



DE LA SALLE UNIVERSITY - MANILA
COLLEGE OF SCIENCE
Mathematics Department

SYLLABUS

COURSE CODE: MSS603M
 COURSE TITLE: Multivariate Analysis
 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

This course aims to present an overview of the theory and application of multivariate methods. Specifically, this course deals with principal component analysis, factor analysis, cluster analysis, multi-dimensional scaling, multivariate analysis of variance, discriminant analysis, canonical correlation analysis, and other multivariate techniques.

PREREQUISITES:

Theory of Statistical Inference and Introduction to the Theory of Linear Models

COURSE OBJECTIVES

- Appreciate multivariate statistical methods and the importance of their underlying assumptions that are needed for their appropriate use
- Demonstrate how multivariate statistical methods are used in modeling and decision making using real life situations
- Be aware of the proper uses and applications of multivariate methods in many other fields such as business, finance, economics, social science, psychology, biology, medicine, and engineering, among others
- Exhibit values like:
 - cooperation through group study;
 - honesty by claiming credit only for the work he has done;
 - patience, perseverance and diligence
 - faith by doing what is right and giving his best in performing any assigned task;
 - self-reliance by being able to solve problems independently.

Topic/ Subtopic	Learning Strategies /Activities	Week/ Meeting
1. Preliminaries 1.1 Some Basic Concepts of Multivariate Analysis 1.2 Types of Multivariate Techniques	Lecture Class Discussion	6 Hours

Topic/ Subtopic	Learning Strategies /Activities	Week/ Meeting
1.3 Multivariate Normal Distribution and its Properties 1.4 Hotelling's T^2 Distribution and its Properties 1.5 Diagnostics and Assumption Checking	Problem Set Computer Lab Exercises	
2. Principal Component Analysis 2.1 Description of Principal Component Analysis 2.2 Objectives of Principal Component Analysis 2.3 Assumptions of Principal Component Analysis 2.4 Applications of Principal Component Analysis		3 Hours
3. Factor Analysis 3.1 Description of Factor Analysis 3.2 Objectives of Factor Analysis 3.3 Assumptions of Factor Analysis 3.4 Deriving Factors and Assessing Overall Fit 3.5 Interpreting the Factors 3.6 Factor Scores 3.7 Applications of Factor Analysis		6 Hours
4. Cluster Analysis 4.1 Description of Cluster Analysis 4.2 Objectives of Cluster Analysis 4.3 Similarity/Dissimilarity Measures 4.4 Types of Clustering Techniques 4.5 Applications of Cluster Analysis		6 Hours
5. Multi-dimensional Scaling Analysis 5.1 Description of Multi-dimensional Scaling 5.2 Objectives of Multi-dimensional Scaling 5.3 Applications of Multi-dimensional Scaling		3 Hours
6. Multivariate Analysis of Variance (MANOVA) 6.1 Description of MANOVA 6.2 Objectives of MANOVA 6.3 Assumptions of MANOVA 6.4 One-Way and Two-Way MANOVA 6.5 Post-Hoc Analysis		6 Hours
7. Discriminant Analysis 7.1 Description of Discriminant Analysis 7.2 Objectives of Discriminant Analysis 7.3 Assumptions of Discriminant Analysis 7.4 Linear & Quadratic Discriminant Functions 7.5 Applications of Discriminant Analysis		6 Hours
8. Canonical Correlation Analysis 8.1 Objectives of Canonical Correlation Analysis 8.2 Assumptions of Canonical Correlation Analysis 8.3 Canonical Functions 8.4 Applications of Canonical Correlation Analysis		3 Hours

Topic/ Subtopic	Learning Strategies /Activities	Week/ Meeting
Final Output		3 Hours

TEACHING STRATEGIES/METHODOLOGY

1. Lecture
2. Report
3. SAS Exercises

REQUIREMENTS OF THE COURSE

1. Examinations / Reports
2. SAS outputs with discussions
3. Learning Output – critique of a paper

TEXTBOOKS

- Everitt, Brian and Hothorn, Brian. (2011). *An Introduction to Applied Multivariate Analysis with R* [electronic resource]. New York, NY: Springer New York.
- Fichet, Bernard, Piccolo, Domenico, Verde, Rosanna, and Vichi, Maurizio. (2011). *Classification and Multivariate Analysis for Complex Data Structures* [electronic resource]. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Grissom, Robert J. and Kim, John J. (2012). *Effect Sizes for Research: Univariate and Multivariate Applications*. New York : Routledge.
- Hair, Black, Babin, Anderson and Tatham. (2010). *Multivariate Data Analysis: A Global Perspective*, 7th edition. New York: Pearson.
- Hardle, W. and Simar, L. (2012). *Applied Multivariate Statistical Analysis*, 3rd ed. Springer.
- Stevens, James P. (2009). *Applied Multivariate Statistics for the Social Sciences*. New York: Routledge.
- Wehrens, Ron (2011). *Chemometrics with R* [electronic resource]: *Multivariate Data Analysis in the Natural Sciences and Life Sciences*. Berlin, Heidelberg: Springer Berlin Heidelberg.

REFERENCES

- Johnson, Richard, A. and Wichern, Dean, W. (2007). *Applied Multivariate Statistical Analysis*. (6th Edition). Upper Saddle River, N.Y.: Pearson/Prentice Hall.
- Levin, Joel R., and Marascuillo, Leonard, A. (1983). *Multivariate Statistics in the Social Sciences*. Monterey, Calif: Brook/ Cole Publishing.
- Morrison, Donald F. (2004). *Multivariate Statistical Methods*, 4th edition. Duxbury Press.
- Sharma, Subhash (1996), *Applied Multivariate Techniques*. N.Y.: John Wiley and Sons, Inc.
- Timm, Neil, H. (2002). *Multivariate Analysis*, (1st Edition). Springer.
- Montgomery, Douglas C. (2009). *Design and Analysis of Experiments*, 7/e. New York: Wiley.

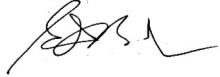
- StatSoft, Inc. Electronic Statistics Textbook. Tulsa, OK: StatSoft. Web: <http://www.statsoft.com/textbook/>.
- Lock, R. WWW Resources in teaching Statistics from <http://it.stlawu.edu/~rlock/tise98/onepage.html>.

FACULTY OUTPUT

- Janairo, Jose Isagani B., Co, Frumencio F., Carandang VI, Jose Santos R., and Amalin, Divina M. (2015). Sequence-dependent cluster analysis of biomineralization peptides. *Zeitschrift Fur Naturforschung C (A Journal of Biosciences)*, 70(7-8)c, pp. 191-195. ISSN 0939-5075.
- Palisoc, Shirley T., Natividad, Michelle T., Co, Frumencio F., and Kaw, Kevin Anthony Y. (2015). Morphological, thickness and electrochemical analyses of spin-coated $[\text{Ru}(\text{NH}_3)_6]^{3+}$ /Nafion films. *Optoelectronics And Advanced Materials – Rapid Communications*, Vol. 9, No. 7-8, July – August 2015, p. 1010 – 1013.
- Abolencia, Jesper L., Quipit Jr., Ananias G., Leong, Robert Neil F., and Co, Frumencio F. (2015). Ordinal Regression Analyses of Breastfeeding Duration in the Philippines. *International Journal of Philippine Science and Technology*, 8(1), 22-26.
- Angkiko, Lorraine Christelle B., Diaz, Priscilla A., Robert Neil F., and Co, Frumencio F. (2014). Biosurveillance of Measles using Control Charts: A Case Study using National Capital Region Laboratory Confirmed Measles Counts from January 2009 to January 2014. *The Philippine Statistician*, 63(2), 31-49.
- Chan, Lailani D., Putong, Ilene Renee L., and Co, Frumencio F. (2014). Analysis of an SEIRS Compartmental Model for Tuberculosis in Quezon City from 2007 to 2011. *The DLSU Mathematics Inbox*, 1(2), 67-79.
- 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.
- Arcilla, R., Co, F., Ocampo, S., and Tresvalles, R. (2013). *Statistical Literacy for Lifelong Learning*. Abiva Publishing
- Ocampo, S., Arcilla, R., Co, F., Jumangit, R., and Diokno, F. (2013). Enthusing students towards statistical literacy using transformative learning paradigm: Implementation and Appraisal. *2013 IASE/IAOS Conference Proceedings*, IASE/IAOS, Hong Kong/Macau, China, August 2013.
- Carandang, J. and Co, F. (2012). Some factors affecting the student evaluation ratings of Biology faculty at DLSU. *3rd International DLSU Education Congress Proceedings*, DLSU College of Education, Manila, September, 2012, ISSN 2244-0151.
- Co, F., Arcilla, R., and Ocampo, S. (2012). Correlates of Hunger: Evidence from the CBMS Data of Pasay City. *Proceedings of the 2012 PSA Annual Conference*, Philippine Statistical Association, Quezon City, August 2012
- Ocampo, S., Arcilla, R., Co, F., Jumangit, R. and Diokno, F. J. (2011). Exploring Latent Factors Using Non-Bayesian and Bayesian Factor Analyses. *DLSU Science and Technology Congress Proceedings*, DLSU, Manila, February 2011.
- Janairo, Jose Isagani B., Janairo, Gerardo C., Co, Frumencio F., and Yu, Derrick Ethelbert C. (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. 15-23 (ISSN 1984-6428 , <http://www.orbital.ufms.br/inpress/inpress.htm>).
- Janairo, Jose Isagani B., Co, Frumencio F., Janairo, Gerardo C., and Yu, Derrick Ethelbert C. (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).
- 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>).
- Acelajado, M., Beronque, Y., and Co, F. (2007). *Algebra: Concepts and Processes, 3rd edition*. National Book

Store. ISBN 971-08-6580-3.

Noted by

A handwritten signature in black ink, appearing to read 'Isagani B. Jos', written in a cursive style.

Dr. Isagani B. Jos
Chair, Department of Mathematics

Dr. Jose Santos R. Carandang VI
Dean, College of Science