

M.Sc. AGRICULTURE

SEMESTER-I (ENTOMOLOGY)

Sr. No	Course Code	Subject	Periods per week		Marks		Internal Assesment		Total Marks		Grand Total
			Th.	Pract.	Th.	Pract.	Th.	Pract.	Th.	Pract.	
1	ENT-511	Insect Morphology and Systematics	4	3	80	40	20	10	100	50	150
2	ENT-512	Insect Anatomy and Physiology	4	6	80	40	20	10	100	50	150
3	ENT-513	Classification of Insects	4	3	80	40	20	10	100	50	150
4	SSC-410 (Minor)	Soil Chemistry and Bio Chemistry	4	6	80	40	20	10	100	50	150
5	STA-415	Statistical Methods for Research Workers	4	3	80	40	20	10	100	50	150
Total			20	21	400	200	100	50	500	250	750

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

Sr. No	Course Code	Subject	Periods per week		Marks		Internal Assesment		Total Marks		Grand Total
			Th.	Pract.	Th.	Pract.	Th.	Pract.	Th.	Pract.	
1	ENT-521	Insect Ecology	4	3	80	40	20	10	100	50	150
2	ENT-522	Toxicology of Insecticides	4	6	80	40	20	10	100	50	150
3	ENT-523	Plant Resistance to Insects	4	3	80	40	20	10	100	50	150
4	BCH-420/ BCH-421 (Minor)	Insecticide Chemistry/ Pesticide Formulations	4	6	80	40	20	10	100	50	150
5	STA-425	Experimental Designs for Research Worker	4	3	80	40	20	10	100	50	150
Total			20	21	400	200	100	50	500	250	750

M.Sc. AGRICULTURE

SEMESTER-III (ENTOMOLOGY)

Sr. No	Course Code	Subject	Periods per week		Marks		Internal Assesment		Total Marks		Grand Total
			Th.	Prac	Th.	Prac	Th	Prac	Th	Prac	
1	ENT-531	Biological Control of Insect Pests	4	3	80	40	20	10	100	50	150
2	ENT-532	Integrated Pest Management	4	6	80	40	20	10	100	50	150
3	AGR-411/ BOT-430 (Minor)	Weed management/ Physiology of Growth & Development	4	3	80	40	20	10	100	50	150
4		Research Work (Four periods per Teacher per Student)	-	4							
Total			12	16	240	120	60	30	300	150	450

M.Sc. AGRICULTURE

SEMESTER-IV (ENTOMOLOGY)

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal assessment		Total Marks		Grand Total
			Th.	Pract.	Th.	Pract.	Th.	Prac	Th	Prac	
1	ENT-541	Commercial Entomology	4	3	60	20	15	05	75	25	100
2.	ENT-542	Storage Entomology	4	3	60	20	15	05	75	25	100
3		Credit seminar	-	3		100				100	100
4		Research Work (Four Periods per Teacher Per Student)		4		250				250	250
		Total	08	13	140	370	35	05	175	375	550

M.Sc. AGRICULTURE

SEMESTER-I (ENTOMOLOGY)

ENT-511

Insect Morphology and Systematics

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Evolution of insect body form. Primary and secondary segmentation, structure of typical secondary segment. Different theories regarding segmentation of insect head. Comparative morphological characteristics of insects and their bearing in insect classification. Insect sense organs. Mechanism of flight. Insect Systematics - history and importance. Taxonomic categories. Taxonomic keys. Important rules of Zoological nomenclature. Ethics in taxonomy. Zoogeographical regions of world.

Practical:

Comparative study of morphological characteristics of representative type of insects. Collection and preservation of insects and their identification with the help of taxonomic keys. Preparation of taxonomic keys.

M.Sc. AGRICULTURE

SEMESTER-I (ENTOMOLOGY)

ENT-512

Insect Anatomy and Physiology

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Importance and scope of insect anatomy and physiology. Structure and physiology of insect integument. Comparative study of anatomy and physiology of digestive, circulatory, respiratory, excretory, reproductive, nervous, sensory, endocrine and exocrine systems. Embryonic and post-embryonic developments. Diapause. Insect nutrition, inter- and intracellular micro organisms. Artificial diets.

