

POSTGRADUATE INSTITUTE OF SCIENCE
UNIVERSITY OF PERADENIYA



M.Sc. in Applied Entomology
2007/2008

1. INTRODUCTION

The study of insects at postgraduate level is an important part of the training of every biologist, agriculturist, veterinary and medical scientist involved in teaching, research or extension. As insects constitute more than 75% of all animals and many of them are of economic importance, entomology plays a key role in food production and health. The M.Sc. Programme focuses on general entomology covering the fields of biology, agriculture, medical and veterinary sciences and their applications. At present there are no postgraduate courses in Entomology at M.Sc. level offered by local Universities.

The programme encompasses insect taxonomy, structure, functions, natural history, pest management and applications in the fields of agriculture, forestry, medical and veterinary sciences with emphasis on toxicological and molecular aspects.

In addition to the biological and economic aspects of insects, the programme addresses insect identification, specially, of the economically important groups to species level through the use of keys and reference specimen collections.

The programme is designed to include field and laboratory work encompassing field trials, sampling of important insect taxa, statistical analysis of data and molecular aspects of entomology.

2. OBJECTIVES

The main objective of the programme is to provide a comprehensive knowledge in general and applied entomology including both theoretical and practical aspects. The programme will expose students to entomological techniques in different areas, field applications in different sectors, and modern technology, in particular the use of DNA in taxonomy.

Graduates on completion of the M.Sc. can be expected to find employment in a variety of government and private sector organizations in the agriculture, forestry, horticulture, medical and veterinary sciences.

3. PROGRAMME ELIGIBILITY

Students with a B.Sc. Degree or equivalent qualifications with Zoology/Botany/Biology as a subject or a Bachelors Degree in Agriculture/Veterinary Science/Medical Sciences are eligible to apply.

4. PROGRAMME FEE

	M.Sc. Programme Fee
Local Candidates	Rs. 60,000.00
SARRC Countries	US\$ 1700.00
Other Countries	US\$ 3400.00

Programme fees shall be paid in two installments (*Rs. 30,000/- at the registration and next Rs. 30,000/- within six months from registration*). Other payments including registration fee, medical fee, library subscription, examination fee and science and library deposits should be paid according to the procedure stipulated in the PGIS handbook.

5. PROGRAMME STRUCTURE AND DURATION

The programme consists of course work and a research project. Course work will be conducted over a period of two semesters each of 15 weeks duration and the research project over a period of 3-6 months. The duration of the entire programme is 18 months inclusive of the research project. For satisfactory completion of the programme a minimum of 24 credits from course work (with a GPA of not less than 3.00) is required for the programme in addition to the seven credits allocated for the seminar and full-time research project. (A student, who does not satisfy the above criteria but obtains a GPA in the range of 2.75 to 2.99 and satisfactorily completes the seminar, is eligible for the Diploma in Applied Entomology but not the M.Sc. Degree).

Programme Summary

Course Code	Course	No. of lecture hrs.	No. of hrs. (Practical/ Fieldwork)	No. of credits
SEMESTER I				
	Basic Structure and Classification of Insects			
ZLE 501	Insect Morphology*	25	10	2
ZLE 502	Insect Physiology*	10	10	1
ZLE 503	Evolution, Classification and Insect Systematics*	30	30	3
ZLE 504	General Techniques in Entomology*	7	15	1
	Insect Ecology and Population Dynamics			
ZLE 505	Principles of Insect Ecology and Population Dynamics	27	6	2
ZLE 506	Insect Sampling and Biostatistics	30	30	3
SEMESTER II				
	Insect Pests of Crops			
ZLE 516	Integrated Crop Pest Management Methods	15	-	1
ZLE 517	Pests of Agricultural crops and Stored Products	24	12	2
ZLE 518	Pests of Plantation crops, Forestry, Horticultural and Export crops	36	18	3
	Insects and Acarines of Medical and Veterinary Importance			

ZLE 519	Insects and Acarines of Medical and Veterinary Importance and their Control	24	12	2
ZLE 520	Integrated Insect Vector Control Methods	25	10	2
	Insect Molecular Biology and Toxicology			
ZLE 521	Molecular Biological Applications in Entomology*	26	8	2
ZLE 522	Insecticides and Toxicology	12	6	1
	Insects and Environment			
ZLE 523	Beneficial Insects, Insects and Indicators of habitat, Insect Conservation	26	8	2
ZLE 524	Scientific Writing and Presentation*	25	10	2
ZLE 597	Seminar and Essay *			1
ZLE 599	Research Project*			6

* Compulsory Courses

All other courses are optional.

In a given academic year not all the optional courses will be offered.

