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

Programme	B.Sc. (Hons) Agriculture (Major: Entomology)	**Course Code**	**ENT-408**	**Credit Hours**	3 (2-1)
Course Title	STORED PRODUCT PESTS AND THEIR MANAGEMEN				

Course Introduction

This course aims to clear the concepts of stored product pest management, food storage principles and storage losses incurred by different insect and mite pests. Students will learn about the basic sampling strategies being used for pest scouting in storage industry and about the biological and ecological aspects of each major stored grain insect or mite pests and will be able to understand different factors affecting grain and other stored food products in storage structures. They can collect, preserve and identify different stored grain insect pests and will also learn about how to rear some of these stored grain insect pests for different studies.

Learning Outcomes

On the completion of the course, the students will have gained the ability to:

1. Acquired the ability to identify the most important pests of stored products and pests of health importance;
2. Will understand the key elements of the biology, ecology and behavior of pests infesting agricultural products after harvest;
3. Will understand the main elements of the biology, ecology and behavior of insects and mites of health importance (mosquitoes, flies, bedbugs, gnats, lice, fleas, ticks);
4. Will be able to use the currently available methods of combating the above enemies.

	Course Content (Theory)	Assignments/Readings
Week 1	**Unit-I** 1.1. Introduction 1.1.1. The ecosystem of stored products. Economic and health importance of pests of stored products. Preventive measures	
	1.1.2. Important Insect Pests of stored food	
Week 2	**Unit-II** 2.1. Feeding strategies of stored grain insect pests	
	2.2. Identifying important families of beetles of stored products	
Week 3	**Unit-III**	

	3.1. Biology, behavior and economic importance of Rice weevil	
	3.2. Biology, behavior and economic importance of Lesser Grain borer	
Week 4	**Unit-IV** 4.1.Biology, behavior and economic importance of Dhora or seed beetle	
	4.2.Biology, behavior and economic importance of Khapra or Dermestid beetle	
Week 5	**Unit-V** 5.1. Biology, behavior and economic importance of Red flour beetle	
	5.2. Biology, behavior and economic importance of Silvanid or saw toothed grain beetle	
Week 6	**Unit-VI** 6.1. Biology, behavior and economic importance of Flat grain beetle	
	6.2. Biology, behavior and economic importance of Anobiid beetle	
Week 7	**Unit-VII** 7.1. Biology, behavior and economic importance of Anthribid beetle	
	7.2. Biology, behavior and economic importance of Hide beetle	
Week 8	**Unit-VIII** 8.1. Biology, behavior and economic importance of Mealworms	
	8.2. Biology, behavior and economic importance of Carpet beetle	
Week 9	**MIDTERM EXAM**	
Week 10	**Unit-IX** 9.1. Biology, behavior and economic importance of Long headed flour beetle	
	9.2. Biology, behavior and economic importance of Angoumois grain moth	
Week 11	**Unit-X** 10.1. Biology, behavior and economic importance of Stored grain mites	
	10.2. Impact of rodents in stored grain	
Week 12	**Unit-XI** 11.1. Sampling and monitoring of stored grain insects	
	11.2. Role of storage conditions or types in reducing post-harvest losses	

Week 13	**Unit-XII** 12.1. Factors Affecting Grain Storage	
	12.2. Physical factors for the multiplication of stored grain insects	
Week 14	**Unit-XIII** 13.1.	
	13.2.	
Week 15	**Unit-XIV** 14.1. Principles to Control Insect Pests of Stored Food	
	14.2. Dealing with Store Houses	
Week 16	**Unit-XV** 15.1. Sampling methods for the detection of the presence of pests in storage and processing areas	
	15.2. Disinfestations: methodology, modern technological approaches, relevant legislation. The use of insecticides, other available preparations & prospects for the use of essential oils	
Course Content (Practical)		**Assignments/Readings**
Week 1	Visits to different godowns and demonstration of sampling methods	
Week 2	Alternative chemical methods of treating stored products pests (biological control, controlled atmospheres, high - low temperatures and ionizing radiation)	
Week 3	Sampling of pests in storage and processing areas	
Week 4	Sampling and identification of stored products pests from storage and processing areas	
Week 5	Sampling and identification of stored products pests from storage and processing areas	
Week 6	Sampling and identification of stored products pests from storage and processing areas	
Week 7	Sampling and identification of stored products pests from storage and processing areas	
Week 8		
Week 9	**MIDTERM EXAM**	
Week 10	Culture of some stored products insect pests under different climatic conditions	
Week 11	Culture of some stored products insect pests under different climatic conditions	
Week 12	Culture of some stored products insect pests under different climatic conditions	
Week 13	Culture of some stored products insect pests under different climatic conditions	

Week 14	Culture of some stored products insect pests under different climatic conditions	
Week 15	Control methods of stored products pests	
Week 16	Control methods of stored products pests	

Textbooks and Reading Material

1. Ashfaq, M. Saleem, M. A. and Ahmad, F. 2009. Zari Agnas ki Mahfooz Zakhira Kari (in Urdu). Pak Book Empire, Lahore.
2. Hill, D.S. 2002. Pests of Stored Food Stuff and their Control. Kluwer.
3. Hill, D.S. 2002. Pests of Stored Food Stuffs and Their Control, Springer Publisher.
4. Rees, D. 2009. Insects of Stored Products. Manson Publishing Company.
5. Zaklandvoi, G. A. and Ratanova. V. F. 1987. Stored Grain Pests and their control. Oxonian Press Pvt. Ltd., London.

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

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.