Practical:

Study of comparative anatomy of various organ systems of insects through dissection and preparation of mounts of internal organs. Experiments to highlight physiological significance of cuticle, digestive, circulatory, respiratory, excretory, endocrine and exocrine systems. Formulation and preparation of artificial diets for rearing of insects.

M.Sc. AGRICULTURE

SEMESTER-I (ENTOMOLOGY)

ENT-513

Classification of Insects

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

History of insect classification and its importance. Introduction to phylogeny of insects. Classification of Superclass Hexapoda including all the classes with special emphasis on Class Insecta. Distinguishing morphological characters alongwith the habits and habitats of insects belonging to economically important families of all the orders of Class Insecta.

Practical:

Collection and preservation of insects. Identification of insects upto family level. Field visits to collect insects of different orders.

M.Sc. AGRICULTURE

SEMESTER-I (ENTOMOLOGY)

SSC-410: Soil Chemistry and Biochemistry (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory

Soil colloids–nature, properties, origin of charges and their significance; Cation and anion exchange phenomena and their importance; Introduction to ionic adsorption and fixation; Soil reaction and buffering; Distribution, characterization, genesis and amelioration of acid, acid sulphate, saline, saline-sodic, sodic and calcareous soils; Plant reaction and tolerance to soil salinity, sodicity and acidity; Chemical and electro chemical properties of submerged soils; Organic matter and characterization of clay –organic matter interaction ; Biochemical decomposition of organic manures and farm wastes, composting and vermicomposting, Biochemistry of humus formation and biogas production .

Practical:

Determination of the effect of dilution and salinity on soil pH; Active and potential acidity; Cation and anion exchange capacity and exchangeable cations; Soluble salts in soils; Lime and gypsum requirements. Nutrient adsorption and fixation capacities of soils; Estimation of biochemical constituents of organic residues- cellulose, hemi-cellulose, lignin and C: N ratio; Preparation of enriched compost, bio-fertilizers and vermiculture.

M.Sc. AGRICULTURE

SEMESTER-I (ENTOMOLOGY)

STA-415: Statistical Methods for Research Workers

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Probability and fitting of standard frequency distribution, sampling techniques, sampling distributions, mean and standard error, simple partial, multiple and intra- class correlation and multiple regression, tests of significance, students'-t, chi-square and large sample tests, confidence intervals, analysis of variance for one way and two way classification with equal cell frequencies, transformation of data.

Practical:

Fitting of distributions, samples and sampling distributions, correlation and regression, tests of significance and analysis of variance.

Note: Students shall be trained to use computer to analysis the data, using available software's. However, during university examination students will use scientific calculators to analyse the data.

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

ENT-521

Time: 3 Hours

Insect Ecology

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Basic concepts of ecology. Organization levels. Ecosystem concept. Food chain. Characteristics of insect populations. Physical environment, its influence on abundance, distribution, rate of increase and diapauses in insects. Concept of intrinsic rate of increase. Biotic factors, intraspecific competition, logistic theory. Interspecific relationships, prey/predator models, effect of food and space on insects. Natural balance, population dynamics and regulation. Defense mechanisms against predators/parasitoids. Estimation of dispersal, migration and mortality factors. Life-tables and their application. Systems approach to ecology. Abundance and diversity of insects, its causes and estimates. Pest outbreaks and forecasting. Sampling considerations for population estimates of insects in different habitats. Pest management as applied ecology.

Practical:

Measurement of microenvironment- maintenance of physical factors, calculation of rate of increase (rm), stable age distribution and fitting of logistic curve for population growth. Determination of distribution pattern, and size and number of samples. Estimation of population of different groups of insect pests. Measurement of insect diversity. Life-tables for determining mortality factors.

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

ENT-522

Toxicology of Insecticides

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Definition, importance, scope, basic principle of insecticide toxicology and its relationship with other disciplines. Structure and mode of action of organochlorines, organophosphates, carbamates, pyrethroids, neonicotinoids, oxadiazines, phenylpyrozoles, botanicals and new promising compounds etc. Criteria, methods, problems and solutions of bioassay. Evaluation of insecticide toxicity, joint action of insecticides, synergism, potentiation and antagonism, factors affecting toxicity of insecticides, selectivity and phytotoxicity. Insecticide metabolism, pest resistance to insecticides, mechanisms and types of resistance, insecticide resistance management and pest resurgence. Insecticide residues, their significance and environmental implications. Insecticide Act, registration and quality control of insecticides, safe use of insecticides, diagnosis and treatment of insecticide poisoning.

