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**Department of Animal Resources**

**College of Agriculture**

**University of Salahaddin-Erbil**

**Subject:Experimental Design and Analysis**

**Course Book – (Year 3)**

**Lecturer's name:Haval Ismail Aziz and Kanyaw ismail mahmud**

**Academic Year: 2015/2016**

**Course Book**

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| **1. Course name** | **Experimental Design and Analysis** | |
| **2. Lecturer in charge** | **Mr.Haval Ismail and Mr.Edres Abdulla** | |
| **3. Department/ College** | **Animal Resources/Agriculture** | |
| **4. Contact** | **e-mail:haval22@yahoo.com**  **Tel:0750 4671223**  **e-mail:edresabdulla@yahoo.com**  [**Tel:07504627152**](Tel:07504627152) | |
| **5. Time (in hours) per week** | **Theory: 2 hours**  **Practical: 3 hours** | |
| **6. Office hours** | **42hours** | |
| **7. Course code** |  | |
| **8. Teacher's academic profile** | EDUCATIONMr.Haval Ismail  * **B.SC : 2002 / Animal Resource / Salahaddin University.** * **M.SC : 2009 / Animal breeding / Salahaddin University.**   **1- Effect of Breed and Some Environmental Fixed Factors on Milk Yield in Commercial Flocks (2002). ( Msc)**  **Published 2 researches.**  **Mr. Edres Abdulla**   * **B.SC : 2000 / Animal Resource / Salahaddin University.** * **M.SC : 2006 / Reproductive physiology / Salahaddin University.**   **1-effect of some Hormonal treatments on the reproductive performance and biochemical changes in blood serum of humdani hoggets’ in Erbil local.(2006).(Msc)** | |
| **9. Keywords** | **A statistic ,Variable , A treatment , An experimental unit**  **A sampling unit , An experimental design**, **The experimental error** | |
| **10. Course overview:** The biological scientist, statistics began about 1925 when **Fisher’s** statistical methods for research workers appeared the extent of a statistics makes it difficult to define is a summary number used to describe a sample. For a given population a statistic is a variable because its value will change from one sample to another within the population. Examples of variables are milk production; weights of animals, heights of barley. There are two kinds of variables: I. Discrete, or count, variables take only integral values? For example, number of diseased animals. 2. Continuous, or measured, variables which can take any value over a small range. An example is the body weight gain of. A single measurement of a variable is called an observation of that variable. An example is the yield of milk in an experiment. A treatment: is a procedure whose effect on the experiment- all material is to be Measured .In a variety trial each variety would be a different treatment. The addition of nitrogen fertilizer to a plot would be a treatment in agronomic experiment. In some experiments doing nothing at all might be one of the treatments. Example breed of sheep, goat, cow. An experimental unit :It is the unit of material to which one application of a treatment  is applied ,and it was used to measure the studied variable it could be an animal | | |
| **11. Course objective:**  Is a planned investigation to discover new facts or to confirm or deny the results of previous investigations? For example, to find the most suitable wheat variety for the rain fed area of Iraq we could conduct an experiment which included a large number of varieties and hope to be able to select the one which is best.  **a**- Define the problem.  **b**- Choosing the variable related.  **c**-Determine the factors affecting the variable.  **d**- Determine the levels of the factors.  **e**-How the levels of the factors and variable could be related.  ANOVA Table:  Source of variation: It means the causes of differences between the experimental Objectives, which determined by the statistical module to describe experiment.  Degree of freedom: It means the independent comparisons could be applied in each Source of variation.  Sum of squares: It indicates to the deviation sum of squares for each sources of variation.  Mean squares: It is the variation of each source of variation and it was calculated by dividing the sum of square of each source by its degrees of freedom. | | |
| **12. Student's obligation**  The role of students and their obligations throughout the academic year :  1-the attendance and completion of all tests, exams from all student  2-doing 1 monthly examination  3-doing 6 daily examination | | |
| **13. Forms of teaching**  1-Data show (power point) 2- White board | | |
| **14. Assessment scheme**  Monthly examination %15practical examination  Final examination %20 practical examination | | |
| **15. Student learning outcome:**  1- Agricultural statistical data analysis  2-Plaining Agricultural research  3-Lerean the principles of statistic’s  4-Understanding that any statistics program must to know the basic Experimental Design and Analysis.  5-Given the importance’s of agricultural research to agricultural developing plan and the value of the scientific results of this agriculture research.  6-To know theObjectives of Good Experiment if you know: 1-Absence the assorted error.2- Confident and precision.3-Simple.4-Amount of information in order to use the results widely.5-Estimate the standard error.  7-To learn the Steps of the scientific experiments: 1-Define the studied problem and how to solve it.2-The hypothesis which helps in getting the solutions.  3-Determine the factor or factors and their levels included in the experiment.  4-Determine the variable or variables studied.5-Define the experimental units and how it classified to the treatments.6-Select the appropriate experimental design.7- Collect the information.8-Analysis the data statistically.9-Discuss the results and it is applying.10-Putting scientific report about the experiment and its results.  On this way the students after graduated can work in any agricultural company. | | |
