Tamkang University Academic Year 107, 2nd Semester Course Syllabus

Course Title	MULTIVARIATE ANALYSIS	Instructor	PAI-LING LI
Course Class	TLXDM1A MASTER'S PROGRAM IN BIG DATA ANALYTICS AND BUSINESS INTELLIGENCE, 1A	Details	◆ Selective ◆ One Semester ◆ 3 Credits

Departmental Aim of Education

Ⅰ. Cultivate students with ability to conduct research on statistical theory.

Ⅱ. Cultivate students with ability for statistical programming.

Ⅲ. Cultivate students to become statistical professionals with management capabilities.

Ⅳ. Cultivate students with international perspectives.

Departmental core competences

A. Ability to conduct research of statistical theory.

B. Data analysis skills.

C. Ability to acquire interdisciplinary knowledge.

D. Logical thinking ability.

E. Statistical consulting ability.

Course Introduction	This course introduces fundamental concepts of analyzing multivariate data, including basic multivariate statistical inferences, principal components analysis, factor analysis, canonical correlation analysis, classification and cluster analysis etc. In addition to basic ideas and theoretical results, practical applications of statistical software are also illustrated by examples.

The Relevance among Teaching Objectives, Objective Levels and Departmental core competences

I.Objective Levels (select applicable ones) :
  (i) Cognitive Domain   : C1-Remembering,   C2-Understanding,   C3-Applying,
                           C4-Analyzing,   C5-Evaluating,   C6-Creating
  (ii) Psychomotor Domain : P1-Imitation,   P2-Mechanism,   P3-Independent Operation,
                           P4-Linked Operation, P5-Automation,   P6-Origination
  (iii) Affective Domain : A1-Receiving,   A2-Responding,   A3-Valuing,
                           A4-Organizing,   A5-Charaterizing,   A6-Implementing

II.The Relevance among Teaching Objectives, Objective Levels and Departmental core competences :
  (i) Determine the objective level(s) in any one of the three learning domains (cognitive,
      psychomotor, and affective) corresponding to the teaching objective. Each objective should
      correspond to the objective level(s) of ONLY ONE of the three domains.
  (ii) If more than one objective levels are applicable for each learning domain, select the
      highest one only. (For example, if the objective levels for Cognitive Domain include
      C3,C5,and C6, select C6 only and fill it in the boxes below. The same rule applies to
      Psychomotor Domain and Affective Domain.)
  (iii) Determine the Departmental core competences that correspond to each teaching objective.
      Each objective may correspond to one or more Departmental core competences at a time.
      (For example, if one objective corresponds to three Departmental core competences: A,AD,
      and BEF, list all of the three in the box.)

No.	Teaching Objectives	Relevance	
		Objective Levels	Departmental core competences
1	Students are able to explain fundamental concepts in multivariate data analysis.	C2	A
2	Students are able to use statistical methods to analyze multivariate data.	C4	ABD
3	Students are able to implement multivariate data analysis packages of the statistical softwares.	C3	ABD
4	Students are familiar with the theoretical results.	C2	AD

Teaching Objectives, Teaching Methods and Assessment

No.	Teaching Objectives	Teaching Methods	Assessment
1	Students are able to explain fundamental concepts in multivariate data analysis.	Lecture, Discussion	Written test, Report, Participation, Exercises
2	Students are able to use statistical methods to analyze multivariate data.	Lecture, Discussion	Written test, Report, Participation, Exercises
3	Students are able to implement multivariate data analysis packages of the statistical softwares.	Lecture, Practicum	Written test, Report, Participation, Exercises
4	Students are familiar with the theoretical results.	Lecture, Discussion	Written test, Report, Participation, Exercises

This course has been designed to cultivate the following essential qualities in TKU students	
Essential Qualities of TKU Students	Description
◇ A global perspective	Helping students develop a broader perspective from which to understand international affairs and global development.
◆ Information literacy	Becoming adept at using information technology and learning the proper way to process information.
◇ A vision for the future	Understanding self-growth, social change, and technological development so as to gain the skills necessary to bring about one's future vision.
◇ Moral integrity	Learning how to interact with others, practicing empathy and caring for others, and constructing moral principles with which to solve ethical problems.
◆ Independent thinking	Encouraging students to keenly observe and seek out the source of their problems, and to think logically and critically.
◇ A cheerful attitude and healthy lifestyle	Raising an awareness of the fine balance between one's body and soul and the environment; helping students live a meaningful life.
◆ A spirit of teamwork and dedication	Improving one's ability to communicate and cooperate so as to integrate resources, collaborate with others, and solve problems.
◇ A sense of aesthetic appreciation	Equipping students with the ability to sense and appreciate aesthetic beauty, to express themselves clearly, and to enjoy the creative process.

Course Schedule

Week	Date	Subject/Topics	Note
1	108/02/18 ~ 108/02/24	Course Introduction: Review of Vector and Matrix Algebra	
2	108/02/25 ~ 108/03/03	Basic Multivariate Statistical Concepts	
3	108/03/04 ~ 108/03/10	Multivariate Normal Distribution	
4	108/03/11 ~ 108/03/17	Multivariate Normal Distribution	
5	108/03/18 ~ 108/03/24	Inference about Mean Vectors	
6	108/03/25 ~ 108/03/31	Inference about Mean Vectors	
7	108/04/01 ~ 108/04/07	Inference about Mean Vectors	
8	108/04/08 ~ 108/04/14	Principal Components Analysis	
9	108/04/15 ~ 108/04/21	Principal Components Analysis	
10	108/04/22 ~ 108/04/28	Midterm Exam Week	
11	108/04/29 ~ 108/05/05	Factor Analysis	
12	108/05/06 ~ 108/05/12	Factor Analysis	

13	108/05/13 ~ 108/05/19	Canonical Correlation Analysis	
14	108/05/20 ~ 108/05/26	Canonical Correlation Analysis	
15	108/05/27 ~ 108/06/02	Discrimination and Classification	
16	108/06/03 ~ 108/06/09	Discrimination and Classification, Cluster Analysis	
17	108/06/10 ~ 108/06/16	Cluster Analysis	
18	108/06/17 ~ 108/06/23	Final Exam Week	

Requirement	1. Undergraduate education in Statistics, Linear Algebra, and Calculus. 2. Ability of using statistical software such as SAS or R. 3. Your grade will be determined by personal performance in class (15%), homework (60%) and a final exam (25%). 4. No Late Homework Accepted!
Teaching Facility	Computer, Projector
Textbook(s)	Applied Multivariate Statistical Analysis, 6th ed., Richard A. Johnson and Dean W. Wichern, 2014.
Reference(s)	Methods of Multivariate Analysis, 3rd ed., A. C. Rencher, and W. F. Christensen, Wiley, 2012. An Introduction to Multivariate Statistical Analysis, 3rd ed, T. W. Anderson, Wiley, 2003. Aspects of Multivariate Statistical Theory, R. J. Muirhead, 1st ed, Wiley, 2005.
Number of Assignment(s)	(Filled in by assignment instructor only)
Grading Policy	◆ Attendance： % ◆ Mark of Usual：15.0 % ◆ Midterm Exam： % ◆ Final Exam： 25.0 % ◆ Other〈Homework〉：60.0 %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php . ※ **Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**