24CO804 ADVANCED APPLIED STATISTICS FOR RESEARCH 3 1 0 4

Course Description:

In this class, we will cover the following aspects:

General Linear Model includes several different statistical models: ANCOVA-one way, two-way, three-way, ANOVA-one way, two-way, three way repeated and mixed methods.

Hypothesis tests using a general linear model can be performed in two ways: as multivariate tests or as multiple independent univariate tests. The General Linear Model and the General Linear Model (GLM) are two commonly used families of statistical methods.

Commonly used models in the GLM family include binary logistic regression for binary or dichotomous outcomes, Poisson regression for count outcomes, and linear regression for continuous, normally distributed outcomes. GZLM-Probit Regression, GZLM-Poisson Log Linear analysis, Generalized Linear Mixed Models, Introduction to Mixed Model, Linear Mixed Models, Generalized Linear Mixed Models, Mixed Models with Random Effects.

Introduction to SmartPLS and its applications, Structural Equation Modelling-Principles and its Purpose of application, Importing data and getting started with SmartPLS, Basic Structural Equation Modelling, Construction and Validation of SEM Model, path analysis, Confirmatory Factor Analysis, Exploring Reliability, Validity and PLS Algorithms, Introduction to Moderation and Mediation, Evaluating Moderation Effect, Measuring Mediating Effect, Running Importance Performance Map Analysis, Multi Group Analysis (MGA),Confirmatory Tetrad Analysis, Confirmatory Composite Analysis (CCA)

Applied statistics is the basis of data analysis, and the practice of applied statistics involves the analysis of data to help define and determine the needs of an organization. The purpose of this course work is to explain applied statistics especially using second generation - Multivariate analysis (MVA). It is based on the principles of multivariate statistics. MVA is typically used in situations where multiple measurements are taken for each test object and the relationships between those measurements and their structures are important. Contemporary overlapping MVA classifications include: Normal and General Multivariate Models and Distribution Theory, Study and Measurement of Associations, Study of Data Structures and Patterns

Multivariate Analysis of the desire to add physics-based analysis to calculate the effects of variables in a hierarchical “system-of-system”. Often studies that want to use multivariate analysis stop because of the dimension of the problem. These problems are often mitigated by the use of surrogate models, which are very accurate approximations of the physics-based code. Because surrogate models are in equation form, they can be estimated very quickly.

Prerequisites: This course is intended for doctoral candidates with basic knowledge on applied statistics using SPSS. There are no formal prerequisites, but research scholars are expected to be familiar with basic descriptive and inferential statistics.

Course Learning Objectives:

1. Provide skills in experimental design and hypothesis testing to conduct rigorous research. Develop a critical thinking accurately interpret and criticize statistical results.
2. Train on advanced statistical models.
3. Promotes interdisciplinary collaboration in the use of Advanced statistical methods to solve real-world problems.
4. Prepare researchers to independently conduct high-quality statistical research and advance in their fields.

Course Outcomes :

CO 1 : Learn theoretical aspects as well as advanced statistical methods through statistics tools.
CO 2 : Apply expertise of advanced statistical methods for understanding & examining relationships.
CO 3 : Apply advanced statistical methods within their own field of research

3. Course Policies

This course is mainly focusing on the application of the advanced multivariate statistical techniques using SPSS and Smart PLS. Every class will be hands on practical class blended with the concept, purpose, rules and procedures of applying each statistical technique using respective software. Every research scholar is expected to apply and perform each statistical techniques and to explore the interpretation with managerial Implications.

Attendance: Regular attendance is obligatory for all classes. Absences should be communicated earlier.

Participation: Active participation in discussions, critical reviews on research papers, and hands-on practical experience is important for reinforcing your learning experience.

Peer Learning: Peer learning while applying statistical techniques in the research concepts is warranted.

Syllabus :

Unit I

Introduction to Hierarchical Regression -Binomial Logistic Regression- Ordinal Regression-Multinominal Regression-Generalized Linear Model (GZLM), GZLM-Probit Regression, GZLM-Poisson Log Linear analysis, Generalized Linear Mixed Models

Unit II

Introduction to Mixed Model, Linear Mixed Models, Generalized Linear Mixed Models, Mixed Models with Random Effects, General Linear Method (GLM): ANOVA repeated measures one way, two way and three way, ANOVA mixed method models one way, two way and three way, ANCOVA one way, two way and three way

Unit III

Introduction to SmartPLS and its applications, Structural Equation Modelling-Principles and its Purpose of application, Importing data and getting started with SmartPLS, Basic Structural Equation Modelling

Unit IV

Construction and Validation of SEM Model, path analysis, Confirmatory Factor Analysis, Exploring Reliability, Validity and PLS Algorithms

Unit V

Introduction to Moderation and Mediation, Evaluating Moderation Effect, Measuring Mediating Effect, Running Importance Performance Map Analysis, Multi Group Analysis (MGA),Confirmatory Tetrad Analysis, Confirmatory Composite Analysis (CCA)

TEXT BOOKS / REFERENCES:

1. James Latting, J.Douglas Cavvol and Paul E Green, Analysing multivariable Data, Thomsom, Fivol. Indian Reprint, 2007.
2. Richard A. Johnson and Dean W.Wichern, Applied Multivariable statistical analysis, Pearson, 5th edition.
3. Multivariate Data Analysis Paperback – Import, 13 February 2009, by Joseph F. Hair Jr (Author), William C. Black (Author), Barry J. Babin (Author).
4. P., Field, Andy (2018-01-15). Discovering statistics using IBM SPSS statistics. Sage,· P., Field, Andy (2016-06-16).
5. Ketchen Jr, D. J. 2013. "A Primer on Partial Least Squares Structural Equation Modeling." Long Range Planning 46 (1–2): 184-185.
6. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (3e). Thousand Oaks, CA: Sage.
7. Lohmöller, J.-B. (1989). Latent Variable Path Modeling with Partial Least Squares. Heidelberg: Physica.

Evaluation Pattern :

Continuous Evaluation (MM 20)	Mid-term Exam (MM: 50)	Final Exam (MM:100)
20	30	50