

**AGRICULTURAL ENTOMOLOGY SYLLABUS FOR CONDUCTING WRITTEN
EXAMINATION FOR DIRECT RECRUITMENT OF TEACHING POSTS IN THE CADRE OF
ASSISTANT PROFESSORS AT UASM**

Sl. No.	Subject	Content
1.	Insect Morphology	Principles, utility and relevance: insect body wall structure, cuticular outgrowths, colouration and special integumentary structures in insects, body tagmata, sclerites and segmentation. Head- origin, structure and modification; types of mouthparts and antennae, tentorium and neck sclerites. Thorax- areas and sutures of tergum, sternum and pleuron, pterothorax; Wings: structure and modifications, venation, wing coupling apparatus and mechanism of flight; Legs: structure and modifications. Abdomen-segmentation and appendages; genitalia and their modifications; Embryonic and post-embryonic development; types of metamorphosis. Insect sense organs (mechano-, photo- and chemoreceptors).
2.	Insect Anatomy, Physiology and Nutrition	Scope and importance of insect anatomy and physiology. Structure, modification and physiology of different systems digestive, circulatory, respiratory, excretory, nervous, sensory, reproductive, musculature, endocrine and exocrine glands. Thermodynamics; physiology of integument, moulting; growth, metamorphosis and diapause. Insect nutrition- role of vitamins, proteins, amino acids, carbohydrates, lipids, minerals and other food constituents; extra and intra-cellular microorganisms and their role in physiology; artificial diets; Bioluminescence.
3.	Principles of Taxonomy	Introduction to history and principles of systematics and importance. Levels and functions of systematics. Identification, purpose, methods character matrix, taxonomic keys. Descriptions subjects of descriptions, characters, nature of characters, analogy vs homology, parallel vs convergent evolution, intraspecific variation in characters, polythetic and polymorphic taxa, sexual dimorphism. Classification of animals: Schools of classification- Phenetics, Cladistics and Evolutionary classification. Components of Biological Classification: Hierarchy, Rank, Category and Taxon. Species concepts, cryptic, sibling and etho-species, intra-specific categories. Introduction to numerical, biological and cytogenetica taxonomy. Nomenclature: Common vs Scientific names. International Code of Zoological Nomenclature, criteria for availability of names, validity of names. Categories of names under consideration of ICZN. Publications, Principles of priority, and homonymy, synonymy, type concept in zoological nomenclature. Speciation, anagenesis v/s cladogenesis, allopatric, sympatric and parapatric processes.
4.	Classification of Insects	Brief evolutionary history of Insects- introduction to phylogeny of insects and major Classification of Superclass Hexapoda – Classes – Ellipura (Collembola,

		Protura), Diplura and Insecta Orders contained. Distinguishing characters, general biology, habits and habitats of Insect orders and economically important families contained in them. Collembola, Protura, Diplura. Class Insecta: Subclass Apterygota – Archaeognatha, Thysanura. Subclass: Pterygota, Division Palaeoptera – Odonata and Ephemeroptera. Division: Neoptera: Subdivision: Orthopteroid and Blattoid Orders (=Oligoneoptera: Plecoptera, Blattodea, Isoptera, Mantodea, Grylloblattodea, Dermaptera, Orthoptera, Phasmatodea, Mantophasmatodea, Embioptera, Zoraptera), Subdivision: Hemipteroid Orders (=Paraneoptera): Psocoptera, Phthiraptera, Thysanoptera and Hemiptera. Division Neoptera – Subdivision Endopterygota, Section Neuropteroid- Coleopteroid Orders: Strepsiptera, Megaloptera, Raphidioptera, Neuroptera and Coleoptera, Section Panorpoidea Orders Mecoptera, Siphonaptera, Diptera, Trichoptera, Lepidoptera, and Section Hymenopteroid Orders: Hymenoptera.
5.	Insect Ecology	History and Definition. Basic Concepts. Organisation of the Biological world. Plato's Natural Balance vs Ecological Dynamics as the modern view. Abundance and diversity of insects, Estimates and Causal factors. Study of abundance and distribution and relation between the two. Basic principles of abiotic factors and their generalised action on insects. Implications for abundance and distribution of organisms including insects- Law of the Minimum, Law of Tolerance, and biocoenosis, Systems approach to ecology. Basic concepts of abundance- Model vs Real world. Population growth basic models – Exponential vs Logistic models. Discrete vs Continuous growth models. Concepts of Carrying capacity, Environmental Resistance and Optimal yield. Vital Statistics- Life Tables and their application to insect biology. Survivorship curves. Case studies of insect life tables. Population dynamics- Factors affecting abundance- Environmental factors, dispersal and migration, Seasonality in insects. Classification and mechanisms of achieving different seasonality- Diapause (Quiescence) - aestivation, hibernation. Biotic factors- Food as a limiting factor for distribution and abundance, Nutritional Ecology. Food chain- web and ecological succession. Interspecific interactions- Basic factors governing the interspecific interactions- Classification of interspecific interactions - The argument of cost-benefit ratios. Competition- Lotka-Volterra model, Concept of niche ecological homologues, competitive exclusion. Prey-predator interactions-Basic model- Lotka-Volterra Model, Volterra's principle. Functional and numerical response. Defense mechanisms against predators/parasitoids- Evolution of mimicry,

