimna separata*, *Orseolia oryzae*

Jowar Maize: *Chilo partellus*, *Atherigonavariasoccata*, *Scirpophaga excerptalis*, *Chilo infuscatelles*

Sugarcane: *Top borer*, *Pyrilla*, *Early Shoot borer and white fly*, *Emmalocera depressella*

Cotton: *Pectinaphora gossypiella*, *Earias Spp*, *Sylepta derogata*, *Dysdercus Spp.*, *Bemisia tabaci*, *Amrasca bigutulla*

Oilseeds: *Lipaphis erysimi*, *Athalia proxima*, *Bagrada cruciferarun*, *Dasyneura*

Pulses: *Helicoverpa armigera*, *Agrotis Spp.*, *Etiella zinckenella*, *Clavigralla gibbosa*, *Exelastis atomosa*, *Melanagromyza obtusa*

Pests of Stored Grains: *Sitophilus oryzae*, *Trogoderma granarium*, *Sitotroga cerealella*, *Callosobruchus chinensis*.

Polyphagous pests: *Odontotermes obesus*, *Holotrichia consanguinea*, *Spilosoma obliqua*, *Spodoptera litura*, *Amsacta Spp*, Locust.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking field crops and their produce. Identification of insect pests and Mites associated with stored grain. Application technique. Fumigation of grain store godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory. Department of Food., Delhi. Visit to nearest FCI godowns.

4. Beneficial Insects and pests of Horticultural crops and their management 3(2+1)AG-608

Theory

Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties, methods of harvesting and preservation of leaves. Rearing of mulberry silkworm, rearing appliances, mounting and harvesting of cocoons. Pests and diseases of silkworm, management, and methods of disinfection. Importance of beneficial insects. bee keeping, pollinating plants and their cycle, bee biology, commercial methods of rearing, equipment used and seasonal management. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Species of lac insect, morphology, biology, host plant and lac production. Processing of lac - seed lac, button lac, shellac and lac- products. Identification of major parasitoids and predators commonly used in biological control.

Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage and management of-

Vegetables: *Helicoverpa armigera*, *Bemisia tabaci*, *Thrips tabaci*, *Leucinodes orbonalis*, *Henosepilachna vigintioctopunctata*, *Bactrocera cucurbitae*, *Aulacophora foveicollis*, *Plutella xylostella*, *Phthorimaea operculella*.

Fruits : *Batocera rufomaculata*, *Amritodus atkinsoni*, *Drosicha mangiferae*, *Papilio demoleus*, Sanjose scale, citrus leaf minor, fruit sucking moth..

Practical

Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Types of silkworm, voltinism and biology and rearing of silkworm and equipment. Honeybee species and castes of bees. Beekeeping appliances and seasonal management. Bee enemies and diseases. Bee pasturage, bee foraging and communication. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to sericulture, beekeeping, lac culture and natural enemies. Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking horticultural crops - vegetable crops, fruit crops. Visit to orchards and gardens.