Department of Soil and Water Sciences

College of Agricultural Engineering Sciences

Salahaddin University- Erbil

Subject: Experimental Design and Analysis

Course Book – Third Stage / Fall Semester

Theoretical name: Dr. Kazhin Sarbaz Rajab Lecturer's

Practical name: Mrs. Bnar Hamadamin Mohammad

 Academic Year: 2023/2024

Course Book

1. Course name	**Experimental Designs and Analysis**
2. Lecturer's in charge	**Dr Kazhin Sarbaz Rajab** **Mrs. Bnar Hamadamin Mohammad**
3. Department/ College	**Soil and Water\ Agricultural Engineering Sciences**
4. Contact	**Kazhin.rajab_@su.edu.krdTel: 07507972635** **bnar.mohammad@su.edu.krd**
5. Time (in hours) per week	**Theoretical 2 hrs practical: 2 hrs**
6. Office hours	**Sunday and Monday 9.00a m to 1:00 pm**
7. Course code	
8. Teacher's academic profile	Dr. Kazhin Sarbaz Rajab My name is Kazhin Sarbaz Rajab I have B.Sc. in Soil and Water Science at Salahaddin University in 2010 and getting Master degree in Water chemistry at Salahaddin University in 2015. Iam Ph. D. in Water chemistry branch.
9. Keywords	Experimental designs, Principles of experimental design, Randomization, relative efficiency, Multiple range tests.

10. Course overview:

Experimental design and Analysis regard as applied statistics, which includes different design and tests. Selecting the suitable design and test in investigations leads to increase in accuracy of data. The experimental design uses in different field and specializations like agricultural sciences, biological sciences, medical sciences economical sciences…etc.

During this course we must refer to the main designs, types of experiments and multiple comparison tests. It is necessary to explain basic terms and steps in experimental design and analysis. Selecting the suitable multiple range test is necessary depending of the type or nature of the research. comparison between designs depending on their efficiency and uses in agricultural experiments and researches.

The application of the studied experimental design in research projects of 4th year students and then conducting statistical analysis for their results using statistical programs like SPSS, SAS and Stat graph   etc.

Explaining the importance of this subject and its application in different fields especially in agricultural sciences and biological sciences.

Finally, it is necessary to throw light on the role of experimental design and analysis for the staff of agriculture research centers in Kurdistan rejoin.

11. Course objective:

To gain an understanding of:

1. Studying the basic terms in experimental design and analysis.

2. Studying the basic principles of experimental design then explaining the role of them in decreasing experimental error.

3. To learn the steps for construction complete randomized design (CRD).

4- Studding the steps for construction complete randomized block design (RCBD).

5- To explain the role of blocking and direction on blocks in decreasing experimental error. 6-Comparison between CRD and RCBD, and why RCBD called agricultural design.

7- To study the steps for construction Latin square design, and then why this design is not widely uses in agricultural experiments and researches.

8- Comparison between the mean of treatments in the laboratory and field experiments using different multiple comparison tests.

9- Comparison between simple experiments and factorial experiments.

10- Steps for construction of CRD, RCBD and Latin square design LSD in case of factorial experiments.

11- To compare between factorial experiments and Split Plot Design. 12-Comparison between systematic and Randomized designs. Pollution.

12. Student's obligation
 The student must have an important role:
1- The students must contribute in the scientific discussions in the class or teaching hall.
2- The students must know the importance of quizzes, homework's, reports and exams.
3- It is necessary to contribute the student in presentation a scientific subject.

13. Forms of teaching
There are different forms of teaching:
1-Datashow and power point.
2- White board.
3-Lectures.

14. Assessment scheme
The course degree was divided as follows %50 of the monthly exam, 15M for the theoretical part 35M for the practical part (15m for the first test, 15m for the second test, and 5m for reports and activity) in theoretical part 15 marks for the first exam, 15% marks for the second exam, 5 marksfor daily quiz and preparing reports. The final exam takes %50, 50 marks for the theory part only.

15. Student learning outcome:
Upon completion of the course, students are expected to:

Explaining and training on selecting the suitable design and application it at summer training and research project. Doing statistical analysis using hand method or statistical programs. The practical part includes the application on different designs and multiple comparison tests: 1st week introduction and symbols2nd week construction on CRD practically and solving some examples of CRD .3rd   and 4th week solving examples about multiple Comparison tests. 5th and 6th week examples about RCBD and calculating missing value. 7th , 8th and 9th week applications and examples about Latin Square Design , calculating Missing value and relative efficiency between designs.10th, 11th and 12th weeks applications and examples about factorial experiment. 13th and 14th weeks solving examples about split plot design.

1- Brown, R.B. (1990). Experimental Design and Analysis. USA. Clark, G.M. (1980). Statistical and Experimental Design, 2nd ed., UK.
2- Clewer, A. G. and D. H. Scarisbrick. (2001). Practical Statistics and Experimental Design for plant and crop science.
3- Cochran, W. G. and Cox, D. R. (1957). Experimental Design, 2nd ed., Johan Wiley and Sone, Inc., New York, USA.
4- Journal of the American Statistical Association No. 411, 442 and 443., (1998).
5- Kassab, J. Y., (1982). Experimental Design and Statistical Analysis Course. North Waley University.
6- Kuehl, R. O. (2000). Design of Experiments .2nd ed.
7- Locioru, E. L., Warren, H. L. and A. G. Clark (1962). Field plot •
8- Technique. USA.
9- Li. C.C. (1964). Introduction to Experimental Statistics. New York.
10- Milton, J. S. and Arnold, J. C. (1995). Introduction to Probability and Statistics, 3rd Mc Graw-Hill Book company. Singapore.
11- Miller, R. G. (1998). Beyond ANOVA Basics of Applied Statistics .CRD press LIC, USA.
12- Montgomery D.C. (1976). Design and Analysis of Experiments.
13- *Oehlert G.W. (2014) A first course in design and analysis of experiment.USA.2nd ed.
14- * Rossello, J. M. and de Gorostiza M. F. (1993). Technical Guidelines for field variety Trials.
*Seltman H.J. (2014) Experimental design and analysis.USA.2nd ed.