		colouration, concept of predator satiation; evolution of life history strategies. Community ecology- Concept of guild, Organisation of communities- Hutchinson Ratio, May's d/w, Relation between the two and their association with Dyar's Law and Przibram's law. Relative distribution of organisms, Concept of diversity- the Wallacian view. Assessment of diversity. Diversity stability debate, relevance to pest management. Pest management as applied ecology.
6.	Insect Pathology	History of insect pathology, infection of insects by bacteria, fungi, viruses, protozoa, rickettsiae, spiroplasma and nematodes. Epizootiology, symptomatology and etiology of diseases caused by the above and the factors controlling these. Defense mechanisms in insects against pathogens. Examples of successful instances of exploitation of pathogens for pest management and mass production techniques of pathogens. Safety and registration of microbial pesticides. Use of insect pathogens in integrated management of insect pests.
7.	Biological Control of Crop Pests and Weeds	History, principles and scope of biological control; important groups of parasitoids, predators and pathogens; principles of classical biological control- importation, augmentation and conservation. Biology, adaptation, host seeking behaviour of predatory and parasitic groups of insects. Role of insect pathogenic nematodes, viruses, bacteria, fungi, protozoa, etc., their mode of action. Biological control of weeds using insects. Mass production of quality biocontrol agent techniques, formulations, economics, field release/application and evaluation. Successful biological control projects, analysis, trends and future possibilities of biological control. Importation of natural enemies- Quarantine regulations, biotechnology in biological control. Semiochemicals in biological control.
8.	Toxicology of Insecticides	Definition and scope of insecticide toxicology; history of chemical control; pesticide use and pesticide industry in India. Classification of insecticides and acaricides based on mode of entry, mode of action and chemical nature. Structure and mode of action of organochlorines, organophosphates, carbamates, pyrethroids, tertiary amines, neonicotinoids, oxadiazines, phenyl pyrazoles, insect growth regulators, microbials, botanicals, new promising compounds, etc. Principles of toxicology; evaluation of insecticide toxicity; joint action of insecticides- synergism, potentiation and antagonism; factors affecting toxicity of insecticides; insecticide compatibility, 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.
9.	Plant Resistance to Insects	History and importance of resistance, principles, classification, components, types and mechanisms of resistance. Insect-host plant relationships; theories and basis of host plant selection in phytophagous insects. Chemical ecology, tritrophic relations, volatiles and secondary plant substances; basis of resistance. Induced resistance - acquired and induced systemic 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; gene transfer, successful examples of resistant crop varieties in India and world. Role of biotechnology in plant resistance to insects.
10.	Principles of Integrated Pest Management	History and origin, definition and evolution of various related terminologies. Concept and philosophy, ecological principles, economic threshold concept, and economic consideration. Tools of pest management and their integration- legislative, cultural, physical and mechanical 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; cost-benefit ratios and partial budgeting; case studies of successful IPM programmes.
11.	Pests of Field Crops	Systematic position, identification, distribution, host-range, bionomics, nature and extent of damage, seasonal abundance and management of insect and mite pests and vectors. Insect pests of cereals and millets and their management. Polyphagous pests: grasshoppers, locusts, termites, white grubs, hairy caterpillars, and non-insect pests (mites, birds, rodents, snails, slugs, etc.). Insect pests of pulses, tobacco, oilseeds and their management. Insect pests of fibre crops, forages, sugarcane and their management.
12.	Pests of Horticultural and Plantation Crops	Systematic position, identification, distribution, host range, bionomics and seasonal abundance, nature and extent of damage and management of insect pests of various crops. Fruit Crops-mango, guava, banana, jack, papaya, pomegranate, litchi, grapes, ber, fig, citrus, aonla, pineapple, apple, peach and other temperate fruits. Vegetable crops- tomato, potato, radish, carrot, beetroot, cole crops, French beans, chow-chow, brinjal, okra, all gourds, gherkin, drumstick, leafy vegetables etc. Plantation crops- coffee, tea, rubber, coconut, arecanut, cashew, cocoa etc.; Spices and Condiments-pepper, cardamom, clove, nutmeg, chillies, turmeric, ginger, beetlevine etc. Ornamental, medicinal and aromatic plants and pests in polyhouses/protected cultivation.

