

<b>Name of the program:</b>	Postgraduate Certificate program in Applied Statistics		
<b>Department:</b>	Department of Statistics		
<b>Semester:</b>	Semester 1 - 2020		
<b>Course Code:</b>	STA 506 2.0		
<b>Course Name:</b>	Linear Regression Analysis		
<b>Credit Value:</b>	2.0		
<b>Core/Optional</b>	Core		
<b>Hourly Breakdown</b>	<b>Theory</b>	<b>Practical</b>	<b>Independent Learning</b>
	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, Christopher Nachtsheim, John Neter, William Li, Applied Linear Statistical Models, Wiley ISBN-13: 978-0073108742
- ☐ Course website: <https://thiyanga.netlify.app/courses/regression2020/>