**The University of Jordan**

**Faculty of Agriculture Department of Plant Protection**

**Program: Ph.D in Plant Protection Academic 2015/2016/1st Sem.**

**Analysis of Pesticides(0606913)**

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| **Credit hours** | **3**  | **Level** | **Ph.D** | **Pre-requisite** | **(Pesticides)606351** |
| **Coordinator/ Lecturer** | **Prof. Tawfiq Al-Antary** | **Office number** | **223** | **Office phone** | **22518** |
| **Course website** |  | **E-mail** | **t.antary@ju.edu.jo** | **Place** |  |

|  |
| --- |
| **Office hours** |
| **Day/Time** | **Sunday** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** |
|  |  |  |  |  |  |
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**Course Description**

This course provide student with information about pesticide impact on environment, concept of analytical of chemistry, pesticide risk, assessment, formulation and residue analysis, sample preparation and extraction, clean-up and determination methods. Recent techniques used for pesticide residues determination will be discussed particularly GC and HPLC.

This module requires practical work consists of at least 15 lab periods including one period for the midterm exam and anther one for final exam. In each lab period, the student should conduct a practical work on extraction, clean up and determination methods. He should be exposed and worked on recent equipment such as GC and HPLC.

The student should submit a copybook containing all practical periods by the end of the semester.

**Learning Objectives**

The main objectives of the course are :

1. Understand the international and local standards for pesticides residues in food commodities and the environment .
2. Follow the proper procedures in residue analysis from sampling to determination.
3. Hands on various instruments , especially chromatography ,used in residue analysis .

Understand the principles of pesticides formulation analysis.

**Intended Learning Outcomes (ILOs):**

Successful completion of the course should lead to the following outcomes:

**A. Knowledge and Understanding:** Student is expected to

1. Be able to handle samples for residue analysis; sampling , extraction ,clean-up and determination .
2. Be able to use instruments like GC, HPLC and others .

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to

1. Choose the suitable methods for extraction and clean-up methods.
2. Choose the suitable apparatus and techniques for residue determination.
3. Apply local and international standards concerning maximum residue levels and other parameter.

**C. Subject- Specific Skills:** Students is expected to

1. Use the proper solvent(s) system.
2. Use extraction apparatus.
3. Pack and use column chromatography and other techniques for cleaning up.
4. Calibrate and handle recent equipment needed for pesticide analysis.

 Work independently in laboratories concerned with pesticide analysis

**D. Transferable Key Skills:** Students is expected to

1. Applying different extraction and clean –up methods.
2. Exposing to advance residues determination and identifying methods and apparatus.

# ILOs: Learning and Evaluation Methods

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| **ILO/s** | **Learning Methods** | **Evaluation Methods** |
| **A, B, C, D.** | **Lectures and Discussions, Homework and Assignments, Projects, Presentation, …** | **Exam, Quiz, presentation, project, assignments, ..** |
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**Course Contents**

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| **Content** | **Reference**  | **Week** | **ILO/s** |
| Information sources for pesticides and their impact on the environment  | 6 | 1 | A 1 |
| Elementary concepts of analytical chemistry  | 7 | ***2*** | ***A2*** |
| Pesticide risk assessment  | 6, 9  | 3 | A3 |
| Formulation versus residue analysis | 4,5,7,8 | 4 | B |
| Sample preparation  | 5, 7 | 5 | B |
| First Exam  |  |  |  |
| Extraction of pesticides  | 5 ,7 | 6+7 | A B |
| Clean- up of pesticides  | 5 ,7 | 6+7 | A B |
| Gas chromatography | 2 , | 8 | AB |
| High pressure liquid chromatography  | 2,3 | 8 | C |
| Thin layer chromatography  | 2,3  | 9 | C |
| Mid Term Exam  |  | 10 | C |
| Spectrometry  | 1, 2 | 11 | C |
| Mass spectrometry  | 1, 2 | 12 | C |
| Nuclear magnetic resonance  | 1 .2 .3 | 13 | C |
| Enzymatic methods  | 5, 7 | 14 | C |
| Electrophoresis  | 2 | 15 | C |
| Miscellaneous methods  | 7 | 16 | C |

**Learning Methodology**

 Lectures: 32 hour, 2 hours per week (including two one hour mid-term exams) .

 Laboratory: 15-lab periods, 3 hours per week (including a mid-term exam and a final exam). Data show, transparencies , slides , videos will be used .

## Projects and Assignments

1. Each student should give a seminar for half an hour including presentation and discussion. the presented seminar should be about a recent technique for pesticide analysis .
2. Each lab period should be written down scientifically including introduction, materials and methods, results , discussion and conclusions in a copybook to be submitted at the end of semester .

# Evaluation

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| **Evaluation** | **Point %** | **Date** |
| **First Exam**  | 15 | **In Previous Agreement with Students** |
| **Second Exam**  | 15 |
| **Assignments** | 20 |
| **Project** | 10 |
| **Final Exam**  | 40 |

# References:

1. Cartmell, E. and Fowles , U.S.A. (1977) Valency and Molecular Structure . Butter Worth ,London . PP311.
2. Ewing, W.Galen. 1985 . Instrumental Methods of Chemical Analysis . Fifth edition MAcGrow Hill international Editions .N.Y. ,USA .
3. Hariss , E. Watter Habgood W. Henry . Programmed Temperatures Gas Chromatography .John Wiley and Sone ,Inc. N.Y.,USA .
4. Henriet ,J. , Lovett, J.F, Martign ,A. and Povlsen, H.H. (2012 )CIAPC Handbook.

Analysis of Technical and Formulated Pesticides Collaborative International Pesticides Analytical Council Ltd .,London , U.K.

1. Myoe , H. , Anson ,ed. (1981 ) . Analysis of Pesticide Residues , Vol. 58 John Willey and Sons , N.Y., USA .
2. Mervyn , L.B(1991 ) Chemistry ,Agriculture and Environment . The Royal Society of Chemistry , London , U.K.
3. Skoog , D.A and West , D.M(1986) Analytical Chemistry .Sounders College Publishing Ltd , New York . PP. 686 .
4. Zweig , Gunther and Joseph Sherma (1984) Analysis Methods for : Pesticides and Plant Growth Regulators , Vol . V1 : Gas Chromatographic Analysis . Academic press , N.Y, USA .
5. White –Stevens , R. (1976) Pesticides in the Environment, Vol. 1. , Part 11 : Marcell Dekker , N.Y, USA .

**Intended Grading Scale (Optional)**

0-39 **F**

40-49 **D**-

50-54 **D**

55-59 **D+**

60-64 **C**-

65-69 **C**

70-73 **C+**

74-76 **B**-

77-80 **B**

81-84 **B+**

85-89 **A**-

90-100 **A**

**Notes:**

* Concerns or complaints should be expressed in the first instance to the module lecturer; if no resolution is forthcoming, then the issue should be brought to the attention of the module coordinator (for multiple sections) who will take the concerns to the module representative meeting. Thereafter, problems are dealt with by the Department Chair and if still unresolved the Dean and then ultimately the Vice President.For final complaints, there will be a committee to review grading the final exam.
* For more details on University regulations please visit:

<http://www.ju.edu.jo/rules/index.htm>