13.	Storage Entomology	Introduction, history of storage entomology, concepts of storage entomology and significance of insect pests. Post-harvest losses in toto vis- vis total production of food grains in India. Scientific and socio-economic factors responsible for grain losses. Important pests namely insects, mites, rodents, birds and microorganisms associated with stored grain and field conditions including agricultural products; traditional storage structures; association of stored grain insects with fungi and mites, their systematic position, identification, distribution, host range, biology, nature and extent of damage, role of field and cross infestations and natural enemies, type of losses in stored grains and their effect on quality including biochemical changes. Ecology of insect pests of stored commodities/grains with special emphasis on role of moisture, temperature and humidity in safe storage of food grains and commodities. Stored grain deterioration process, physical and biochemical changes and consequences. Grain storage- types of storage structures i.e., improved and modern storage structures in current usage. Ideal seeds and commodities' storage conditions. Important rodent pests associated with stored grains and their non-chemical and chemical control including fumigation of rat burrows. Role of bird pests and their management. Control of infestation by insect pests, mites and microorganisms. Preventive measures- Hygiene/sanitation, disinfestations of stores/receptacles, legal methods. Curative measures- Non-chemical control measures- ecological, mechanical, physical, cultural, biological and engineering. Chemical control prophylactic and curative. Characteristics of pesticides, their use and precautions in their handling with special emphasis on fumigants. Integrated approaches to stored grain pest management.
14.	Insect Vectors of Plant Viruses and other Pathogens	History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouth parts and feeding processes of important insect vectors. Efficiency of transmission. Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors. Transmission of plant viruses by aphids, whiteflies, mealy bugs and thrips. Transmission of mycoplasma and bacteria by leafhoppers and planthoppers. Transmission of plant viruses by psyllids, beetles and mites. Epidemiology and management of insect transmitted diseases through vector management.
15.	General Acarology	History of Acarology; importance of mites as a group; habitat, collection and preservation of mites. Introduction to morphology and biology of mites and ticks. Broad classification- major orders 29 30 and important families of Acari including diagnostic characteristics. Economic importance, seasonal occurrence, nature of damage, host

