Course Allotment of M.Sc. (Ag) Entomology

S. N.	Course Code	Course Name	Credits	Distribution of Marks	
				Theory (Mid. + End)	*Practical*
SEMESTER-I					
1.	ENT-6431	Insect Morphology	3 (2+1)	(20+40)	40
2.	ENT-6432	Insect Systematic	3 (2+1)	(20+40)	40
3.	ENT-6433	Insect Anatomy, Physiology and Nutrition	3 (2+1)	(20+40)	40
4.	AST-6364	Statistical Methods	3 (2+1)	(20+40)	40
Total			**12**	**400**	
SEMESTER-II					
5.	ENT-6435	Insect Ecology	3 (2+1)	(20+40)	40
6.	ENT-6436	Toxicology of Insecticides	3 (2+1)	(20+40)	40
7.	ENT-6437	Plant Resistance to Insects	3 (2+1)	(20+40)	40
8.	AST-6364	Design of experiments	3 (2+1)	(20+40)	40
Total			**12**	**400**	
SEMESTER-III					
9.	ENT-7431	Integrated Insect Pest Management	3 (2+1)	(20+40)	40
10.	ENT-7432	Advanced Techniques of Plant Protection	3 (2+1)	(20+40)	40
11.	ENT-7433	Biological Control	3 (2+1)	(20+40)	40
12.	ENT-7434	Insect-Pests and Disease-vectors Crops	3 (2+1)	(20+40)	40
Total			**12**	**400**	
SEMESTER-IV					
13.	ENT-7435	Storage Pests and Their Management	3 (2+1)	(20+40)	40
14.	ENT-7436	Insect of Industrial Importance	3 (2+1)	(20+40)	40
15.	ENT-599	Seminar	1	Satisfactory/Unsatisfactory	
16.	ENT-7437	IPM Package of Crops (Special Paper) OR	12	100	
	ENT-598	Thesis			
Total			**19**	**300**	
Grand Total			**55**	**1500**	

Semester-Ist

COURSES OF M.SC.(AG.) ENTOMOLOGY

ENT-6431 INSECT MORPHOLOGY 3 (2+1)

Introduction and brief history of entomology (1), Principles; utility and relevance (1), Integument structure, physical colours, outgrowths, appendages, functions (2), structure of insect head (2), appendages, antennae (1) mouthparts and modifications (2) tentorium, neck sclerites (1), Thorax - structure of tergum, sternum and pleuron and pterothorax (2), wings - origin, structure, modification, venation, articulation, wing coupling apparatus (2), Legs - structure, articulation, modification 1, Abdomen - sclerites, pregenital and genital segments, appendages, genitalia (2), Metamorphosis (2),

Practical

Preparation of permanent and temporary mounts, slides (1) , cuticular outgrowths (1), general morphology of grass hopper (1), Head sclerites, suture , areas , tentorium (2), types of antennae (I), mouthparts and their modifications in grasshopper, honey bee, red cotton bug, thrips, butterfly, house fly, caterpillar (4), Thoracic sclerites (1), wings types and venation (2), wing coupling (1), legs - types (l), abdomen - stinging organ in . bees (I), genitalia (1), Identification of immature stages - types of larvae and pupae (1).

ENT 6432 INSECT SYSTEMATICS 3 (2+1)

Relationship between systematics and taxonomy (1), Zoological nomenclature and zoological classifications (1), type concept and types at species level, History of insect systematics. Insect phylogeny, current classification (1), Importance of taxonomy and levels of systematics (1),concept of species, sub-species, kinds of species and taxonomic keys (1), Principles and application of zoological nomenclature (4), Description of new taxa (1), Classification of different orders up to families of agricultural importance (3).

Practical

Taxonomic collections, curation of insects (3), Preparation of slides for making illustration (l), Illustrating taxonomic characters (1), Camera Lucida drawing of insects (2), Identification of insect keys (2), Repository of insect collections (1), website visits to museums identification of insects of agricultural importance (1).

ENT 6433 INSECT ANATOMY, PHYSIOLOGY AND NUTRITION 3 (2+1)

Scope and importance of insect anatomy and physiology (1), Embryonic development (2), Anatomy and physiology of digestive(3), excretory (3), respiratory (2), circulatory (2), nervous (2), endocrine and exoc-rine (2) and reproductive systems (4). Metabolism

of carbohydrates, Lipids and nitrogenous compounds (2), Insect nutrition (1), Role of vitamins, proteins, amino acids, carbohydrates, lipids, sterols and minerals in insect nutrition (2), Sensory organs and insect behaviour (2), Metabolism of carbohydrates, lipids and nitrogenous compounds (3).

Practical

Dissection of insects to study comparative modifications, digestive, respiratory, nervous and reproductive systems in grass hopper, bugs, flies, bees, beetles, moths, Experiments to study haemocyte count, observations on histology of embryonic stages from permanent to slides, Colorimetric estimation, of uric acid and acetylecholine esterase (4), Paper chromatography of amino acids, pH of insect gut. Preparation of artificial diet of a lepidopteran insect (2).

IInd Semester

ENT 6435 INSECT ECOLOGY 3 (2+1)

Basic concepts - population and environment (2), Population regulation - natural control and current theories (2), Characteristics of population (1), Biotic potential and environmental resistance (2), Stable age distribution (1), population dynamics (1), Diapause, hibernation and aestivation (2), Effect of environmental factors on distribution and abundance of insects (2), Food chain and ecological succession (2), Ecological indicators (1).

Practical

Measurement of micro-environments (3), Concepts of life table and construction of life tables (4), Computer simulation, modeling (3), Estimates of population density (3), Sampling methods and plans (3), Estimation of dispersion and migration (2).

