Department of Plant Protection

College of Agricultural Engineering Sciences

University of Salahaddin

Subject: Molecular Entomology

Course Book – (Master's Degree)

Lecturer's Name: Dr. Pshtiwan Abdullah Jalil

Academic Year: 2023-2024

Course Book

1. Course name	**Molecular Entomology**
2. Lecturer in charge	**Pshtiwan Abdullah Jalil, PhD**
3. Department/ College	**Plant Protection Dept./Agricultural Engineering Sciences College.**
4. Contact	**e-mails: Pshtiwan.jalil@su.edu.krd** **Tel: 0750 4823304**
5. Time (in hours) per week	**Sunday, Theory (2) and Practically (2) hrs./week**
6. Office hours	**8:30 – 2:00 from Sunday to Thursday**
7. Course code	
8. Teacher's academic profile	**Personal information:** Date of Birth: 1-1-1982 Place of Birth: Kirkuk Nationality: Iraqi Marital Status: Married Sex: Male **Education and certifications:** **Pshtiwan Abdullah Jalil,** I Achieved a Doctor of Philosophy (Ph.D.) in Entomology/Molecular Insect Taxonomy, at Salahaddin University, Erbil, Kurdistan Region-Iraq, 2020. My dissertation title was "Taxonomic and molecular study of some flat-headed borers (Coleoptera: Buprestidae) occurring across Erbil Province, Kurdistan Region-Iraq". I got a Master of Science in Economic Insects on horticultural crops, entitled "Biological and Ecological Study of the small cabbage white butterfly, *Pieris rapae* L. (Lepidoptera: Pieridae) on the Cabbage and Cauliflower in Gradarasha Research Station, Erbil Province, Kurdistan Region-Iraq". In College of Agricultural Engineering Sciences, Salahaddin University, Erbil, 2011.
9. Keywords	Insect Molecular, DNA, RNA, Primer, Taq-man, Electrophoresis, COI, molecular Markers, PCR, Rt-PCR, Prob.

10. Course overview:

The course will cover theoretical and practical Molecular Entomology. Molecular Entomology is that branch of molecular biology that studies the insect genetics and identification technique that essential to taxonomy (and especially with their genetic role) and it is helping to confirm the species identification provide solutions for a synonyms and subspecies based on the molecular level (genetics, sequence, COI, S 16 and S28 genes. These have been called DNA **Molecular Marker** Systems in **Entomological** Research (Marker System Techniques).

So molecular biology sometimes studies this process back word; e.g. if there was a problem in the presence of the species in NCBI or depraved sequence result and what and how the amino acids of the protein is changed and what nucleic acid sequence is responsible for the making a precise phylogeny. Through this course some of the methods and applications of Molecular

technique in entomology will be discussed. We'll look at the techniques researchers use in the lab to manipulate DNA and see how to alter the genetic material present in an insect. There are many practises for Molecular technique, and we'll do some of them. We'll also discuss the practical and ethical questions elevated by the ability to modify an insect's genetic make-up.

11. Course objective:

The understanding of the fundamentals theoretical of the main techniques of molecular biology, the use of molecular biology techniques in the identification of insect species, and the recognition of its importance in the study of genetic variability are essential resources to those who plan to work in research or molecular biology either molecular genetics and important for the professional biologist in general. The learning outcomes of this course are:

1. Cognize basic concepts and terminology of the main techniques of molecular biology.
2. Describe and understand the applicability of the main techniques of molecular biology.
3. Perform the basic techniques of detection and analysis of proteins and nucleic acids to cover different levels of research in molecular biology and genetics.
4. Collect and correlate the information obtained and know how to present it in the form of a scientific report.

12. Student's obligation

The students should attend regularly for all lectures throughout the course. By being present and on time, students can be actively involved in the learning process, participate in lessons, and benefit from class activities, and writing notes. Additionally, students should come prepared for daily quizzes and actively contribute to class discussions to enhance their conception and critical thinking skills. Also, there are many important things such as taking part in practical parts in department labs and completing all tests, exams, assignments, and weekly reports.

