Tamkang University Academic Year 103, 1st Semester Course Syllabus

Course Title	DESIGN OF EXPERIMENTS	Instructor	CHEN SHUN-YI
Course Class	TSMCB4A DEPARTMENT OF MATHEMATICS (SECTION OF DATA SCIENCE AND MATHEMATICAL STATISTICS), 4A	Details	◆ Selective ◆ 1st Semester ◆ 3 Credits

Departmental Aim of Education

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.

Departmental core competences

A. To learn the fundamentals of mathematics.

B. To develop independent and logical thinking ability.

C. To learn basics of probability and statistic.

D. To use the aid of computer in solving mathematical and statistical problems.

E. To obtain the ability to collect and analyze data.

F. To establish ability to pursue knowledge in advanced mathematics.

Course Introduction	This course will cover the statistical concepts and techniques of experimental design as a tool for scientists to use for product design and process development as well as improvement. The use of experimental design in developing products that are robust to environmental factors and other sources of variability will be illustrated. We are going to introduce some basic statistical methods, analysis of variance, factorial experiments, fractional factorial designs, nested and split-plot designs, and response surface methodology.

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 will be able to acquire the ability of the statistical concepts and techniques of experimental design in related problems.	C4	CE

Teaching Objectives, Teaching Methods and Assessment

No.	Teaching Objectives	Teaching Methods	Assessment
1	Students will be able to acquire the ability of the statistical concepts and techniques of experimental design in related problems.	Lecture, Discussion, Appreciation, Problem solving	Written test, Report, Participation

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	103/09/15 ~ 103/09/21	Introduction of experimental design	
2	103/09/22 ~ 103/09/28	Basic statistical concepts	
3	103/09/29 ~ 103/10/05	Inferences about the differences in treatment means	
4	103/10/06 ~ 103/10/12	Experiments with a single factor	
5	103/10/13 ~ 103/10/19	Analysis of the fixed effects model	
6	103/10/20 ~ 103/10/26	Comparison of individual treatment means	
7	103/10/27 ~ 103/11/02	Model adequacy checking and choice of sample size	
8	103/11/03 ~ 103/11/09	Fitting response curves in the one-way model	
9	103/11/10 ~ 103/11/16	The regression approach and nonparametric methods	
10	103/11/17 ~ 103/11/23	Midterm Exam Week	
11	103/11/24 ~ 103/11/30	Randomized block design	
12	103/12/01 ~ 103/12/07	Latin square design and Graeco-Latin square design	

13	103/12/08 ~ 103/12/14	Balanced incomplete block designs	
14	103/12/15 ~ 103/12/21	Partially balanced incomplete block designs	
15	103/12/22 ~ 103/12/28	Introduction to factorial designs	
16	103/12/29 ~ 104/01/04	Two-factor factorial design	
17	104/01/05 ~ 104/01/11	Random and mixed effects models	
18	104/01/12 ~ 104/01/18	Final Exam Week	

Requirement	1. Students will be required to present in class on the topics they are assigned to study in advance. 2. Evaluation and grading criteria for the course: regular attendance; steady participation in class discussions; active in group-assignment participation.
Teaching Facility	Computer, Projector
Textbook(s)	Design and Analysis of Experiments, 8th ed., by D. C. Montgomery (2012)
Reference(s)	1. Design and Analysis of Experiments, 2nd ed., by D. C. Montgomery (1991) 2. Response Surface Methodology, by R.H. Myers and D. C. Montgomery (1995)
Number of Assignment(s)	(Filled in by assignment instructor only)
Grading Policy	◆ Attendance： 40.0 % ◆ Mark of Usual：60.0 % ◆ Midterm Exam： % ◆ Final Exam： % ◆ Other〈 〉： %
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.**