		range of mite pests of different crops, mite pests in polyhouses, mite pests of stored products and honeybees. Management of mites using acaricides, phytoseiid predators, fungal pathogens etc. Culturing of phytophagous, parasitic and predatory mites.
16.	Soil Arthropods and their Management	Soil arthropods and their classification, habitats and their identification. Estimation of populations; sampling and extraction methods. Role of soil arthropods in detritus feeding, litter breakdown and humus formation. Soil arthropods as bio-indicators of habitat qualities. Effect of soil arthropod activity on soil properties. Harmful and beneficial soil arthropods and their management, interrelationship among arthropods and other soil invertebrates and soil microorganisms. Anthropogenic effects on soil arthropods.
17.	Vertebrate Pest Management	Vertebrate pests of different crops; biology of vertebrate pests such as rodents, birds and other mammals. Biology of beneficial birds. Population dynamics and assessment, patterns of pest damage and assessment, roosting and nesting systems in birds. Management strategies- physical (trapping, acoustics and visual), chemical (poisons, repellents, fumigants and anticoagulants), biological (predators, parasites), cropping practices, alteration of habitats, diversion baiting and other eco-friendly methods- Operational practices- baiting, bioassays (LD50 studies), equipments and educative programmes.
18.	Commercial Entomology	Bee keeping- General colony management during different seasons. Seasonal management. Managing colonies for honey production and pollination. Artificial queen rearing. Pests and diseases of honey bees. Bee poisoning. Production and marketing of quality honey and value added honey products. Establishment and maintenance of apiaries. Study of different species of silkworms, characteristic features, moriculture, silk and its uses, pests and diseases of silkworms, rearing and management of silkworms. Lac insect- natural enemies and their management. Economic and public health importance of insect pests in human habitation and habitats, biology, damage and control of mosquitoes, houseflies, bed bugs, ants, termites, cockroaches, flies, silverfish, head and body lice, carpet beetles, cloth moths, crickets, wasps, house dust mites, insect pests of cattle, poultry, pet animals and their management. Principles and methods of pest management in residential places and public buildings, insecticides for domestic use and their safety, pre- and post construction termite proofing of buildings, appliances for domestic pest control. Rodent control methods. Organic methods of domestic pest management.
19.	Plant Quarantine	Definition of pest, pesticides and transgenics as per Govt. notification; relative importance; quarantine – domestic and international. Quarantine restrictions in the movement

		of agricultural produce, seeds and planting material; case histories of exotic pests/ diseases and their status. Plant protection organization in India. Acts related to registration of pesticides and transgenics. History of quarantine legislations, PQ Order 2003. Environmental Acts, Industrial registration; APEDA, Import and Export of bio-control agents. Identification of pest/disease free areas; contamination of food with toxicants, microorganisms and their elimination; Symptomatic diagnosis and other techniques to detect pest/pathogen infestations; VHT and other safer techniques of disinfestation/ salvaging of infected material. WTO regulations; non-tariff barriers; Pest risk analysis, good laboratory practices for pesticide laboratories; pesticide industry; Sanitary and Phytosanitary measures.
20.	Forest Entomology	Insects in relation to forests interacting environmental or habitat factors. Role of insects in Nutrient cycling in forest ecosystems. History and importance of forest Entomology in India. Classification of forest insect pests. Factors responsible for outbreak of forest pests. Survey methodology for forest pests. Bioecology, nature of damage, distribution and management strategies of important insect pests of timber and fruit yielding species of natural forests and plantations. Timber Pests and their management. Non –insect pests of forest trees. Principles and concepts of forest pest management.
21.	Vermiculture and Vermicomposting	Vermiculture-definition and scope. Classification of earthworms up to families/ important genera. Earthworm distribution. Earthworm activity on soil properties. Physico – chemical and biological properties. Reproductive patterns and earthworm biomass production. Earthworms and soil microorganisms. Vermicomposting. Definition and scope. Selection of earthworm species. Bioresources for vermicomposting. Structural designs and methodology. Factors influencing the process. Properties of vermicompost – compost enrichment. Vermi wash. Definition. Methodology for extraction, chemical composition and application. Vermmeal – definition and scope. Preparation and utility. Role of earthworms in sustainable agriculture. Earthworms as bio-concentrators and bio-indicators. Earthworms in human welfare.