



B.Sc. Degree Program
Faculty of Applied Sciences
University of Sri Jayewardenepura

Course Title	Design and Analysis of Experiments
Course Code	STA 225 2.0
Credit Value	02
Status	Core
Year/ Level	Year 2
Semester	2
Theory: Practical: Independent Learning	30 : 00 : 70
Other: Pre-requisite course/s	STA 114 2.0 Probability and Distribution Theory I, STA 123 2.0 Probability and Distribution Theory II, STA 124 1.5 Data Analysis I, STA 213 2.0 Statistical Inference, STA 226 1.5 Data Analysis II, 224 2.0 Regression Analysis

Aims of the Course:

- To introduce the need and the importance of designing an experiment.
- To provide an in-depth coverage of various designing techniques.

Intended Learning Outcomes:

On the successful completion of this course, the student should be able to:

1. Recognize the response and factors to be studied, experimental units, blocking factors in a given problem.
2. Plan an experiment to meet the objectives. given problem and interpret the results.
3. Perform pairwise comparisons
4. Select and apply a suitable design for a given problem and interpret the results.
5. Identify the limitations of applying the designs you have learned to any practical situation
6. Use regression approach to estimate the model parameters and test their significance.

Course Content:

1. Introduction: Experimental studies and observational studies, Basic concepts and terminology
2. Completely Randomized Design
Building the model, ANOVA, Analysis of factor level means, Multiple comparison techniques, Testing model adequacy, Analysis using R
3. Designs with one blocking variable
Randomized Complete Block Design, Model for Randomized Complete Block design, ANOVA and testing hypotheses, Evaluation of appropriateness of the model, Analysis using R programming language, Incomplete Block Designs
4. Designs with more than one blocking variables
Latin Square Design, Latin Square model, Analysis of Latin Square experiments

5. Two Factor experiments
Two factor experiments, Building the model, Main effects and interaction effects, ANOVA
6. Regression approach for parameter estimation and test of significance in some selected designs.

Scope and Schedule of Teaching - Learning Activities:

Topic No.	Topic/Sub Topic	No. of Hrs			Teaching Method	Assessment Criteria	ILO Alignment
		T	P	IL			
1	Introduction: Experimental studies and observational studies, Basic concepts and terminology	2	0	4	Lecture/ Practice questions		1
2	Completely Randomized Design	2	0	4	Lecture		2, 3
3	Completely Randomized Design	2	0	4	Lecture/ Flipped classroom/ Practice questions		2,3
4	Completely Randomized Design	2	0	4	Lecture/ R programming practice questions FA 1: Quiz	10% of Final Marks	2, 3
5	Designs with one blocking variable	2	0	4	Lecture/ Practice questions		2, 3
6	Designs with one blocking variable	2	0	5	Lecture/ R programming practice questions		2, 3
7	Designs with one blocking variable	2	0	5	Lecture/ R programming practice questions/ Virtual Discussion Forum		2, 3
8	Designs with more than one blocking variables	2	0	5	Lecture/ Virtual Discussion Forum/ R programming practice questions FA 2: Quiz	10% of Final Marks	2, 3
9	Designs with more than one blocking variables	2	0	5	Lecture/ R programming practice questions		2, 3
10	Two Factor experiments	2	0	5	Lecture/ R programming practice questions FA 3: Quiz	20% of Final Marks	2, 3, 4
11	Two Factor experiments	2	0	5	Lecture/ R programming practice questions		4, 5
12	Regression approach for parameter estimation and test of significance in some selected designs	2	0	5	Lecture/ R programming practice questions		6
13	Applications with R programming	2	0	5	Lecture/ R programming practice questions		4, 5, 6
14	Case study	2	0	5	Lecture/ R programming practice questions		4, 5, 6
15	Revision and ways to continue learning DOE	2	0	5	Lecture/ R programming practice questions		4, 5, 6
	Total	30	00	70			

Linking Program Outcomes with ILOs:

Program Outcomes: B.Sc. General degree

1. Demonstrate competency in theoretical knowledge and practical and/or technical skills in respective subject areas (statistics).

2. Communicate efficiently and effectively in the respective subject areas using written, oral, visual and/or electronic forms.
3. Facilitate, and participate as an empathetic and emotionally intelligent team player with leadership qualities, in a group, diverse team or organization.
4. Apply subject based knowledge and skills creatively in making appropriate judgements in changing situations.
5. Integrate creativity and innovation to achieve entrepreneurial competencies.
6. Implement solutions in keeping with ethical, societal and environmental norms and need for sustainable development.
7. Secure life goals through lifelong learning with the aim of strengthening professional skills, and ensuring the betterment of the community.

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
ILO 1	***	*		*			
ILO 2	***	***		**			
ILO 3	**	**			**		
ILO 4	***	***			**		*
ILO 5	***	***	***	***	***	***	***
ILO 6	***	***	***	***	***	***	

*** - Strongly linked; ** - Medium linked; * - Weekly linked

Mode of Assessment:

Formative Assessment (FA): FA1 10% + FA2 10% + FA3 20% = 40% of total marks

Summative Assessment (SA): End Semester Examination: 2-hour paper covering MCQs and or Short Questions, Structured Essay-type questions and Essay-type question = 60% of total marks

References:

- Talagala, T. S. (2021). Course website: 225 2.0 Design of Experiments, *Course website*. <https://smart-doe.netlify.app/>
- Montgomery, D. C. (2017). Design and analysis of experiments. John wiley & sons.
- Neter, J., Kutner, M. H., Nachtsheim, C. J., & Wasserman, W. (1996). Applied linear statistical models.