ENT 6436 TOXICOLOGY OF INSECTICIDES 3 (2+1)

Principal of toxicology (1), Insecticides - their classification (1), Mode of action, structure, activity, relationships of arsenicals, rotenoids, dinitrophenols, fluoro- compounds, chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids, nicotenoids, neem products and newer molecules viz. - avermectins (7), metabolism and toxicity (4), synergism, antagonism and compatibility (2), systemic and selective insecticides (2), Insect resistance to insecticides and resurgence '(3), Insecticide residue - their significance, analysis and environmental implications (7), Diagriosisand treatment of insecticide poisoning (2), Plant products (2), Formulations. Rules of insecticide registration and quality control (S). Application techniques and hazards (2).

Practical

Preparation of laboratory formulations and standard concentration of insecticides (2), Bioassay technique (4), Testing of relative toxicity and synergism (3), Sampling for insecticide residue, their extraction, cleanup and estimation(3), compatibility of pesticides, phytotoxicity, toxicity to beneficial insects (4), Scrutiny of pesticides. containers with reference to Insecticide Act, 1968, Evaluation of spray particles. Assessment of efficacy of Insecticides under laboratory and field conditions correction for natural mortality, Fixing LDSO, LCSO and L *TSO* for insecticide. Dragsstedt-Behrens -Graphical and Finney's methods - pro bit analysis.

ENT 6437 PLANT RESISTANCE TO INSECTS 3 (2+1)

History and importance (1), Ecological and genetic resistance (1), Mechanism of plant resistance to insects (2), Factors that affect the expression or permanence of resistance (1), Role of secondary plant substances in host selection (2), Chemoreception (1), phagostimulants (1), Peculiarities of plant reaction to pest injury (1), Methods of. investigating pest resistance (?),~ -. Genetics of pest resistance (1), Sources of plant resistance (2), Genetically modified plants for pest resistance (1), Resistance to insects in major crops (2).

Practical

Use of planimeter (1), Graphic technique and choice tests for measuring resistance (4), Measurement of plant characters and working out their correlations with plant resistance(3), Testing of resistance in important crops (5), Bioassay of plant extracts of susceptible/resistant varieties (3), Demonstration of antibiosis, preference and non-preference (2).

IIIrd Semester

ENT -7431 INTEGRATED INSECT PEST MANAGEMENT 3 (2+1)

The concept and history of pest management (4), Components of pest management (2), Ecological and socio-economic aspects, cost benefit and risk/benefit ratios (3), Cultural, biological, chemical, genetic, legal and other control tactics and their integration for pest management (6), Sampling and measuring the economic levels of damage, economic injury levels and economic threshold (2), Analysis and modeling for pest management and case histories (2), Decision and succession of crop pests as influenced by biotic and

abiotic factors (3), Key factor and time series analysis in pest management (3), Pest management in major crops (5), Integration of IPM options in integrated farming systems and sustainable agriculture (3).

Practical

Collection and identification of natural enemies of insect pests of rice, pigeon pea, vegetables and oilseeds (2), Calculation of diversity index and economic thresholds (2), Demonstration of IPM technology in field crops (1), Scouting (1), Impact analysis (1), IPM in protected cultivation system (2).

ENT -7432 ADVANCED TECHNIQUES OF PLANT PROTECTION 3 (2+1)

Pest control equipment principles, operation, maintenance, selection (2), Application of pesticides and bio-control agents, seed dressing, soaking, root-dip treatment, dusting, spraying low and high volume sprayers), Application through irrigation water (6), soil disinfections, soil fumigation (4), sterilization, solarisation, deep ploughing (summer), flooding (stagnant water treatment), Techniques to check the spread of pest through seed, bulbs, corms, cuttings and cut flowers (2), Physical cleaning, cutting and removal of infected parts, hot water treatment, Use of light, Microscopy (3),Use of tissue culture techniques in Plant protection (4), Computer application for predicting/forecasting pest/disease attack and identification (4).

Practical

Identification and learning about function of various plant protection equipments and their parts (5), calibration of sprayers 0), seed dressing, soaking, root-dip treatment, dusting, spraying (low and high volume sprayers) (3), Solarization, Microscopy (2).

ENT-7434 INSECTS OF INDUSTRIAL IMPORTANCE
3 (2+1)

(Apiculture/ sericulture/Lac culture)

Apiculture: Introduction to apiculture (1), Bee biology, natural enemies and seasonal management (3), Ecology and behaviour of bees (1), Methods of communication and reproduction (2), Bees as pollinator (1), Bee keeping equipments, honey extraction and bee products (2), Beekeeping as industry in India (2).

Sericulture: History, development and organization of silk industry (1), food plants of silkworm, the cultivation and management (2), Mulberry and on-mulberry silkworms and their systematic (2), Bio-ecology of mulberry silkworm (1), silkworm rearing technology (2), diseases, predators and parasitoid of silkworms and their management (4).

Lac culture: History of lac culture (1), Bionomics of lac insect, natural enemies of lac insect and their management (3), Lac host management (2), Lac production technology (1). Lac processing (1), Bio products of lac industry and their utilization (1), Lac based

production (1).

Practical

Identification of bee species (1), Apicultural equipment (1), Ecology examination, bee activities, seasonal management, colony multiplication, queen rearing, control of bee enemies and diseases, colony records, production/collection, use and testing of bee products (4), Propagation and layout, pruning, harvesting of mulberry (1), Identification of mulberry and non-mulberry silkworms (1), Morphology and anatomy of silkworm (1), rearing of mulberry silkworm (2), Identification of various disease, predators and parasitoid of silkworms (2), Identification of life stages of lac insects (1), care and maintenance of host of lac insect (l), Identification of natural enemies of lac insect (1), visit to production units (1).