

# The University of Jordan

**Faculty of Agriculture**  
**Program: Ph.D. in Hort. & Crop Science**

**Dept. Horticulture & Crop Science**  
**Year: 2018-2019/ Spring semester**

## Design and Analysis of Experiments II (0631901)

<b>Credit hours</b>	<b>3</b>	<b>Level</b>	<b>Ph.D.</b>	<b>Pre-requisite</b>	<b>0601701</b>
<b>Lecturer</b>	<b>Prof. Muhanad Akash</b>	<b>Office number</b>	<b>290</b>	<b>Office phone</b>	<b>22340</b>
<b>Course website</b>	<b><a href="http://elearning.ju.edu.jo/">http://elearning.ju.edu.jo/</a></b>	<b>E-mail</b>	<b>makash@ju.edu.jo</b>	<b>Place</b>	

<b>Office hours</b>					
<b>Day/Time</b>	<b>Sunday</b>	<b>Monday</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Thursday</b>

### Course Description

This course covers advanced statistical methods, design and analysis for agricultural research, such as incomplete block design, Lattice design and Lattice equal confounding and their uses. This course also covers combined analysis of several experiments over space and time.

### Learning Objectives

The course is designed to expose students to the following fields in experimental design:

1. Review basic principles of experimental statistics.
2. Overview of advanced experimental designs and their analysis.
3. Topics of current interest in experimental statistics not covered in other courses such as: multivariate analysis of variance, nonparametric statistics, categorical data analysis, and related topics in statistical genetics

### Intended Learning Outcomes (ILOs):

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

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

**A1-** Understand the basic concepts of statistical models and use of samples

**A2**- Review analysis of variances and experimental designs  
**A3**- Apply advanced methods of statistical analysis

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to  
**B1**- Achieve maximum power and benefits from designing experiments  
**B2**- Interpret results efficiently

**C. Subject- Specific Skills:** Students is expected to  
**C1**- Design wide range of experiments  
**C2**- Implement computer software

**D. Transferable Key Skills:** Students is expected to  
**D1**- Internet use and data mining  
**D2**- Practice data analysis and interpretation

## ILOs: Learning and Evaluation Methods

<b>ILO/s</b>	<b>Learning Methods</b>	<b>Evaluation Methods</b>
A. Knowledge and Understanding (A1-A3)	Lectures and Discussions	Exams, assignments
B. Intellectual Analytical and Cognitive Skills (B1-B2)	Lectures, Homework and Assignments	Exams, assignments
C. Subject Specific Skills (C1-C2)	Lectures, Homework	Exams , assignments
D. Transferable Key Skills (D1-D2)	Lectures, Assignments	Assignments

## **Course Contents**

<b>Content</b>	<b>Reference</b>	<b>Week</b>	<b>ILO/s</b>
1. Fundamental Definitions and Concepts of Design	Kuehl (2000)	1	A1,A2,B1,B2
2. Formulating Design Models	Kuehl (2000)	2	A1,A2,B1,B2,C1
3. Fundamentals of Mixed Model Analyses	Kuehl (2000)	3	A1,A2,B1,B2,C1
4. Analysis of Variances and Simple Experimental Designs	Kuehl (2000)	4-6	A1,A2,B1,B2,C1,D1,D2
5. Analysis of Covariance	Kuehl (2000)	6,7	A3
6. Power	Kuehl (2000)	7	A1,A2,B1,B2,C1
7. Repeated Measures Designs	Kuehl (2000)	8	A3,C1
8. Incomplete Block Designs	Kuehl (2000), Cochran & Cox (1992)	9,10	A3,C1
9. Incomplete Block Designs with Confounding	Kuehl (2000), Cochran & Cox (1992)	10,11	A3,C1
10. Fractional Factorial Designs	Kuehl (2000)	12	A3
11. Response Surface Designs	Kuehl (2000)	13	A3
12. Designs for Mixtures	Kuehl (2000)	14	A3
13. Computer Software Applications (SAS Software).	SAS links	15,16	C2, D1,D2

## **Learning Methodology**

- 1. Lectures:** 2 per week (including TWO one-hour exams)
- 2. Duration:** 16 weeks, 48 hours in total
- 3. Assignments:** to be notified

## **Evaluation**

<b>Evaluation</b>	<b>Point %</b>	<b>Date</b>
<b>First Hour Exam</b>	20	
<b>Second Hour Exam</b>	20	
<b>Assignments</b>	10	
<b>Homework</b>	10	
<b>Final Exam</b>	40	

### **Main Reference/s:**

- Kuehl, R. O. 2000. Design of Experiments: Statistical Principles of Research Design and Analysis, 2<sup>nd</sup> Edition. Duxbury Press.
- Cochran, W. G. and G. M. Cox. 1992 reprint. Experimental Design, 2<sup>nd</sup> Edition. John Wiley and Sons Inc. (Call # 001.424 C663)

### **References:**

- Steel, R. G. D., J. H. Torrie and D. A. Dickey. 1997. Principles and Procedures of Statistics. 3<sup>rd</sup> Edition. McGraw-Hill, Inc.
- Mendenhall, W., R. J. Beaver, B. M. Beaver. 2005. Introduction to Probability and Statistics. 12<sup>th</sup> Edition. Duxbury Press.
- Little, T. M. and F. J. Hills. 1978. Agricultural Experimentation. John Wiley and Sons.
- Peterson, R. G. 1994. Agricultural Field Experiments. Marcel Dekker Inc.
- Zar, J. H. 1999. Biostatistical Analysis. Pearson Education, Inc.
- Clarke, G. M. 1994. Statistics and Experimental Design: An introduction for Biologists and Biochemists. John Wiley and Sons.
- Littell, R. C., G. A. Milliken, W. W. Stroup and Wolfinger, R. D. 1996. SAS System for Mixed Models. Cary, North Carolina: SAS Institute Inc.
- SAS Links:

SAS Institute:

<http://www.sas.com/>

SAS Institute Technical Support:

<http://support.sas.com/>

SAS 9.3 online documentation:

<http://support.sas.com/documentation/93/index.html>

### **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>