

## Tamkang University Academic Year 103, 1st Semester Course Syllabus

Course Title	STOCHASTIC PROCESSES	Instructor	YIH CHI HSIAO
Course Class	TETGM1A MASTER'S PROGRAM, DIVISION OF COMMUNICATION AND ELECTROMAGNETIC WAVES, DEPARTMENT OF ELECTRICAL ENGINEERING, 1A	Details	<ul style="list-style-type: none"> <li>◆ Selective</li> <li>◆ One Semester</li> <li>◆ 3 Credits</li> </ul>
Departmental Aim of Education			
<p>I. Educate students to have electrical and robotics engineering knowledge to solve electrical engineering related problems.</p> <p>II. Educate the student as a senior electrical engineer to enable creative thinking, to be independently complete the assigned tasks and be willing to work as a team member.</p> <p>III. Educate students to have advanced global awareness to cope with the challenges of modern diversified professor careers.</p>			
Departmental core competences			
<p>A. Have professional knowledge in the fields of VLSI and computer system; communication and electromagnetic; control chips and system.</p> <p>B. Have the ability to plan and execute electrical engineering research studies.</p> <p>C. Have the ability to prepare professional papers in the electrical engineering field.</p> <p>D. Have the abilities to be creative thinking and to independently solve electrical engineering related problems.</p> <p>E. Have the ability to lead, manage, plan, coordinate and integrate personnel from various fields.</p> <p>F. Have advanced global awareness and the ability of lifelong self-study.</p>			
Course Introduction	<p>This course aims to provide students a solid mathematical background for studying communication and network systems. We will introduce the basic concepts of probability theory and random processes, including random variables, random vectors, limit theorems of random sequences, statistical inference, Gaussian and Poisson random processes, and discrete and continuous Markov chains. Moreover, we will teach students how to apply probability theory to model and solve wireless communication problems.</p>		

## 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-Characterizing, 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 can understand the basic concepts of probability.	C4	AD
2	Students can understand the basic concepts of random processes.	C4	AD
3	Students can understand the basic concepts of statistical inference.	C4	AD
4	Students can understand the basic concepts of Markov chains.	C4	AD

### Teaching Objectives, Teaching Methods and Assessment

No.	Teaching Objectives	Teaching Methods	Assessment
1	Students can understand the basic concepts of probability.	Lecture, Discussion, Problem solving	Written test, Report, Participation
2	Students can understand the basic concepts of random processes.	Lecture, Discussion, Problem solving	Written test, Report, Participation
3	Students can understand the basic concepts of statistical inference.	Lecture, Discussion, Problem solving	Written test, Report, Participation
4	Students can understand the basic concepts of Markov chains.	Lecture, Discussion, 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	Basic Concept of Probability Theory	
2	103/09/22 ~ 103/09/28	Discrete Random Variables	
3	103/09/29 ~ 103/10/05	Continuous Random Variables	
4	103/10/06 ~ 103/10/12	Pairs of Random Variables	
5	103/10/13 ~ 103/10/19	Random Vectors	
6	103/10/20 ~ 103/10/26	Transform Methods	
7	103/10/27 ~ 103/11/02	Convergence of Random Sequences	
8	103/11/03 ~ 103/11/09	Limit Theorems	
9	103/11/10 ~ 103/11/16	Hypothesis Testing (I)	
10	103/11/17 ~ 103/11/23	Hypothesis Testing (II)	
11	103/11/24 ~ 103/11/30	Parameter Estimation	
12	103/12/01 ~ 103/12/07	Bayesian Inference	

13	103/12/08 ~ 103/12/14	Random Processes and Their Properties	
14	103/12/15 ~ 103/12/21	Power Spectral Density and Optimum Linear Filtering	
15	103/12/22 ~ 103/12/28	Kalman Filtering	
16	103/12/29 ~ 104/01/04	Discrete-Time Markov Chains	
17	104/01/05 ~ 104/01/11	Continuous-Time Markov Chains	
18	104/01/12 ~ 104/01/18	Final Exam	
Requirement	All handouts and homework assignments can be downloaded on the course website. Please visit the course website on a weekly basis.		
Teaching Facility	Computer, Projector		
Textbook(s)	A. Leon-Garcia, Probability, Statistics, and Random Processes for Electrical Engineering, 3rd. ed., Pearson, 2009.		
Reference(s)	1. D. P. Bertsekas and J. N. Tsitsiklis, Introduction to Probability, 2nd ed., Athena Scientific, 2008. 2. R. M. Gray and L. D. Davisson, An Introduction to Statistical Signal Processing, 1st ed., Cambridge University Press, 2004.		
Number of Assignment(s)	8 (Filled in by assignment instructor only)		
Grading Policy	◆ Attendance : 20.0 %    ◆ Mark of Usual :        %    ◆ Midterm Exam :        % ◆ Final Exam : 40.0 % ◆ Other (Homework) : 40.0 %		
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at <a href="http://info.ais.tku.edu.tw/csp">http://info.ais.tku.edu.tw/csp</a> or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at <a href="http://www.acad.tku.edu.tw/CS/main.php">http://www.acad.tku.edu.tw/CS/main.php</a> . <b>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</b>		