13. Forms of teaching

In each lecture, the theoretical-practical hour is expository with projection that introduces the topic to be developed during class and will present the method and the technique applied in the practical part. The laboratory component will cover a series of experiments, by providing protocols. During the experiments will be presented and discussed the basic concepts and terms related to molecular techniques in entomology. The first practice session will be entirely dedicated to handling the basic equipment for using Molecular methods practices. In the beginning of each class will be given directions on how to research appropriate literature on the topics. The following methods of teaching will be followed.

PowerPoint presentations, Using a whiteboard, Practical dissection

14. Assessment scheme

Students must pass mid-term exams, is worth 50 marks, and the final exam is worth 50 marks.

15. Student learning outcome:

Through the end of this course, students should be able to:

- Demonstrate an inclusive understanding of insect physiology basics and principles.
- The structure of each insect system.
- Utilize practical methods for dissection Successfully.
- Observation of all insect systems and organs.
- Understanding the mechanisms and function of each system and organ.

16. Course Reading List and References:

- The following textbooks and references are recommended for further reading:

BARTLETT J.M.S. & STIRLING D., 2003. PCR Protocols, 2nd Ed., Humana Press, New Jersey.
HARTL D. & JONES E.W., 2009. Genetics. Analysis of genes and genomes, 9th Ed., Jones and Bartlett Publishers, Boston.

LIMA N. & MOTA M. (ED), 2003. Biotecnologia: fundamentos e aplicações. Lidel – Edições Técnicas, Lda., Lisboa.

AUSUBEL F. M., 2002. Short protocols in molecular biology: a compendium of methods from current protocols in molecular biology, 5th Ed. (2 volumes), John Wiley & Sons, Inc., New Jersey.
TAGU D. & MOUSSARD C., 2006. Techniques for molecular biology. Taylor and Francis Group, Science Publishers, New Hampshire.

WATSON J.D., BAKER T.A., BELL S.P. & GANN A., 2008. Molecular Biology of the gene, 5th Ed., Pearson Benjamin Cummings.

WINFREY M.R., ROTT M.A. & WORTMAN A.T., 1997. Unraveling DNA: molecular biology for the laboratory. Prentice Hall, Inc., New Jersey.

17. The Topics:	Lecturer's name
1- Overview about Molecular technique and its applications **2- DNA structure and its types** **3- RNA, structure, function, and types**	

4- Methods of DNA extraction (using different protocols) **5. DNA electrophoresis on agarose gel** **6. Polymerase chain reaction (PCR). DNA amplification by PCR** **7. Real-Time PCR, and its application** **8. Restricting the amplified DNA (using restriction enzymes)** **9. Application of various types of molecular genetic markers** **10. DNA sequencing (reading of sequencing gels)** **10. Bioinformatics**	

18. Examinations:

1. **Definitions**, Define the following terms:
2. Agarose, CYBER green, dNTPs, Translation, Transduction, Primer, Quantitative PCR.

3. **Explanations**, such as:

- What is the difference between DNA, and RNA?

- Compare between
  - Reporter, and Quencher.
  - Ethidium Bromide & Bromophenol Blue
  - CYBER green dye & Dual labelled probe method

- Write the components of the PCR tube.
- Write the steps of Real-Time PCR.
- What is Ct Value? What are the factors that it depended on?
- How does TaqMan Probe work?
- Write the function of these chemicals in DNA extraction.
  - Lysis Buffer
  - Nacl
  - Absolute Ehanol

19. Extra notes:

- When an exam postponed by a student, whatever be the reason, he/she has to do the exam within one week. It is the student's responsibility to contact the subject lecturer and the department presidency with the frame time to rearrange for an alternative exam. Failure to do so in a timely way may result in an uncounted grade for the missed exam.

20. Peer review پێداچوونەوەی هاوەڵ

I hereby approve that the course is comprehensive and covers all aspects of the course. The subject is arranged sequentially which enables the students to learn gradually step by step.

Name:

Degree:

Specialty:

Signed:

Date: