DE LA SALLE UNIVERSITY - MANILA
COLLEGE OF SCIENCE
Mathematics Department

SYLLABUS

COURSE CODE: MSS515M

COURSE TITLE: Introduction to the Theory of Linear Models

CLASS DAY & TIME:

ROOM:

NAME OF FACULTY:

COURSE CREDIT: 3 units

CONTACT NO. (DEPT):   536-0270, 524-4611, loc. 420

TERM/SCHOOL YEAR:

COURSE DESCRIPTION

A course on linear models, estimation and test of hypothesis in both the full and less than full rank models.

COURSE OBJECTIVES

The students will:
1. explain the motives behind using linear models;
2. differentiate between least squares and maximum likelihood estimation procedures;
3. implement simple and multiple regression models in conjunction with model checking procedures;
4. interpret all statistical results derived from all procedures related to regression;
5. exhibit values such as:

    5.1 cooperation through group study;

    5.2 honesty by claiming credit only for the work he has done;

    5.3 zeal and seriousness of intent to learn by participating actively in class discussion, doing his homework regularly and consulting his mentor;

    5.4 patience, perseverance and diligence by solving assigned exercise completely including the difficult ones;

    5.5 faith by doing what is right and giving his best in performing any assigned task;

    5.6 self-reliance by being able to solve problems independently.

Topic/ Subtopic	Learning Strategies /Activities	Week/ Meeting
1. Introductory Concepts 1.1 Elementary Matrix Operations 1.2 Inverses of Matrices 1.3 Eigenvalues and Rank	Lecture Facilitated group discussion Problem solving	
2. Quadratic Forms and their Distributions 2.1 Quadratic Forms 2.2 Expectations and Variances of random vectors and matrices 2.3 Distribution of Some Special Quadratic Forms 2.4 Independence	Lecture Facilitated group discussion Problem solving	
3. Estimation in the Full Rank Model 3.1 Formulation of the Full Rank Model 3.2 Least Squares Estimation of Model Parameters 3.3 Estimating the Variance 3.4 Maximum Likelihood Estimation 3.5 Interval Estimation of the Coefficients and of Linear Functions of the Coefficients 3.6 Joint Confidence Region on the Regression Coefficients 3.7 Generalized Least Squares	Lecture Facilitated group discussion Problem solving	
4. Hypothesis Testing in the Full Rank Model 4.1 Testing for Model Adequacy 4.2 Hypothesis Tests on Subvectors 4.3 Partial and Sequential Tests 4.4 An Alternative Apporoach to Hypothesis Tests on Subvectors 4.5 The General Linear Hypothesis 4.6 Orthogonality	Lecture Facilitated group discussion Problem solving	
5. Estimation in the Less Than Full Rank Model 5.1 Conditional Inverses 5.2 Reparameterization 5.3 Estimability 5.4 Interval Estimation	Lecture Facilitated group discussion Problem solving	
6. Hypothesis Testing in the Less Than Full Rank Model 6.1 Hypothesis Testing in a General Setting 6.2 Reparameterization 6.3 Some Less Than Full Rank Models	Lecture Facilitated group discussion Problem solving	
7. Additional Topics 7.1 Analysis of Covariance 7.2 Random Effects Models 7.3 Generalized Linear Models	Lecture Facilitated group discussion Problem solving	

TEACHING STRATEGIES/METHODOLOGY
1. Lecture
2. Report
3. Computer Hands-on Exercises using SAS

REQUIREMENTS OF THE COURSE
1. Examinations / Reports
2. SAS outputs with discussions
3. Learning Output – critique of a paper
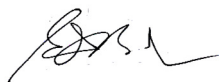4. Problem Sets

REFERENCES

- Bapat, R. B. (2012) Linear algebra and linear models. New Delhi: Hindustan Book Agency/Springer.
- Christensen, R. (2011). Plane answers to complex questions [electronic resource]: The theory of linear models. New York, NY: Springer New York.
- Draper, N.P., & Smith, H. (1998). Applied regression analysis (3rd ed.). New York: Wiley.
- Freedman, D. (2009). Statistical models: theory and practice. Cambridge: Cambridge University Press.
- Graybill, F. A. (1976). Theory and Application of the Linear Model. Duxbury Press.
- Kahane, L. H. (2008). Regression basics. Los Angeles: Sage Publications.
- Montgomery, D.C. & Peck, E.A. (1992). Introduction to linear regression analysis (2nd ed.). New York: Wiley.
- Myers, Raymond H., and J.S.Milton. (1991) . A First Course in the Theory of Linear Statistical Models. Duxbury Advanced Series in Statistics and Decision Sciences. PWS-KENT Publishing Company, Boston, USA. 342p.
- Neter, J., Kutner, M., Wasserman, W., & Nachtsheim, C. (1996). Applied linear regression models (3rd ed.). Chicago: Irwin.
- Searle, S. (1971). Linear Models. N.Y.: Wiley
- Yan, X. (2009). Linear regression analysis: theory and computing. Hackensack, NJ: World Scientific.

FACULTY OUTPUT

- Arcilla, R., Co, F. and Ocampo, S. (2011). "Correlates of Poverty: Evidence from the Community-Based Monitoring System (CBMS) Data". DLSU Business and Economics Review, Vol. 20, No. 2, January 2011, pp. 33-43 (ISSN 0116-7111, http://www.philjol.info/philjol/index.php/BER/article/view/1912).
- Beltrano, Elline Jade, Leong, Robert Neil F., and Co, Frumencio F. (2013). Regression Analyses of the Philippine Birth Weight Distribution. The Philippine Statistician, 62(2), 31-52.
- Carandang, J. and Co, F. (2012). "Some factors affecting the student evaluation ratings of Biology faculty at DLSU". Proceedings of the 3rd International DLSU Education Congress, DLSU College of Education, Manila, September 2012.
- Co, F., Arcilla, R., and Ocampo, S. (2012). "Correlates of Hunger: Evidence from the CBMS Data of Pasay City". Proceedings of the 2012 Philippine Statistical Association Annual Conference, Quezon City, August 2012.

- Janairo, J.I.B., Janairo, G.C., Yu, D.E.C. and F. Co. (2010). "Regression Analysis on the Chemical Descriptors of a Selected Class of DPP4 Inhibitors". Studies in Mathematical Sciences, Vol. 1, No. 1, 2010, pp. 01-06 (ISSN 1923-8444-Print; ISSN 1923-8452 – Online, www.cscanada.net).
- anairo, J.I.B., Janairo, G.C., Yu, D.E.C. and F. Co. (2011). **"**Assessing the Binding Affinity of a Selected Class of DPP4 Inhibitors using Chemical Descriptor-Based Multiple Linear Regression". Orbital (The Electronic Journal of Chemistry), Vol. 3, No. 1, January – March 2011, pp. 01-06 (ISSN 1984-6428 , http://www.orbital.ufms.br/inpress/inpress.htm).

- Ocampo, S., Arcilla, R., Co, F., Jumangit, R. and F. J. Diokno. (2011). "Exploring Latent Factors Using Non-Bayesian and Bayesian Factor Analyses". Proceedings of the DLSU Science and Technology Congress, DLSU, Manila, February 2011.
- Ocampo, S., Arcilla, R., Co, F., Jumangit, R. and F.J. Diokno. (2013). "Enthusing students towards statistical literacy using transformative learning paradigm: Implementation and Appraisal" . Proceedings of the 2013 IASE/IAOS Conference, IASE/IAOS, Hong Kong/Macau, China, August 2013.

Noted by

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