

Tamkang University Academic Year 112, 2nd Semester Course Syllabus

Course Title	MULTIVARIATE ANALYSIS	Instructor	MENG-YING CHOU
Course Class	TSMCB3A DEPARTMENT OF MATHEMATICS (SECTION OF DATA SCIENCE AND MATHEMATICAL STATISTICS), 3A	Details	◆ General Course ◆ Required ◆ One Semester
Relevance to SDGs	SDG4 Quality education		
D e p a r t m e n t a l A i m o f E d u c a t i o n			
I . To teach knowledge in mathematics. II. To train teaching professionals in mathematics. III. To develop independent and creative thinking. IV. To establish ability to present oneself. V . To promote cooperative working spirit. VI. To prepare self learning ability in multiple areas.			
Subject Departmental core competences			
A. To learn the fundamentals of mathematics.(ratio:5.00) B. To develop independent and logical thinking ability.(ratio:5.00) C. To learn basics of probability and statistic.(ratio:20.00) D. To use the aid of computer in solving mathematical and statistical problems.(ratio:5.00) E. To obtain the ability to collect and analyze data.(ratio:5.00) F. To establish ability to pursue knowledge in advanced mathematics.(ratio:60.00)			
Subject Schoolwide essential virtues			
1. A global perspective. (ratio:10.00) 2. Information literacy. (ratio:20.00) 3. A vision for the future. (ratio:20.00) 4. Moral integrity. (ratio:5.00) 5. Independent thinking. (ratio:30.00) 6. A cheerful attitude and healthy lifestyle. (ratio:5.00)			

7. A spirit of teamwork and dedication. (ratio:5.00)				
8. A sense of aesthetic appreciation. (ratio:5.00)				
Course Introduction	Random Vectors, its distributions, and hyothesis tests. Linear Models Principal Components Analysis Factor Analysis Clustering Discriminant Analysis			
<p>The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.</p> <p>Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.</p> <p>I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.</p> <p>II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.</p> <p>III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.</p>				
No.	Teaching Objectives			objective methods
1	To make students to learn the multivariate normal distribution, its tests, the PCA, factor analysis, clustering methods.			Cognitive
The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment				
No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDEF	12345678	Lecture, Discussion, Practicum	Testing, Study Assignments, Practicum, Lab class
Course Schedule				
Week	Date	Course Contents		Note
1	113/02/19 ~ 113/02/25	1.3 Kernel Densities, 2. Matrix Algebra.		
2	113/02/26 ~ 113/03/03	3.1 Covariance, 3.2 Correlation, 3.3 Summary Statistics.		
3	113/03/04 ~ 113/03/10	3.4 Linear Model Model for Two Variablees, 3.5 Simple Analysis of Variance.		

4	113/03/11 ~ 113/03/17	3.6 Multiple Linear Model, 3.6 ANOVA Model in Matrix Notation.	
5	113/03/18 ~ 113/03/24	4.1 Distribution and Density, 4.2 Moments and Characteristic Functions, 4.3 Transformation.	
6	113/03/25 ~ 113/03/31	4.4 Multinormal Distributions, 4.5 Sampling Distributions and Limit Theorems	
7	113/04/01 ~ 113/04/07	Weeks of TKU administration and observation on teaching (Holiday).	
8	113/04/08 ~ 113/04/14	5.1 Elementary Properties of the Multinormal, 5.2 The Wishart Distribution, 5.3 Hotelling's T ² -Distribution.	
9	113/04/15 ~ 113/04/21	Midterm Exam Week	
10	113/04/22 ~ 113/04/28	6.1 Likelihood Function, 6.2 The Cramer-Rao Lower Bound	
11	113/04/29 ~ 113/05/05	7.1 Likelihood Ratio Test, 7.2 Linear Hypothesis	
12	113/05/06 ~ 113/05/12	11. Principal Components Analysis	
13	113/05/13 ~ 113/05/19	12. Factor Analysis	
14	113/05/20 ~ 113/05/26	13. Cluster Analysis	
15	113/05/27 ~ 113/06/02	14. Discriminant Analysis	
16	113/06/03 ~ 113/06/09	16. Canonical Correlation Analysis	
17	113/06/10 ~ 113/06/16	Final Exam Week (Date:113/6/11-113/6/17)	
18	113/06/17 ~ 113/06/23	Flex week, learning activities should be arranged.	
Key capabilities		self-directed learning Information Technology Problem solving	
Interdisciplinary		STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)	
Distinctive teaching			

Course Content	Logical Thinking
Requirement	Students should well have knowledge in the subjects including Probability, Statistics, and Linear Regression.
Textbooks and Teaching Materials	Self-made teaching materials:Presentations Using teaching materials from other writers:Textbooks Name of teaching materials: Textbook 1: Härdle, W. K., & Simar, L. (2015). Applied multivariate statistical analysis. Springer.
References	Textbook 2 : Richard Johnson, Dean Wichern. Applied multivariate statistical analysis, 6e. Pearson.
Grading Policy	<p>◆ Attendance : 5.0 % ◆ Mark of Usual : 25.0 % ◆ Midterm Exam : 30.0 %</p> <p>◆ Final Exam : 30.0 %</p> <p>◆ Other 〈Lab class〉 : 10.0 %</p>
Note	<p>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 .</p> <p>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</p>