Practical:

Insecticide formulation and mixtures, quality control of pesticide formulations. Working out doses and concentrations of pesticides for laboratory and field evaluation for their bioefficacy, bioassay techniques, probit analysis, evaluation of insecticide toxicity and joint action. Toxicity to beneficial insects. Preparation of working standard solutions of pesticides, Sampling, extraction, clean-up and estimation of insecticide residues by various methods, calculations and interpretation of data, visit to toxicology laboratories, good laboratory practices.

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

ENT-523

Plant Resistance to Insects

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

History and importance of host plant resistance. Principles, classification, components, types and mechanisms of resistance. Insect-host plant relationships. Theories and bases of host-plant selection. Chemical ecology. Tritrophic relations. Volatiles and secondary plant substances. Basis of resistance. Factors affecting plant resistance including biotypes and measures to combat them. Screening techniques.

Breeding for insect resistance in crop plants. Exploitation of wild plant species and gene transfer. Successful examples of resistant crop varieties in India and world. Role of biotechnology in plant resistance to insects.

Practical:

Screening techniques for measuring resistance. Measurement of plant characters and working out their correlations with plant resistance. Testing of resistance in important crops. Demonstration of antibiosis, tolerance and antixenosis.

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

BCH-420

Insecticide Chemistry (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Introduction and classification of synthetic insecticides, chemistry of conventional organochlorine insecticides: DDT, HCH, Lindane; uses, mode of action. Cyclodiene insecticides: nomenclature, uses, synthesis and mode of action of aldrin, dieldrin. Organophosphorus insecticides: chemistry, classification and mode of action. Important reactions namely Michaelis-Arbuzov reaction, Perkow reaction, Thiono-thiolo rearrangement. Preparation, properties and uses of eidfenphos, fenthion, DDVP, monocrotophos, phosphamidon, chlorfenvinfos, malathion, ethyl parathion, fenitrothion, quinalphos, diazinon, chlorpyrifos, disulfoton, dimethoate, acephate. Chemistry of carbamate insecticides: classification, synthesis, uses and mode of action of carbofuran, carbaryl, aldicarb, methomyl and propoxur. Synthetic pyrethroids: Chemistry, classification, mode of action, history and evolution from natural pyrethrins. Preparation, synthesis, uses and properties of cypermethrin, deltamethrin, fenvalerate, cyfluthrin, non-ester pyrethroid – ethofenprox. Neonicotinoids: Chemistry, classification, mode of action and uses. Preparation, properties and uses of imidacloprid, acetamiprid, thiacloprid. General introduction and mode of action of ecdysones and ecdysoids. Inhibitors of chitin synthesis, chemosterilants.

Practical:

Preparation and characterization of DDT, DDE, and Methoxychlor, Preparation of organophosphorus insecticide: Part A – phosphorodichloridite and Part B – phosphonate, Preparation and characterization of oxime ether, Preparation of DDVP. Estimation of different insecticides

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

BCH-421

Pesticide Formulations (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

General aspects: definition, objectives, process, product spectrum, classification, formulation codes etc. Solid and liquid formulations including the latest developments: preparation, properties, specifications, use etc. Formulants: carriers/ diluents, surfactants, synergists, safeners, encapsulants, antioxidants, stabilizers etc. highlighting chemistry, classification, properties, use etc., formulant-toxicant interactions, pesticide mixtures. Machinery and equipment, packaging and labeling. Packaging standards, requirement, materials, disposal, decontamination etc. Labeling: content, specifications, needs for low literacy regions, etc. Application: principles, distribution and coverage, recent developments. Precautions in use of pesticides. Bio-efficacy: basic considerations and applied aspects, physico-chemical basis, pesticide antidotes.

Practical:

Equipment used in formulation research, Determination of acidity of a pesticide, Determination of alkalinity of a pesticide, Preparation of controlled release formulation, Release of active ingredient from CR formulation in soil and water, Preparation of toxicant based creams, Study of solid carriers: Determination of (i) Surface acidity by volumetric method, (ii) Surface area, study of solid carriers, (iii) Sorptivity and (iv) Particle size. Preparation of dust, wettable powder and granules, Determination of wettability and suspensibility of wettable powder, Study of liquid carriers (i) Flash point and specific gravity, Study of liquid carriers (ii) Determination of viscosity. Study of surfactants: Micelle formation, Preparation of liquid formulations, Determination of emulsion stability of an emulsifiable concentrate, Application technology: Sprayers.

