



**Department of Field Crops**

**College of Agricultural Engineering Sciences**

**Salahaddin University**

**Subject: Agricultural Experimental Design**

**Course Book – (Year 3)**

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**Academic Year: 2022-2023**

### Course Objectives:

The course will cover texts on review of some designs of experiments which used in applied agriculture researches especially in field crops.

Design and analysis of experiments an objective basis for the analysis of problems in which the data depart from the laws of exact causality. We can summarize the experiment in several points:

- 1- Define the problem.
- 2- Choosing the variable related or effected.
- 3- Determine the factors affecting the variable and how it could be classified.
- 4- Determine the levels of the affects.
- 5- How the levels of the factors and variables could be related.

In general, the experiments could be divided into:

- 1- Uni-factor experiments (simple) which include one factor only with fixing the effect of other factors.
- 2- Factorial experiments which studied the effect of two factors or more, two factors with different levels using all combinations.

### Forms of Teaching:

Different forms of teaching will conducted to gain the objectives of the course, such as:

1. Power point presentations.
2. Practical lecturers.
3. Solution of exercises.

**Course Program (Syllabus):**

Week NO.	Subject
1 <sup>st</sup>	Introduction- Review of statistical principles
2 <sup>nd</sup>	Scientific research- The experiment-Experimental unit-The design-Treatments
3 <sup>rd</sup>	The basic rules of experimental design-Steps of the scientific exp.- The analysis
4 <sup>th</sup>	Analysis of Variance-Contain of ANOVA Table-The experimental error
5 <sup>th</sup>	Design and analysis of single factor exp. CRD
6 <sup>th</sup>	= = = = =
7 <sup>th</sup>	Design and analysis of single factor exp. RCBD
8 <sup>th</sup>	= = = = =
9 <sup>th</sup>	Design and analysis of single factor exp. LSD
10 <sup>th</sup>	= = = = =
11 <sup>th</sup>	Mean comparisons after ANOVA – LSD and Duncan Multiple Range Test
12 <sup>th</sup>	Design and analysis of two factor exp. Factorial experiment in CRD
13 <sup>th</sup>	Design and analysis of two factor exp. Factorial experiment in RCBD
14 <sup>th</sup>	Design and analysis of two factor exp. Split plot in CRD
15 <sup>th</sup>	Design and analysis of two factor exp. Split plot in RCBD

**Questions:**

**Q1:** An experiment was conducted using CRD in greenhouse to study the effect of 5 irrigation levels on the length of roots in cotton. Compare between treats using DMRT at  $\alpha = 0.05$ .

	R1	R2	R3	R4	Yi.
t1	30.9	35.1	28.5	31.6	126.1
t2	25.6	26.6	22.8	28.5	103.5
t3	18.5	19.1	15.2	20.2	73.0
t4	15.1	10.8	11.9	13.4	51.2
t5	8.2	9.3	6.5	7.8	31.8

**Q2:** An experiment was conducted using RCBD with six replications. If you know the following information:

$Y1. = 42 \quad Y2. = 24 \quad Y3. = 30 \quad Y4. = 48 \quad \text{Cal. F. of Blocks} = 1$

$C. V. \% = 10\%$

Complete ANOVA Table and find the following effects:

$\hat{t}_2, S(\bar{y}1. - \bar{y}2.), S^2\bar{y}$

**Q3:** The following experiment illustrated grain yield / plant of wheat in Latin square design in order to compare between five seeding rates (A, B, C, D, and E):

D 25	C 18	B 20	E 22	A 14
C 18	E 23	A 16	D 21	B 19
E 23	B 18	C 20	A 21	D 23
A 18	D 21	E 24	B 18	C 21
B 19	A 17	D 23	C 16	E 23

Complete ANOVA Table and find the following effects:

$$\hat{t}_3, S(\bar{y}_1. - \bar{y}_2.)$$

**Q4:** What are the advantages of factorial experiments?

**Q5:** Construction the layout of Factorial experiment with 2 factors A = 2, B = 3 in RCBD with 3 replicates. Then write the statistical model and ANOVA Table including SOV and df only.

• **References:**

- Al-Rawi, K. M. and A. A. Khalafallah. 1980. Design and Analysis of Agricultural Experiments. Mosul University Press. (In Arabic).
- Dawood, K. M. and Z. A. Elyas. 1990. Statistical Procedures for Agricultural Research. Mosul University Press. (In Arabic )
- Cochran, W. G. and G. M. Cox. 1957. Experimental Design. 2<sup>nd</sup>ed.
- Steel, R.G.D. and J.H. Torrie. 1980. Principles and Procedures of Statistics. 2<sup>nd</sup>ed.
- Gomez, K.A and A.A Gomez.1984. Statistical Procedures for Agricultural Research. 2<sup>nd</sup>ed.
- Mason, R. D. *et al.*, 1999. Statistical Techniques in Business and Economics .10<sup>th</sup>ed.
- Dean, A. and D. Voss. 1999. Design and analysis of experiments. Springer-Verlag New-York, Inc.