Name of the program:	Postgraduate Certificate program in Applied Statistics		
Department:	Department of Statistics		
Semester:	Semester 1 – 2022 February		
Course Code:	STA 506 2.0		
Course Name:	Linear Regression Analysis		
Credit Value:	2.0		
Core/Optional	Core		
Hourly Breakdown	**Theory**	**Practical**	**Independent Learning**
	20	10	70

Course Aim/Intended Learning Outcomes:

- ❑ Formulate a linear regression model.
- ❑ Define model assumptions.
- ❑ Explain how the method of least squares is used to estimate the parameters in linear regression model.
- ❑ Analyse residuals to determine whether the regression model is adequately fit for the data.
- ❑ Validate regression assumptions.
- ❑ Test statistical hypotheses and construct confidence intervals on regression model parameters.
- ❑ Use the regression model to predict a future observation and to construct an appropriate prediction interval for the future observation.
- ❑ Use transformations in regression analysis if needed.
- ❑ Use indicator variables to model qualitative regressors.
- ❑ Use stepwise regression and other model building techniques to select the appropriate set of variables for a regression model.
- ❑ Conduct regression analyses using R software.
- ❑ Interpret results of regression outputs.

Course Content: (Main topics, Sub topics)

- Introduction to regression
  - Terminologies
  - Correlation
  - Parametric modelling vs Nonparametric modelling
  - Uses of regression
- Simple linear regression
  - Simple linear regression model
  - Least-squares estimation of the parameters

- Model adequacy checking
- Hypothesis testing on the slope and intercept
- Interval estimation
- F-test for significance of regression
- Prediction of new observations
- Regression through origin

- Multiple linear regression
  - Multiple linear regression model
  - Estimation of the model parameters
  - Residual analysis
  - Test for significance of regression
  - Tests on individual regression coefficients
  - Extra-sum-of-squares method
  - Confidence intervals in multiple regression
  - Prediction of new observations
- Transformation of variables
  - Variance-stabilizing transformations
  - Transformations to linearize the model
  - Analytical methods for selecting transformations
- Lack of fit of regression model
  - Pure error
  - Model-independent measures of pure error
  - Lack-of-fit test
- Weighting to correct model inadequacies
  - Generalized least squares
  - Weighted least squares
- Diagnostics for leverage and influence
  - Leverage
  - Measures of influence
  - Treatment of influential observations
- Regression with qualitative variables
  - Dummy variables
  - Interaction term involving dummy variables
- Variable selection procedures
  - All possible regression
  - Forward selection procedure
  - Backward elimination procedure
  - Stepwise method

- Multicollinearity
  - Multicollinearity diagnostics
  - Treatment for dealing with multicollinearity
- Bootstrapping in regression
  - Bootstrap sampling in regression

Teaching /Learning Methods: Lectures and Student-centered teaching-learning methods
Mode of Delivery:
All lectures will be delivered using online teaching methods. Discussion/practical sessions and mid/final exams will be held in the University.

Semester Schedule for the course:
Week 1-4: Lectures (online)
Week 5-6: Discussion/practical (in class)
Week 7: Mid exam (in class)
Week 8-12: Lectures (online)
Week 13-14: Discussion/practical (in class)
Week 15: Revision (in class)
Week 16: Study leave
Week 17-18: Final exam (in class)

Detailed schedule is available here:
https://thiyanga.netlify.app/courses/regression2020/contentreg/

Assessment Strategy:

Continuous Assessment			Final Assessment		
30%			70%		
quizzes %	mid-term %	other % (specify)	Theory (%)	Practical (%)	Other (%) (specify)
0%	100%	0%	90%	10%	0%

References/Reading Materials:

- D. Montgomery and E. Peck, Introduction to Linear Regression Analysis, Wiley, 2012 ISBN: 978-0-470-54281-1
- Michael Kutner, Christoper Nachtsheim, John Neter, William Li, Applied Linear Statistical Models, Wiley ISBN-13: 978-0073108742
- Course website: https://thiyanga.netlify.app/courses/