DS801 **REGRESSION ANALYSIS** **3-0-0-3**

Course outcome / Learning Objectives: A conceptual and practical introduction to the basic concepts and techniques of regression analysis:
1. Learn how to apply linear regression models in practice: identify situation where linear regression is appropriate; build and fit linear regression models with software; interpret estimates and diagnostic statistics; produce exploratory graphs.
2. Learn about the theory underlying point estimation, hypothesis and confidence intervals for linear regression models.

Simple linear regression: Examples of simple linear regression; Interpretation of parameters; Estimation of the slope and the intercept in simple linear regression; Sampling properties of estimates. Theory of point estimation: least squares, maximum likelihood, method of moments; Confidence Intervals for parameters in simple linear regression.

Multiple linear regression: Design matrix; Interpretation and estimation of parameters; Multicollinearity; Hypothesis tests: t-test, F-test, Likelihood-ratio test; Weighted least-squares.

Residuals and their analysis: Assessing goodness-of-fit, normality, homogeneity of variances, detection of outliers and influential observations; Diagnostic plots for linear regression models.

Model selection: Mallow's Cp, AIC, BIC, R-squared, subset selection of independent variables, transformation of dependent and independent variables, multicollinearity, principal component regression, ridge-regression, Lasso.

Logistic Regression: Statistical models for binary data; Interpretation of odds and odds ratios; Maximum likelihood estimation in logistic regression; Deviance, Residual analysis for logistic regression.

TEXT BOOKS / REFERENCES:
1. G. Seber and A. Lee "Linear Regression Analysis", Second Edition, Wiley, 2003.
2. A. Dobson and A. Barnett, "An Introduction to Generalized Linear Models", Third Edition, Chapman and Hall/CRC, 2008.
3. N. Draper and H. Smith, "Applied Regression Analysis", Third Edition, Wiley, 1998.
4. J. Fox, " Applied Regression Analysis, Linear Models and Related Methods", Sage, 1997.
5. C. Rao and H. Toutenburg, "Linear Models: Least Squares and Alternatives", Second Edition, Springer, 1999.