**STA 2402 GENERALIZED LINEAR MODELS** (45 Contact Hours)

Pre-Requisites:
STA 2408: Regression Modelling II

(a) **Course Purpose**
This course provides the fundamental concepts of a generalised linear model (GLM), and describes how a GLM may apply.

(b) **Learning outcomes**
By the end of this course the student should be able to;

(1) Describe the principles of Multiple Linear Regression and the Normal Linear Model.

(2) Define an exponential family of distributions and show that the binomial, Poisson, exponential, gamma, normal can be written in this form.

(3) State the mean and variance for an exponential family, and define the variance function and the scale parameter. Derive these quantities for the distributions.

(4) Define the link function and the canonical link function.

(5) Describe the linear predictor, illustrating its form for simple models, including polynomial models and models involving factors.

(6) Define the deviance and scaled deviance and state how the parameters of a GLM may be estimated.

(7) Describe how a suitable model may be chosen by using an analysis of deviance and by examining the significance of the parameters.

(8) Define the Pearson and deviance residuals and describe how they may be used.

(9) Apply statistical tests to determine the acceptability of a fitted model.

(c) **Course Description**

Multiple Linear Regression and the Normal Linear Model. Exponential family of distributions and their properties;Binomial,poisson, gamma and normal distributions. Link and canonical functions. Variables and Polynomial models and deviances. Statistical tests: Pearson's Chi-square test and the Likelihood ratio test.

(d) **Teaching Methodology**
Lectures, Assignments, Tutorials, Demonstrations, Case Studies, Class presentation, Group discussion, Practical.

(e) **Instructional Material and Equipment**
Marker boards, markers, dusters, computers and LCD projector.

(f) **Course Assessment**
Assignments (5%), Group work (10%), CATs (15%), End of Semester Examination (70%).

(g) **Course Text Books**

[1] Barnett A., *An Introduction to Generalized Linear Models*, 3rd edition, Chapman & Hall, ISBN-13: 978-1584889502, 2008.

[2] Fox J., *Applied Regression Analysis and Generalized Linear Models*, 2nd edition, Sage publications, ISBN: 978-0761930426, 2008.

[3] Myers R., *Generalized Linear Models with Applications in Engineering and the Sciences*, 2nd edition, Wiley, ISBN-13: 978-0470454633, 2010.

(h) **Course Journals**

[1] International Journal of Mathematical Modeling, Simulations and Applications, ISSN: 0973-8355.

[2] International Journal of Statistics and Probability, ISSN: 1927-7032.

[3] Interactions in Generalized Linear Models, ISSN: 2076-0760.

[4] The Stata Technical Journal, ISSN: 1536-9734.

(i) **Reference Text Books**

[1] Rice J. A., *Mathematical Statistics and Data Analysis*, 3rd edition, International Thomson Publishing, ISBN: 978-0495109860, 2006.

[2] Garson G., *Generalized Linear Models & Generalized Estimating Equations*, Statistical Associates Publishers, ASIN: B009434OUQ, 2013.

[3] McCullagh P., *Generalized Linear Models*, 2nd edition, Chapman & Hall, ISBN: 978-0412317606, 1989.

(j) **Reference Journals**

[1] Methodology and computing in applied probability, ISSN: 1387-5841.

[2] Journal of Statistical Computation and Simulation, ISSN: 0094-9655.

[3] Brazilian Journal of Probability and Statistics, ISSN: 0103-0752.