M.Sc. AGRICULTURE

SEMESTER-II (ENTOMOLOGY)

STA-425: Experimental Designs for Research Workers

Time: 3 Hours

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Note: Students are allowed to use scientific calculator in University examinations; statistical tables will be provided to students in examinations. No rigorous mathematical proofs are expected from students; stress will be on application only.

Theory

Need for designing of experiments- characteristics of a good design, basic principles- randomization, replication and local control, uniformity trials- size and shape of plots and blocks, analysis of variance and interpretation of data, completely randomized, randomized block and latin square design, multiple comparison tests, factorial experiments- interpretation of main effects and interactions, orthogonality and partitioning of degrees of freedom confounding in 2^3 , 2^4 and 3^3 designs, split and strip plot designs, crossover designs and balanced incomplete block designs, response surface designs, switch over trials and long term experiments; Selection of experimental design, mechanical errors in field experiments and methods of reducing it, presentation of research results.

Practical:

Time: 3 Hours

cross over and balanced incomplete block designs.

Note: Students shall be trained to use computer to analysis the data, using available software's. However, during university examination students are allowed to use scientific calculators to analysis is the data.

M.Sc. AGRICULTURE

SEMESTER-III (ENTOMOLOGY)

ENT-531

Biological Control of Insect Pests

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Principles and scope of biological control. Techniques in biological control. Biology and host seeking behaviour of predatory and parasitic groups of insects. Role of insect pathogens and their mode of action. Biological control of weeds using insects. Techniques for mass production of quality biocontrol agents. Various formulations and economics of bioagents. Field application and evaluation. Analysis of successful biological control projects. Trends and future possibilities of biological control. Importation of natural enemies and quarantine regulations. Biotechnology in biological control. Semiochemicals in biological control

Practical:

Identification of common natural enemies of crop pests and weed killers. Techniques for rearing of natural enemies. Visits (only where logistically feasible) to bio- control laboratories to learn rearing and mass production of natural enemies of crop pests and weeds and their laboratory hosts. Field collection of parasitoids and predators. Hands- on training in culturing and identification of common insect pathogens. Quality control and registration standards for biocontrol agents.

M.Sc. AGRICULTURE

SEMESTER-III (ENTOMOLOGY)

ENT-532

Integrated Pest Management

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

History and origin. Definition and evolution of various related terminologies. Concept and philosophy of IPM. Ecological principles. Determination of crop losses and economic thresholds. Integration of different pest management methods. Pest survey and surveillance, forecasting, types of surveys including remote sensing methods, factors affecting surveys. Political, social and legal implications of IPM. Pest risk analysis, pesticide risk analysis and cost-benefit ratios. Case studies of successful IPM programmes. National and international set-ups for integrated pest management.

Practical:

Characterization of agro-ecosystems. Sampling methods and factors affecting sampling. Population estimation methods. Crop loss assessments, potential losses, avoidable losses, unavoidable losses. Computation of EIL and ETL. Crop modelling, designing and implementing IPM system.

M.Sc. AGRICULTURE

SEMESTER-III

(ENTOMOLOGY)

AGR-411

Weed Management

Time: 3 Hours

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per Week 4+6

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Weeds- Introduction, harmful and beneficial effects, characteristics and classification. Weed biology and ecology. Crop weed association, competition and allelopathy. Concepts of weed prevention, control and eradication. Methods of weed control. Physical, cultural, chemical, biological and integrated weed management. Herbicides- classification, formulation, advantages ,disadvantages and methods of application. Introduction to adjuvant and their use in herbicides. Introduction to selectivity of herbicides. Mode of action and fate of herbicides in soil. Compatibility of herbicides with other agrochemicals. Weed management in major field and horticultural crops and in non cropped areas. Shift in weed flora in cropping systems. Classification, useful and harmful aspects and control measures of aquatic weeds. Problematic weeds and their control.