احمد, ليلى عزيز)2002(. مقارنة طرائق تقدير القيم المفقودة في تصميم قطاعات العشوائية الكاملة. رسالة الماجستير/ قسم االحصاء/ جامعة صالح الدين.

الحقني ، مسعد زكي)1982(تصميم وتحليل التجارب الحقلية. جامعة صالح الدين.

المحمداوي، فاضل مصلح و مؤيد اليونس .)2000(. التجارب الزراعية التصميم والتحليل. جامعة بغداد، العراق.

الراوي، خاشع محمود الراوي)1980(تصميم وتحليل التجارب الزراعية. مطابع جامعة موصل.

اِلساهوكي، مدحت و كريم محمد وهيب)1990(تطبيقات في تصميم وتحليل التجارب.

الشواني، أميد صابر عبدهللا)2002(دراسة توفر شروط تحليل التباين لبعض التجارب التطبيقية ذات النموذج الثبت. رسالة الماجستير في االحصاء، كلية االدارة و االقتصاد، جامعة صالح الدين-أربيل)بأشراف د. أكرم عثمان إسماعيل(.

الزعبي، محمد بالل وعباس الطالفي)2004(. النظام االحصائي جامعة SPSS .منهم وتحليل البيانات االحصائية الدول العربية .)1993(. دليل مشاكل تصميم وتحليل التجارب في البحوث الزراعية. المنظمة العربية للتنمية الزراعية.

إسماعيل، أ. ع.، عبدالرحيم، ع. م. و قاسم، ع. ع.)2003(تصميم التجارب وتحليلها. الجزء االول. احمد, ليلى عزيز)2002(مقارنة طرائق تقدير القيم المفقودة في تصميم قطاعات العشوائية الكاملة. رسالة الماجستير/ قسم االحصاء/ جامعة صالح الدين.

حمد، أختر صابر)2000(دراسة مقارنة الطريقة المعلمية واالمعلمية لتحليل التغاير بأستخدام المحاكاتز رسالة

17. The Topics:	Lecturer's name
1st week Introduction (definition of experimental design, Basic terms in experimental design,).In this week the students will learn definition and steps of experimental design in additional to some scientific terms. (Theory). Example about symbols in experimental design (Practical).	**Lecturer's name Dr. Kazhin Sarbaz Rajab**
2nd week Basic principles of experimental design, Classification of experimental design in to two types systematic and random design. The goals of these topics to study the role of principles of experimental design in accuracy of data and comparison between systematic and random designs.. (Theory). Testing accuracy of data and comparison between systematic and random design practically. (Practical).	**Mrs. Bnar Hamadamin Mohammad**
3rd week Complete randomized design (CRD), Multiple comparison tests. The goals are:1-to learn the construction of this design.2-When and where this design can be use? (Theory). Examples on CRD in case of equal and unequal replicates (Practical).	
4th week Comparison between different tests then selecting the suitable one for statistical analysis. (Theory). Practical examples about multiple comparison tests. (Practical).	
5th week Randomized block design. The goals are: **1-Blocking the uniform experimental units in a same block.2-Limiting the direction of blocks. (Theory).** Solving examples related to field experiments (Practical).	
6th week Comparison between CRD and RCBD.(Theory). Comparison between CRD and RCBD practically in the field and lab. (Practical).	
7th week Missing value in CRD, causes of missing value and its effect on statistical analysis. (Theory). Solving some examples which are having missing value (Practical).	
8th week Missing value in RCBD, causes of missing value and its effect on AANOVA table statistical analysis (Theory). Solving some examples which are having missing value then adjusting ANOVA table and SS treatment.. (Practical).	

	Lecturer's name Dr. Kazhin Sarbaz Rajab Mrs. Bnar Hamadamin Mohammad
9th week Latin Square Design .In this topic the students will learn the reasons of rarely use of this design in the field experiments. (Theory). Examples about LSD (Practical). **10th week Relative efficiency between designs (Theory).** Solving Practical examples about relative efficiency. (Practical). **11th week Theoretical exam. (Theory).** Practical exam (Practical). **12th week Factorial experiments, Basic terms, Factorial experiment using CRD, RCBD and LS. (Theory).** Practical examples (Practical).	

18. Practical Topics (If there is any)	
There are three main and important skills the students should learn, which are M. PowerPoint , M. Excel and M. Word that ledthem dealing with computer and internet	Lecturer's name Dr. Kazhin Sarbaz Mrs. Bnar Hamadamin Mohammad

19. Examinations:
1. *Compositional:*
   A. 1-Definition?
   B. 2-give the reason of …..?
   C. 3- What are the differences between.. ?
   D. 4- Fill-in the blanks?
   E. Enumerate factors that affect......
2. *True or false type of exams:*

3. *Calculation:*

20. Extra notes:

21. Peer review Prof. Dr. Akram Othman Esmail
پێداچوونەوەی هاوەڵ

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