



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

Course Title	Regression Analysis
Course Code	AMT 325 2.0
Credit Value	02
Status	Optional
Year / Level	Year 3
Semester	2
Theory: Practical: Independent Learning	28: 20: 52
Other: Pre-requisite Course/s	AMT 212 2.2 Mathematical Statistics II

Aim of the Course:

To introduce the concepts of regression analysis (both simple and multiple) including parameter estimation, inference on regression parameters, diagnostics methods, goodness-of-fit test and how to handle qualitative predictions.

Intended Learning Outcomes:

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

- 1) identify problems that need regression models;
- 2) formulate regression models;
- 3) apply regression methods to solve problems;
- 4) analyze the appropriateness of regression methods and
- 5) implement regression methods via statistical software (Minitab).

Course Content:

Introduction to Regression; Applications of regression analysis; Steps in regression analysis; Simple Linear Regression; Parameter estimation; Interpretation of regression coefficients; Properties of least squares estimators; test of hypotheses; Confidence intervals; Predictions; Measuring the quality of fit; Regression line through the origin; Model Adequacy Checking; Residual analysis; Multiple Linear Regression; Matrix notations; Parameter estimation; Interpretation of regression coefficients; Test of hypotheses; Confidence intervals/region; Prediction; Introduction to Multicollinearity; Qualitative Variables as Predictors; Introduction to Variable Selection Procedures; Form a model using Minitab statistical package.

Scope and Schedule of Teaching - Learning Activities:

Session No.	Topic / Sub Topic	No. of Hrs.			Teaching Method	Assessment Criteria	ILO Alignment
		T	P	IL			
1	1 Introduction to Regression 1.1 Introduction 1.2 Regression vs Correlation 1.3 Applications of regression	2	0	4	Lecture / Handout 1		-
2	1.4 Uses of Regression 2 Simple Linear Regression 2.1 SLR model	2	0	4	Lecture / Handout 1-2		-
3	2.2 Parameter Estimation 2.3 Important Features of the Model 2.4 Meaning of Regression Parameters	2	0	2	Lecture / Handout 2		1,2,3
4	2.5 Point estimators 2.6 Example 3 Normal Error Regression Model 3.1 Methods of Maximum Likelihood	2	2	2	Lecture / Handout 2-3		1,2,3,4
5	3.2 Sampling Distributions 3.3 CI for Regression Parameters 3.4 Hypothesis testing	2	2	4	Lecture / Handout 3		1,2,3,5
6	3.5 FA 1 4 Prediction of New Observation 4.1 Interval Estimation of $E[Y_h]$ 4.2 Sampling distribution of h	2	2	2	Lecture / Handout 3-4	10% of final mark	1,2,3,4,5
7	4.3 Prediction of New Observation 5 ANOVA approach to Regression 5.1 Partitioning of Total Sum of Squares 5.2 ANOVA Table	2	0	2	Lecture / Handout 4-5		1,2,3,4
8	5.3 Coefficient of Determination 5.4 Example 6 Model Diagnostic 6.1 Residuals	2	2	4	Lecture / Handout 5-6		1,2,3,4,5
9	6.2 Assumption Violation 6.3 Outliers 7 Lack of fit 7.1 Introduction 7.2 Notation	2	4	4	Lecture / Handout 6-7		1,2,3,4,5
10	7.3 LoF test 8 Matrix Approach to SLR 8.1 Matrix form of SLR	2	0	4	Lecture / Handout 7-8		1,2,3,4
11	8.2 Matrix derivatives 8.3 ANOVA 8.4 FA 2	2	0	4	Lecture / Handout 8	10 % of final mark	1,2,3,4
12	8.3 Fitted Values and Residuals 9 Multiple Linear Regression 9.1 Model with p Predictors	2	0	4	Lecture / Handout 8-9		1,2,3,4

13	9.2 Matrix approach 9.3 ANOVA Result 9.4 Inference about Parameters	2	2	4	Lecture / Handout 9		1,2,3,4,5
14	10 Regression with Qualitative variables 6.1 Indicator Variable 6.2 Models with Indicators	2	0	4	Lecture / Handout 10		1,2,3,4
15	11 Practical session	0	6	4	Lecture / Lab	10% of final mark	1,2,3,4,5
<i>Total</i>		28	20	52			

Linking Program Outcomes with ILOs:

Program Learning Outcomes:

1. Demonstrate competency in theoretical knowledge and practical and/or technical skills in respective subject areas.
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 judgments 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	***	**	*	**	*	*	***

*** - Strongly Linked; ** - Medium linked; * Weakly linked

Mode of Assessment:

Formative Assessment (FA): FA1 10% + FA2 10%: Computer Practicals 10% = 30% of Total Marks

Summative Assessment (SA): End Semester Examination: 2-hour paper covering = 70% of Total Marks

References

Introduction to Linear Regression Analysis – Douglas C. Montgomery and Elizabeth A. Peak

Applied Linear Statistical Models – John Neter, Micheal H. Kutner, Chris J. Nachtsheim, William Li