Practical:

Identification of weeds and weed seeds. Survey of weeds in crop fields and other habitats. Preparation of weed herbarium. Computation of herbicide doses, weed control efficiency and weed index. Methods of recording weed intensity under different situations. Herbicide label information of commonly available herbicides. Herbicide application equipments and their calibration. Diagnosis of herbicide toxicity symptoms in different crops and weeds. Visits to problem areas.

M.Sc. AGRICULTURE

SEMESTER-III

(ENTOMOLOGY)

BOT-430

Time: 3 Hours

Physiology of Growth and Development

Max. Marks: 150

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Concepts of growth, differentiation and pattern formation; growth curves, meristems, growth kinetics, factors affecting growth and general aspects of development, level of differentiation, control of development at genetic level. Hormones and growth regulators - auxins, gibberellins, cytokinins, ethylene, ABA, other inhibitors, retardants, polyamines, aliphatic alcohols, brassins, hormonal regulation of growth and development, plant movements; photoperiodism, phytochrome, flowering hormones, vernalization, abscission, ageing, senescence; physiology of seed and fruit development; seed germination; seed and bud dormancy. Plant physiology and agriculture.

Practical:

Experiments on growth measurements, hormonal bioassays, plant movements; experiments on quality of light on seed germination, breaking of dormancy. Experiments on photoperiodism. Experiments on hormonal regulation of development.

M.Sc. AGRICULTURE

SEMESTER-IV (ENTOMOLOGY)

ENT-541

Commercial Entomology

Time: 3 Hours

Max. Marks: 100

Theory: 60

Practical: 20

Internal assessment 15+5=20

Periods per week :4+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Development of apiculture. Classification of bees and distribution of genus *Apis*. Morphological adaptations. Behaviour and activities of honey bees. Honey bee nutrition. Artificial queen bee rearing and bee breeding. Sex and caste determination. Honey bee ecology. Bee pheromones. Pests and diseases of honey bees. Bee poisoning. Hive products. Planned crop pollination using bees. Silkworm species and their characteristics. Moriculture. Silk seed production. Rearing and management of silkworms. Pests and diseases of silkworms. Silk and its uses. Lac insect's management. Economic importance of insect-pests of human health and habitation. Biology, damage and management strategies for mosquitoes, house flies, bed bugs, ants, termites, cockroaches and wasps.

Practical:

Morphological adaptations in different castes of honey bees. Recording of colony data. Selection and breeding of honey bees. Latest techniques in mass queen bee rearing. Artificial diets and feeding. Production and extraction of hive products. Preparation of beekeeping projects. Recording pollination behaviour and determining pollination requirements. Identification of different species of silkworms. Silkworm rearing equipment. Silkworm rearing and management. Diseases of silkworms. Lac insect and host management. Lac collection and processing. Management of insect-pests of public health importance and human dwellings.

M.Sc. AGRICULTURE

SEMESTER-IV (ENTOMOLOGY)

ENT-542

Time: 3 Hours

Storage Entomology

Max. Marks: 100

Theory: 60

Practical: 20

Internal assessment 15+5=20

Periods per week :4+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Introduction, history and concepts of storage entomology. Post-harvest losses. Factors responsible for grain losses. Important pests namely insects, mites, rodents, birds and micro-organisms associated with stored grains and agricultural products. Association of stored grain insects with fungi and mites, their systematic position, identification, distribution, host range, biology, nature and extent of damage. Sources of infestation. Type of losses in stored grains and their effect on quality including biochemical changes. Ecology of insect pests of stored commodities. Stored grain deterioration process. Type of storage structures. Ideal storage conditions. Management of rodent and bird pests. Preventive and curative measures for the management of insect pests of stored grains. Characteristics of pesticides, their use and precautions in their handling with special emphasis on fumigants. Integrated approaches to stored grain pest management.

Practical:

Collection and identification of stored grains insect pests and their nature of damage. Detection of insect infestation in stored food grains and estimation of stored losses. Determination of micro flora of grains. Determination of grain moisture. Familiarization of storage structures. Laboratory culturing of stored grain pests. Demonstration of preventive and curative measures including fumigation techniques. Field visits to grain markets, central and FCI warehouses, IGSMRI and commercial silos.

M.Sc. AGRICULTURE

SEMESTER-IV (ENTOMOLOGY)

CREDIT SEMINAR

Total Marks: 100
Periods per week: 03

RESEARCH WORK

Total Marks: 250
Periods per week: 04