SYLLABUS ENTOMOLOGY

Topics	Details	Marks
Unit 1: Systematics	History and development of Entomology, Evolution of insects. Classification of insects up to order level, habits, habitats and distinguishing features of different Order and important Families. DNA barcoding, Phylogenetic analysis.	75
Unit 2: Morphology	Body wall, its structure, outgrowths, endoskeleton, Body regions, segmentation, sclerites and sutures. Head and head appendages, types of mouth parts, antennae, their structure and types. Thorax structure, thoracic appendages and their modification. Wings, their modification and venation, Abdomen; structure, abdominal appendages both in Pterygota and Apterygota. External genitalia, general structure and modification in important insect orders.	
Unit 3: Insect Ecology	Concept of ecology, Environment and its components-biotic and abiotic factors and their effects on growth, development, population dynamics, distribution and dispersal. Principle of biogeography and insects' biodiversity. Biotic potential and environmental resistance. Ecosystems, agroecosystems analysis, their characteristics and functioning. Intra and inter specific relationship; competition, predator-prey and host parasite interactions, ecological niche. Life table studies, population models. Food chain and food web. Arthropod population monitoring, pest forecasting. Diapause and causes of pest outbreaks.	
Unit 4: Insect Embryology, and Physiology	Embryonic and post embryonic development, types of metamorphosis, physiology of ecdysis. Endocrine glands and concept of neurosecretion; Juvenile Hormone, General features and types of larvae and pupae. Feeding potential: Feeding potential of insects, Feeding indices and relationships, Concepts on crop selection and switching (from phytochemicals to insect digestion).Reproductive potential: Reproductive potential of insect, Calculation and assay, Responsible factors, Role in pest management and crop-yield prediction	
Unit 5: Biological Control	Importance and scope of biological control, history of biological control: Biocontrol agents-parasites, predators and insect pathogens. Important entomophagous insect Orders and Families. Ecological, biological, taxonomic, legal and economic aspects of biological control, phenomena of multiple parasitism, hyper parasitism, super parasitism and their applied importance. Principles and procedures of using exotic biocontrol agents. Utilization of natural biocontrol agents: conservation, habitat management and augmentation. Mass multiplication techniques and economics. Effective evaluation techniques, Biocontrol organizations in world and India. Successful cases of biological control of pests.	
Unit 6: Insecticide, Toxicology and Insecticide resistance	History, scope and principles of chemical control. Properties, mode of actionand functional group variation of chemical pesticides, bioinsecticides, neonicotinoids, fumigants, IGRs, attractants, repellents botanicals (natural pyrethroids, rotenone, neem products, nicotine, pongamia spp. etc). Contact and systemic insecticides,Dose-responserelationship, Dose standardization, Testing method/technique, Toxicity evaluation. Insecticides Act 1968, registration and quality control of insecticides. Pesticide management Bill, 2020. insecticide resistance; mechanism and management of insecticide resistance.	
Unit 7: Host Plant Interaction	Chemical ecology: mechano and chemo receptors. Host plant selection by phytophagous insects. Secondary plant substances and their defenses against phytophagous insect. Basis of resistance (Antixenosis, Antobiosis, Tolerance). Tritrophic interactions, induced resistance. Breeding for insect resistant plant varieties. Insect resistance to transgenic plants and its management.	
Unit 8: Innovative Approaches in Pest Control	Behavioral control: pheromones-types and uses, advantages and limitations. Hormonal control: types and function of insect hormones, insect hormone mimics, advantages and limitations. chemosterilants, antifeedants, attractants, repellents; their types, method of applications, advantages and limitations. Genetic control: concepts and methods, case histories, advantages and limitations. Potentialities of IPM; molecular approaches for developing insect pest management strategies (RNAi, CRISPR). AI-based insect pest management: integrating artificial intelligence with traditional Integrated Pest Management (IPM) principles to achieve more accurate pest identification, monitoring, prediction, and automated control	
Unit 9: Integrated Pest Management	History, concept and principles of IPM. Components of IPM. Insect pest survey: Identification, Methods/Techniques, Pest surveillance and assessment, Status ranking, Forecasting. Host plant resistance, agronomic manipulations, mechanical and physical methods, chemical methods, biocontrol agents utilization, genetic and behavioral control strategy etc. Concept of damage levels-Economic threshold levels (ETL), Economic injury levels (EIL) and their determination. Push-Pull strategy.	
Unit 10: Pesticide Application Equipments	Types of appliances: sprayers, dusters, fog generators, smoke generators, soil injecting guns, seed treating drums, flame throwers, etc. Power operated sprayers and dusters. Types of nozzles and their uses. Maintenance of appliances. Aerial application of pesticides, principles of aerial application, factors affecting the effectiveness of aerial application. Equipments for aerial applications. Advantages and disadvantages of aerial application.	
Unit: 11 Methods in Entomology	Molecular Biology Techniques: Isolation, separation and analysis of biological macromolecules (DNA, RNA, proteins), chromatography, electrophoresis and centrifugation. Biophysical Methods: Spectroscopy (UV/visible, fluorescence), molecular structure determination using X-ray diffraction, cryo-electron microscopy and NMR, Molecular analysis using light scattering, different types of mass spectrometry methods. Genomics, Transcriptomics, Proteomics and Metabolomics: Structure and organization of prokaryotic and eukaryotic genomes, Comparative genomics, Global gene expression analysis, Comparative transcriptomics, Differential gene expression; protein interaction analysis and mapping, targeted and untargeted metabolic profiling, DNA finger printing and its applications, DNA bar coding, Single-cell sequencing, single-cell omics. Histochemical and Immunotechniques: Antibody generation, Detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, detection of molecules in living cells, in situ localization by techniques such as FISH and GISH. Microscopic techniques: Simple and complex microscope technique; scanning and transmission microscopes, sample preparation techniques for microscopy	
Unit 12: Statistics and Computer Application	Frequency distribution, mean, mode and median. Standard, normal, bionomial and Poisson's distribution, Sampling methods and standard errors. Correlation and regression: Partial and multiple, tests of significance; t, F, chi-square, Duncan's multiple range tests. Design of experiments: Principles of Randomized block design, completely randomized block design, Latin square design, Split-plot designs. Probit analysis.	
Unit 13. Tea Pest Management	Systematic position, identification, distribution, bionomics, nature and extent of damage, seasonal abundance and management of insect and mite pests of tea (tea mosquito bug, Red spider mite, tea Looper complex, tea red slug caterpillar, tea jassid, tea thrips, tea live wood eating termite and scale insect). Insect pest scenario in relation to climate change. IPM in tea, Minor pest of tea; Plant Protection Code. MRL issue in Tea.	
General Studies	General Reasoning / General English / General Awareness / Innovative Knowledge etc	25
		Total Marks 100