

**Department of Entomology
Faculty of Agricultural Sciences
University of the Punjab, Lahore
Course Outline**



Programme	B.Sc. (Hons) Agriculture (Major: Entomology)	Course Code	ENT-406	Credit Hours	3 (2-1)
Course Title	INSECTICIDES AND THEIR APPLICATION				
Course Introduction					
This course aims to provide information to students about concept of toxicity and insecticide formulations, mode of action, residues of insecticides and various types of spray equipment. Course includes the description about the classification of different insecticide formulations on basis of their mode of entry in to target insect body, on basis of their chemical nature, mode of action, toxicity level and formulation types. Moreover, basic structural and functioning principles of major insecticide application apparatus are discussed in this course.					
Learning Outcomes					
On the completion of the course, the students will have gained the ability to:					
<ol style="list-style-type: none"> 1 Outline the history of insecticides 2 Recognize the major classes of insecticide and understand their mode of action 3 List and describe processes involved in toxicodynamics of insecticides 4 Become aware of the limitations of insecticide use such as resistance and environmental contamination 5 Develop a basic understanding on performing insect bioassays 					
Course Content (Theory)				Assignments/Readings	
Week 1	Unit-I 1.1.Introduction to insecticides and their application				
	1.2. Definition and scope of insecticide 1.3. History of chemical control 1.4. Insecticide use and pesticide industry in Pakistan				
Week 2	Unit-II 2.1. Nomenclature of insecticides 2.1.1. Evaluation of toxicity 2.1.2. The uptake of insecticides		Assignment 1: Environmental effects of insecticides 1. Insecticide Resistance 2. Environmental Toxicology of Insecticides		
	2.2. Classification on the basis of mode of entry				

Week 3	Unit-III 3.1. Classification on the basis of chemical nature (natural and synthetic insecticides)	
	3.2. Classification on the basis of mode of action	
Week 4	Unit-IV 4.1. Classification on the basis of toxicity	
	4.2. Classification on the basis of formulations	
Week 5	Unit-V 5.1. Classification on the basis of formulations (cont....)	Assignment 2: Discuss principles of toxicology
	5.2. Classification on the basis of formulations (cont....)	
Week 6	Unit-VI 6.1. Classification on the basis of formulations (cont....)	
	6.2. Compatibility, physico-chemical properties, residues of insecticides	
Week 7	Unit-VII 7.1. Compatibility, physico-chemical properties, residues of insecticides (cont....)	
	7.2. Mode of action of insecticides	
Week 8	Unit-VIII 8.1. Mode of action of insecticides (cont....)	
	8.2. Mode of action of insecticides (cont....)	
Week 9	MIDTERM EXAM	
Week 10	Unit-IX 9.1. Pesticide Dissipation, Residue Dynamics, Different methods/ Steps in residue analysis	
	9.2. Pesticide Dissipation, Residue Dynamics, Different methods/ Steps in residue analysis (cont....)	
Week 11	Unit-X 10.1. Pesticide Dissipation, Residue Dynamics, Different methods/ Steps in residue analysis (cont....)	Assignment 3: Preparation of flow chart of Insecticides Classification
	10.2. Pesticide Dissipation, Residue Dynamics, Different methods/ Steps in residue analysis (cont....)	
Week 12	Unit-XI 11.1. Confirmative analytical techniques in residue analysis	
	11.2. Insecticide resistance and its management	
Week 13	Unit-XII 12.1. Hazards and safety measures	

	12.2. Hazards and safety measures (Cont.....)	
Week 14	Unit-XIII 13.1. Maximum Residue Levels in pesticide	Assignment 4: Make comprehensive notes regarding principles, operation and application of various chromatographic techniques
	13.2. Insecticide Act, registration and quality control of insecticides	
Week 15	Unit-XIV 14.1. Insecticide Act, registration and quality control of insecticides (Cont.....)	
	14.2. Insecticide metabolism; pest resistance to insecticides; mechanisms and types of resistance; insecticide resistance management and pest resurgence	
Week 16	Unit-XV 15.1. Insecticide metabolism; pest resistance to insecticides; mechanisms and types of resistance; insecticide resistance management and pest resurgence (Cont.....)	
	15.2. Insecticides Management	
Course Content (Practical)		Assignments/Readings
Week 1	Insecticide formulations and mixtures	
Week 2	Computation, preparation and field application of different formulations of insecticides	
Week 3	Computation, preparation and field application of different formulations of insecticides (cont....)	
Week 4	Quality control of pesticide formulations	
Week 5	Laboratory and field evaluation of bioefficacy of insecticides	
Week 6	evaluation of insecticide toxicity and joint action	
Week 7	Bioassay techniques	
Week 8	Probit analysis	
Week 9	MIDTERM EXAM	
Week 10	Introduction to different pesticide appliances	

Week 11	Working out doses and concentrations of pesticides	
Week 12	Visit to toxicology laboratories	
Week 13	Identification, classification, handling and maintenance of application equipment	
Week 14	Knowhow about hazards and safety measures of insecticides handling	
Week 15	Determination of functioning of various types of hand and power operated equipment's for insecticide application.	
Week 16	Visit to pesticides industries/field visits	

Textbooks and Reading Material

1. Chattopadhyay SB. 1985. Principles and Procedures of Plant Protection. Oxford & IBH, New Delhi.
2. Gupta HCL.1999. Insecticides: Toxicology and Uses. Agrotech Publ., Udaipur.
3. Ishaaya I & Degheele (Eds.). 1998. Insecticides with Novel Modes of Action. Narosa Publ. House, New Delhi.
4. Matsumura F. 1985. Toxicology of Insecticides. Plenum Press, New York.
5. Perry AS, Yamamoto I, Ishaaya I & Perry R. 1998. Insecticides in Agriculture and Environment. Narosa Publ. House, New Delhi.
6. Prakash A & Rao J. 1997. Botanical Pesticides in Agriculture. Lewis Publ., New York.
7. Dovener, R.A. Mueninghoff, J.C. and Volgar, G.C. 2002. Pesticides formulation and delivery systems: meeting the challenges of the current crop protection industry. ASTM, USA
8. Dodia, D.A. Petel, I.S. and Petal, G.M. 2008. Botanical Pesticides for Pest Management. Scientific Publisher (India) Jodhpur.
9. Ishaaya, I. and Degheele, D. 1998. Insecticides with Novel Modes of Action: Mechanism and Application. Norosa Publishing House, New Delhi.
10. Mathews G.A. 2002. Pesticide Application Methods. 4th Ed. Intercept. UK.
11. Otto, D. and Weber, B. 1991. Insecticides: Mechanism of Action and Resistance. Intercept Ltd., U.K.
12. Roy, N.K. 2006. Chemistry of Pesticides. Asia Printograph Shahdara Delhi.
13. Saleem, M.A. 2004. Principles of Insect Toxicology. Vol.-I. Izhar sons Printers. Lahore.

Note:

1. It is preferable to use latest available editions of books. Mention the publisher & year of publication.
2. The References/ bibliography may be in accordance with the typing manual of the concerned faculty/subject. Preferably follow APA 7th Edition publication manual.

Teaching Learning Strategies

1. Multimedia
2. White Board
3. Group discussion
4. Quiz/Assignments

5. Demonstration/Activity

Assignments: Types and Number with Calendar

1. Functioning of various types of hand and power operated equipment for insecticide application (Mid-term)
2. Submit diagrams of different types of nozzles along with its function (Final-term)

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.