6. PROGRAMME CONTENTS

ZLE 501 - Insect Morphology (2 Credits)

A detailed review of the anatomy and morphology of the major insect groups with emphasis on taxonomic features. Detailed features of the head, thorax and abdomen of representative insect groups; Variation in wing venation and external genitalia and their significance in representative groups.

ZLE 502 - Insect Physiology (1 Credit)

Insect biochemistry and advances in insect physiology; Physiology of insect digestion, respiration, circulation, excretion, reproduction and development; Endocrine system and hormones; Insect flight, diapause and the role of pheromones in the life of insects. Communication systems in social insects.

ZLE 503 - Evolution, Classification and Insect Systematics (3 Credits)

Introduction to principles of systematics, insect phylogeny and classification, phenetics and cladistics; Identification of economically important insect groups using keys.

ZLE 504 - General Techniques in Entomology (1 Credit)

Insect collecting methods and curation techniques; Slide mounting of microscopic insects, insect mouthparts and insect genitalia; Dissection techniques and insect drawing techniques; Insect rearing techniques.

ZLE 505 - Principles of Insect Ecology and Population Dynamics (2 Credits)

Principals of Insect Ecology; Insects in different habitats (freshwater, soil, vegetation and leaf litter) and their adaptations; Factors affecting the abundance, distribution and fluctuations of insect populations in different environments; Use of life tables and population prediction models.

ZLE 506 - Insect Sampling and Biostatistics (3 Credits)

Sampling methods of insects in different agricultural systems, forests and fresh water; Methods of sampling of specific insect groups and types of collecting gear. Use of simple random sampling, stratified sampling, sequential sampling and mark-recapture technique.

Types of biological data; Frequency distributions; Measures of central tendency, dispersion and variability; Tests of significance, types of errors, confidence intervals; Parametric and Non-parametric methods; Correlation, regression, χ^2 test and one-way analysis of data and their use in entomological research.

ZLE 516 - Integrated Pets Management (1 Credit)

Insects and Pest status; Introduction to IPM; Mechanical, physical, biological and chemical methods of pest management; Theory and practice of biological control of insect pests and weeds using pathogens, predators and parasitoids; Use of semio-chemicals (pheromones, repellents) and genetical methods, use of transgenic plants and GM products.

ZLE 517 - Pests of Agriculture and stored products (2 Credits)

Insect pests of rice, vegetables and fruits; nature of damage; symptoms of damage; pest management. Insect pests of stored food (grain, fruits, pulses) and other products and their management methods.

ZLE 518 - Pests of Plantation Crops, Forestry, Horticultural and Export Crops (3 Credits)

Insect plant interactions, Insect pests of plantation crops (tea, rubber, coconut and minor crops.), their biology, damage and management; Insect pests of forest trees and timber.

ZLE 519 - Insects and Acarines of Medical and Veterinary Importance and their Control (2 Credits)

Taxonomic, biological and ecological characteristics of different groups of arthropods of medical importance; the notion of vectors, transmission mechanisms of pathogenic agents and the functioning of vector systems. Ecology, behaviour and control of vectors of major diseases, vector competence, population dynamics and surveillance. Insect venoms and allergies.

Arthropods of veterinary importance; vectors of livestock animals; Identification, life cycles, behaviour, pathogenesis and control of arthropod-pathogens; Control of arthropod-borne diseases; Insects of forensic importance.

ZLE 520 - Integrated Insect Vector Control Methods (2 Credits)

Methods of vector control, natural and synthetic insecticides, chemical methods of vector control, Biological methods of vector control, environmental management in vector control

ZLE 521 - Molecular Biological Applications in Entomology (2 Credits)

DNA as the genetic material; Gene structure and expression; DNA Isolation; DNA manipulation enzymes; Gel Electrophoresis; blotting; Restriction Fragment length Polymorphism; DNA profiling, DNA probes, DNA sequencing, polymerase chain reaction, gene cloning, cloning vectors; DNA libraries; transgenic organisms and production of recombinant proteins, molecular diagnosis of vector borne diseases; DNA chips and microarray analysis; assessing affinities amongst and within insect species using DNA markers; molecular approaches to evolution, other applications, database searches.

ZLE 522 - Insecticides and Toxicology (2 Credits)

Insecticide toxicology with emphasis on chemistry, toxicity, mode of action and features of major groups of currently used insecticides; Genetical basis of insecticide resistance; Methods of toxicity testing, probity analysis, analytical methods for detecting pesticide residues; Biological and environmental factors affecting toxicity of insecticides; Insecticide resistance mechanisms (metabolic and insensitive target site mechanism); Economic and legal aspects of insecticide use.