| **16. Course Reading List and References‌:**   1. Methods of Livestock Research on Smallholder Farms. Arthur Louis Goetsch / 2014. 2. Experimental and Analysis Design (Arabic) | | |
| **17. The Topics:** | | **Lecturer's name** |
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| **18. Practical Topics (If there is any)** | | **Lecturer's name** |
| **Course book on Experimental Design and Analysis**  **The important Variables in Experimental Design and Analysis**  ***Experiments:*** Is a planned investigation to discover new facts or to confirm or deny the results of previous investigations. For example, to find the most suitable wheat variety for the rain fed area of Iraq we could conduct an experiment which included a large number of varieties and hope to be able to select the one which is best.  ***Experimental Design and Analysis:***  The biological scientist, statistics began about 1925 when Fisher’s statistical methods for research workers appeared the extent of statistics makes it difficult to define.  **The goal: ANOVA Table**  **Source of variation:**It means the causes of differences between the experimental Objectives, which determined by the statistical module to describe experiment.  **Degree of freedom:** It means the independent comparisons could be applied in each Source of variation.  **Sum of squares:** It indicates to the deviation sum of squares for each sources of variation.  **Mean squares:** It is the variation of each source of variation and it was calculated by dividing the sum of square of each source by its degrees of freedom.  Variables ,Experimental Unit , Treatments, Experimental Error, Random and Replication  **Analysis of Variance**  - Analysis of Variance ANOVA Table  1- The Completely Randomized Design (C.R.D)  equal number of replication  **2- The Completely Randomized Design (C.R.D)**  Unequal number of replication  Test of Hypotheses  a- Null Hypotheses’- Alternatives is Hypotheses  **Linear Model to any design**  ANOVA Table  Source of variation  Degree of freedom  Sum of squares  Mean squares  F Calculate  F Tablet  Advantages (CRD)  Disadvantages (CRD)  **Estimation of Variance Components**   1. Dunnett test   B-Duncan test  c- LSD test  2- Randomized Complete Block Design (R.C.B.D)  1- Advantages (R.C.B.D)  2- Disadvantages (R.C.B.D)  **Missing Values** for CRD , RCBD and LSD  **Relative Efficiency of R.C.B.D Compared with C.R.D**  Relative Efficiency of R.C.B.D with L.S.D  Relative Efficiency of C.R.D with L.S.D  3- Latin Square Design (L.S.D)  **3- Latin Square Design (L.S.D)**  1- Advantages (L.S.D)  2- Disadvantages (L.S.D)  4- **Factorial Experiments conducted in C.R.D**  5- Factorial Experiments conducted in R.C.B.D  A- Two factors A\*B (2\*3)  B-Three factors A\*B\*C (2\*2\*3) | | **Mr. Haval Ismail 3hours**  **12/10/2015**  **Mr.Haval Ismail 3hours**  **19/10/2015**  Mr.Haval Ismail  3 hours  26/10/2015  **Mr.Haval Ismail**  3 hours  2/11/2015  **Mr.Haval Ismail**  3 hours  9/11/2015  **Mr.Haval Ismail** 3hours  16/11/2015  **Mr.Haval Ismail**  3 hours  23/11/2015  **Mr. Edres Abdulla**  3 hours  30/11/2015  **Mr. Edres Abdulla**  3 hours  7/12/2015  **Mr. Edres Abdulla**  3 hours  14/12/2015  **Mr. Edres Abdulla**  3 hours  21 /12/2015 |
| **19.** Examinations:  1- Direct - some examples:  A- write the step of Duncan multiple rang test:  .  B-Write advantages of Latin Square Design (LSD)  C-Write Linear Model and test the significant with Duncan test.  D- Write Dis advantages of Latin Square Design (CRD**)**  **E-**Complete ANOVA Table.   |  |  | | --- | --- | | treatment | R1 R 2 R 3 | | T1 | 4 3 6 | | T2 | 9 8 11 | | T3 | 5 8 7 | | T4 | 2 5 3 |   **2- In direct**  A Suppose you have the following information from a study with (4) replicates and (4) treatments: Y1.=54, Y2.=36, Y3.=60 , Y4.= y..=192 , ∑Yij²=3268  Analyze the data including the linear model, hypothesis tests and complete ANOVA table and compare between mean using LSd test at level α=(0.05)?  B- Are there any deference between complete randomized design equal and complete randomized design unequal | | |
| **20. Extra notes:**  Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. | | |
| **21. Peer reviewپێداچوونه‌وه‌ی هاوه‌ڵ**  This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.  *(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*  ئه‌م کۆرسبووکه‌ ده‌بێت له‌لایه‌ن هاوه‌ڵێکی ئه‌کادیمیه‌وه‌ سه‌یر بکرێت و ناوه‌ڕۆکی بابه‌ته‌کانی کۆرسه‌که‌ په‌سه‌ند بکات و جه‌ند ووشه‌یه‌ک بنووسێت له‌سه‌ر شیاوی ناوه‌ڕۆکی کۆرسه‌که و واژووی له‌سه‌ر بکات.  هاوه‌ڵ ئه‌و که‌سه‌یه‌ که‌ زانیاری هه‌بێت له‌سه‌ر کۆرسه‌که‌ و ده‌بیت پله‌ی زانستی له‌ مامۆستا که‌متر نه‌بێت.‌‌ | | |