

## AEN 4105 ENGINEERING EXPERIMENTAL DESIGN

Credit Units : 3 Credit Units

Course Credits (CU):3 CU i.e. 45 Contact Hours per semester

Course Duration : 15 weeks (45 hours) i.e. 30 LH, 30 PH

Course Type : CORE (BSC Agric Engineering IVI)

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### 1. Course Description

Elements of engineering experiments. Parameter Estimation; Confidence intervals and hypothesis tests. Data collection using experiments or surveys. Design of experiments and surveys. Analysis and interpretation of data. Regression and correlation analysis. Covariance analysis. Data presentation.

### 2. Course Objectives

The **main objective** of the course is to enable students to gain knowledge and skills on how to carry out engineering research using experiments and surveys.

The **Specific Objectives** include;

- (1) To equip students with knowledge on the elements of research
- (2) To equip students with knowledge on the types of experimental designs and when to apply them.
- (3) To equip students with knowledge on appropriate methods for data collection using surveys.
- (4) To equip students with knowledge on how to employ techniques of data analysis and interpretation
- (5) To equip students with knowledge on how to present research results.

### 3.Recommended Texts

Statistical Procedures for Agricultural Research. Kwanchai A. Gomez & Arturo A. Gomez. John Wiley & sons, Inc.1984

A basic Course in Statistics. Clarke G.M & Cooke .D. Oxford University Press. 1998.

Probabaility and statistics for Engineers. Scheaffer McClave.International Thompsomn Publishsing.1995

Design and Analysis of Experiments. Douglas C. Montegomery

Applied statistics and probability for Engineers. Douglas C. Montegomery and G. Runner. John wiley and sons, Inc. 2003

### 4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED

TOPIC	CONTENT	METHOD OF INSTRUCTION / Time allocated	TOOLS / EQUIPMENT NEEDED
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LECTURE 1. INTRODUCTION	<ul style="list-style-type: none"> <li>• Elements of engineering research</li> <li>• Importance of objectives in research</li> <li>• Methods of engineering research</li> </ul>	Interactive lectures (5 hrs)	Chalk / BB LCD and computer
LECTURE 2	<ul style="list-style-type: none"> <li>• Confidence intervals</li> <li>• hypothesis tests.</li> </ul>	Interactive lectures (5 hrs)	Chalk / BB LCD and computer
LECTURE 3	<ul style="list-style-type: none"> <li>• Data collection</li> <li>• Importance of data</li> <li>• Methods of data collection</li> </ul>	Interactive lectures (5 hrs)	Chalk / BB LCD and computer
LECTURE 4.	<ul style="list-style-type: none"> <li>• Use of experiments for data collection</li> <li>• Design of experiments (one factor, 2 factor factor)</li> </ul>	Interactive lectures (10hrs)	Chalk / BB LCD and computer
LECTURE 5	<ul style="list-style-type: none"> <li>• Analysis and interpretation of data from experiments. (Anova, T-test, f-test, Chi square)</li> </ul>	Interactive lectures (5 hr)	Chalk / BB LCD and computer
LECTURE 6	<ul style="list-style-type: none"> <li>• Use of surveys for data collection</li> <li>• Design of surveys instruments</li> <li>• Developing and testing questionnaires</li> </ul>	tutorials (5 hrs)	Chalk / BB LCD and computer
LECTURE 6	<ul style="list-style-type: none"> <li>• Use of computer statistical packages for data analysis and interpretation</li> </ul>	Practical in computer lab. (5 hrs)	Well equipped computer lab
LECTURE 7.	<ul style="list-style-type: none"> <li>▪ Test</li> </ul>	2hrs	LCD and computer
LECTURE 8.	<ul style="list-style-type: none"> <li>▪ Regression and correlation analysis</li> <li>▪ Testing for goodness of fit</li> </ul>	tutorials (8 hrs)	LCD and computer
LECTURE 9.	<ul style="list-style-type: none"> <li>• Covariance analysis</li> </ul>	tutorials (2 hrs)	Transport
LECTURE 10	<ul style="list-style-type: none"> <li>• Data presentation</li> </ul>	Tutorial (5 hrs)	LCD and computer
LECTURE 13	<ul style="list-style-type: none"> <li>• Test 2</li> </ul>	Tests (3 hrs)	
LECTURE 14	<ul style="list-style-type: none"> <li>• Exams</li> </ul>	3hrs	
LECTURE 15	<ul style="list-style-type: none"> <li>• Exams</li> </ul>		

## 5. SUMMARY OF TIME NEEDED

Interactive lectures	30 hrs
Tutorials and practicals	25hrs
Evaluation (tests)	05 hrs

#### **6. OVERALL COURSE EVALUATION**

Continuous Assessment Test	20%
Class practicals,Assignments	20%
Final examination	60%