ZLE 523 - Beneficial Insects, Insects as Indicators of Habitat, Insect Conservation (2 Credits)

Beneficial insect groups and their role in natural and agricultural systems; Bees and their role in crop pollination with emphasis on specific floral relationships with crop plants; Parasitoid, predators and pathogens as biological controlling agents; Insects as decomposers and their role in recycling of nutrients; Insect products and their use.

Insect groups important in the assessment of environment quality. Case studies from a variety of sites (mines, rehabilitation lands); Invasive insects.

Principles of conservation of rare and endangered insects; Conservation and management of insects that provide ecological services; Political, social and ethical aspects of insect conservation.

ZLE 524 - Scientific Writing and Presentation (2 Credits)

Use of Scientific Method, Writing of scientific papers, reports and project proposals - Organization and Content; Oral presentations and the effective use of visual aids; use of Computer aided presentations

ZLE 597 - Seminar and Essay (1 Credit)

Students are expected to write essays on assigned topics following literature searches (print and electronic). Students are expected to make presentations on assigned topics.

ZLE 599 - Research Project (6 Credits)

Each student should select a research problem in a preferred area that falls within the course themes, in consultation with a supervisor appointed by the Board of Study. The project could be conducted at the institution where the supervisor is and where facilities are available. On completion of the research project the candidate is required to submit a Research Report and present the findings at a seminar. Students will be assigned research projects during the first semester in order to give sufficient time for planning the project.

7. PROGRAMME EVALUATION

Evaluation of student's performance is as stipulated in the PGIS Hand Book 2002.

8. TEACHING PANEL

- Prof. Daya Ahangama, Department of Agriculture Biology, University of Peradeniya
B.Sc. Agric. (Cey.), M.Sc. (Leipzig), Ph.D. (Texas A & M)
- Dr. Subhashini Ariyapperuma, Entomologist, Western Province, Ministry of Health
B.Sc. (Col.), Ph.D. (Liverpool)
- Dr. Premaratne Bandara, HORDI, Gannoruwa
B.Sc. (Perad.), M.Phil. (Perad.), Ph.D. (Perad.)
- Prof. J.P. Edirisinghe, Department of Zoology, University of Peradeniya
B.Sc. (Cey.), Ph.D. (Adelaide)
- Prof. J.S. Edirisinghe, Department of Parasitology, University of Peradeniya
M.B.B.S. (Cey.), M.Sc. (Lond.), Ph.D. (Lond.), MD (Col.)
- Dr. Rohini Ekanayake (Former Deputy Director of the National Plant Quarantine Service, Department of Agriculture), 84, Amunugama South, Gunnapana
B.Sc. (Perad.), Ph.D. (Perad.)
- Dr. L.C. Priyanthi Fernando, Coconut Research Institute, Lunuwila
B.Sc. (Perad.), Ph.D. (Qld.)
- Dr. D. Hemachandra, Department of Agriculture Biology, University of Peradeniya
B.Sc. (Perad.), Ph.D. (Manitoba)
- Prof. S.H.P.P. Karunaratne, Department of Zoology, University of Peradeniya
B.Sc. (Perad.), M.Sc. (Perad.), Ph.D. (Lond.), FRES (Lond.)
- Dr. W.A.I.P. Karunaratne, Department of Zoology, University of Peradeniya
B.Sc. (Perad.), Ph.D. (Perad.)
- Dr. C. Kudagamage, Director General, Department of Agriculture, Peradeniya
B.Sc. (Perad.), M.Sc. & Ph.D. (Purdue)
- Prof. V. Kumar, Department of Chemistry, University of Peradeniya
B.Sc. (Cey.), Ph.D. (Oxford)
- Dr. G. K. Manuweera, Office of the Pesticide Registrar, P.O. Box 49, Peradeniya
B.Sc. (Perad.), M.Phil. (Perad.), Ph.D. (Missouri)
- Dr. L. Nugaliyadde, Department of Agriculture Biology, University of Ruhuna

B.Sc. (Cey.), M.Sc. (Philippine), Ph.D. (Newcastle upon Tyne, UK)
Mrs. M.D.B. Perera, Anti Malaria Campaign, Kurunegala
B.Sc. (Kelaniya), M.Sc. (Perad.)
Dr. R.W.K. Punchihewa, Department of Agriculture Biology, University of Ruhuna
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B.Sc., Agric. (Perad.), M.Phil. (Perad.), Ph.D. (Edin.)
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B.V.Sc. (Cey.), M.V.Sc. (Cey.), Ph.D. (Qld.)
Dr. Anura Wijesekara, HORDI, Gannoruwa
B.Sc.Agric. (Perad.), Ph.D. (Maryland)
Prof. M. K. de S. Wijesundara, Department of Parasitology, University of Peradeniya
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9. PROGRAMME COORDINATORS

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