UNIVERSITI TEKNOLOGI MARA

AGR256: AGRICULTURAL RESEARCH METHODS

Course Name (English)	AGRICULTURAL RESEARCH METHODS APPROVED
Course Code	AGR256
MQF Credit	3
Course Description	This course will introduce students to the research techniques in the conduct of field experimentation and factors affecting the outcomes of experimental results. Students will study the techniques of sampling, three types of experimentation designs, data collection including computing descriptive and inferential statistics. The student will compute descriptive statistics that include methods of data presentation, measurement of central tendency and dispersion. The student will also compute inferential statistics that include statistical tests based on normal distribution as well as chi-square tests, linear regression and the use of correlation coefficient.
Transferable Skills	Demonstrate ability to apply creative, imaginative and innovative thinking and ideas to problem solving
Teaching Methodologies	Lectures, Tutorial, Discussion
CLO	CLO1 Explain the need for statistical evaluation and techniques of experimentation in field research. CLO2 Identify the use and applications of techniques of experimentation in agriculture CLO3 Compute and interpret descriptive statistics CLO4 Compute and interpret inferential statistics.
Pre-Requisite Courses	No course recommendations

Topics
1. 1.0 Introduction 1.1) 1.1 The Need for Statistical Evaluations. 1.2) 1.2 Prerequisite for a successful experiment. 1.3) 1.2.1 Literature review 1.4) 1.2.2 Formulation of hypothesis 1.5) 1.2.3 Selection of treatments, experimental unit, experimental material and number of replications 1.6) 1.2.4 Selection of experimental designs and types of experiments
2. 2.0 Field Plot Technique 2.1) 2.1 Uncontrolled Factors and Sources of Variation: Effect on Interpretation of Results and Accuracy. 2.2) 2.2 Soil Heterogeneity 2.3) 2.2.1 Factors affecting Soil Heterogeneity: Soil Topography, Soil Fertility, Soil Moisture and Previous Treatment. 2.4) 2.2.2 Choosing a Good Experimental Site: Slopes, Areas Used for Experiments in Previous Cropping, Graded Areas, Presence of Large Trees, Poles and Structures and Unproductive Site 2.5) 2.2.3 Coping with Soil Heterogeneity: Minimum Plot Size, Plot Shape, Block Size and Shape, Number of Replications 2.6) 2.3 Plant variability 2.7) 2.3.1 Genetic Determination 2.8) 2.3.2 Competition Effects: Inter-plot and Intra-plot Competition, Varietal Competition, Fertilizer Competition, Border Effect, Alley Space Effect 2.9) 2.4 Climatic variation over time and location 2.10) 2.5 Conducting Field Experiment 2.11) 2.5.1 Keeping Other Factors Constant 2.12) 2.5.2 Precaution against Pests and Diseases.

3. 3.0 Data Collection and Presentation
3.1) 3.1 Basic statistical terms and deductive and inductive statistics
3.2) 3.2 Data Presentation
3.3) 3.2.1 Frequency Distribution And Relative Frequency.
3.4) 3.2.2 Histogram And Frequency Polygon.
3.5) 3.2.3 Cumulative Frequency and Ogive.
3.6) 3.2.4 Bar Chart And Pie Chart.
3.7) 3.3 Measure of Central Tendency for grouped and ungrouped Data.
3.8) 3.4 Measure of Dispersion and Coefficient of Variation.
3.9) 3.5 Sampling in Experimental Plots.
3.10) 3.6 Sampling Designs
3.11) 3.6.1 Simple Random Sampling
3.12) 3.6.2 Stratified Sampling
3.13) 3.6.3 Systematic Sampling.

4. 4.0 Experimental Error
4.1) 4.1 Components of experimental error.
4.2) 4.2 Methods of increasing accuracy of experiments.

5. 5.0 Tests Of Significant Difference
5.1) 5.1 Hypothesis and Type I and Type II Error.
5.2) 5.2 Normal Distribution.
5.3) 5.3 Level Of Significance.
5.4) 5.4 T-Test (Paired And Unpaired).
5.5) 5.5 Chi-Square Test
5.6) 5.5.1 Test for a fixed-ratio hypothesis.
5.7) 5.5.2 Test for independence in a contingency table.

6. 6.0 Experimental Designs
6.1) 6.1 F Test And Analysis Of Variance (ANOVA).
6.2) 6.2 Three Basic Principles Of Experimental Design: Randomization, Replication And Local Control.
6.3) 6.3 Completely Randomised Design.
6.4) 6.4 Randomised Complete Block Design.
6.5) 6.5 Latin Square Design.

7. 7.0 Factorial Experiments
7.1) 7.1 Completely Randomised and Randomised Complete Block Designs in Factorial Experimentations

8. 8.0 Correlation
8.1) 8.1 Product-Moment Correlation Coefficient.
8.2) 8.2 Spearman Rank Correlation.

9. 9.0 Simple Linear Regression
9.1) 9.1 Scatter Diagram
9.2) 9.2 Least Square Method.

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Journal Reading: Search current agricultural experiment journal via online. Based on the reading, each students need to extract the title, authors, introduction, hypothesis, objective, treatments, replication, experimental design, experimental unit, results and discussion.	30%	CLO1
Test	Test 1- cover Topic 1 up to Topic 4	15%	CLO2
Test	Test 2-Cover Topic 5 up to topic Topic 6	15%	CLO3

Reading List

Reference Book Resources

- **Clewer, A.G. and Scarisbrick, D.H. 2001, *Practical Statistics and Experimental Design for Plant and Crop Science*, John Wiley & Sons Chichester [ISBN: 978-0-471-899]**
- **Gomez, K.A and Gomez, A.A 1984, *Statistical Procedures for Agricultural Research*, 2 Ed., John Wiley & Sons New York**
- **Pearce, S.C. 1983, *The Agricultural Field Experiment*, John Wiley & Sons New York**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources