

## Tamkang University Academic Year 109, 2nd Semester Course Syllabus

Course Title	RANDOMIZED ALGORITHMS	Instructor	CHUANG-CHIEH LIN
Course Class	TEIBM1A MASTER'S PROGRAM, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM),	Details	◆ General Course ◆ Selective ◆ One Semester
Relevance to SDGs	1A 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 . Cultivate the ability to conduct independent research and problem solving. II . Strengthen creativity and research capacity. III . Build profound professional knowledge in computer science and information engineering. IV . Engage in self-directed lifelong learning.			
S u b j e c t   D e p a r t m e n t a l   c o r e   c o m p e t e n c e s			
A. Independent problem solving ability.(ratio:10.00) B. Independent innovative thinking ability.(ratio:10.00) D. Research & development (R&D) ability in information engineering.(ratio:80.00)			
S u b j e c t   S c h o o l w i d e   e s s e n t i a l   v i r t u e s			
2.Information literacy. (ratio:90.00) 5.Independent thinking. (ratio:10.00)			
Course Introduction	This course focuses on theoretical aspects and applications of randomized algorithms. Compared to heuristic algorithms which do not have accuracy or time complexity guarantee, randomized algorithms have rigorous guarantees so that the outputs turn out to be convincing. We expect the students to learn solid theoretical foundation and also be capable of implementing several projects on applying randomized algorithms.		

**The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.**

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.

II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.

III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	Examples of Probability Paradoxes	Cognitive
2	Las Vegas and Monte Carlo	Cognitive
3	Chernoff Bounds	Cognitive
4	The Stable Marriage Problem	Cognitive
5	The Coupon Collector's Problem	Cognitive
6	Randomized Quicksort	Cognitive
7	Random Graphs	Cognitive
8	Random Treaps	Cognitive
9	Markov Chains	Cognitive

**The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment**

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
2	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
3	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
4	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
5	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
6	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)

7	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
8	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online), Practicum
9	ABD	25	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)

#### Course Schedule

Week	Date	Course Contents	Note
1	110/02/22 ~ 110/02/28	Introduction	
2	110/03/01 ~ 110/03/07	Examples of Probability Paradoxes	
3	110/03/08 ~ 110/03/14	Probability Prerequisites	
4	110/03/15 ~ 110/03/21	Probability Prerequisites	
5	110/03/22 ~ 110/03/28	Las Vegas and Monte Carlo Algorithms	
6	110/03/29 ~ 110/04/04	Las Vegas and Monte Carlo Algorithms	
7	110/04/05 ~ 110/04/11	Chernoff Bounds	
8	110/04/12 ~ 110/04/18	Chernoff Bounds	
9	110/04/19 ~ 110/04/25	Randomized Quicksort	
10	110/04/26 ~ 110/05/02	The Secretary Problem	
11	110/05/03 ~ 110/05/09	The Stable Marriage Problem	
12	110/05/10 ~ 110/05/16	The Coupon Collector's Problem	
13	110/05/17 ~ 110/05/23	Random Graphs	
14	110/05/24 ~ 110/05/30	Random Treaps	
15	110/05/31 ~ 110/06/06	Markov Chains	
16	110/06/07 ~ 110/06/13	Markov Chains Monte Carlo	
17	110/06/14 ~ 110/06/20	Final Project Presentation	
18	110/06/21 ~ 110/06/27	Final Project Presentation	

Requirement	Prerequisites on Probability Theory and programming.
Teaching Facility	Computer, Projector
Textbooks and Teaching Materials	Randomized Algorithms. Motwani, R. and Raghavan, P., 1995. Cambridge University Press. Probability and Computing: Randomized Algorithms and Probabilistic Analysis. M. Mitzenmacher and E. Upfal, 2005.
References	The Probabilistic Method. 3rd Edition. N. Alon and J. H. Spencer, 2008.
Number of Assignment(s)	10 (Filled in by assignment instructor only)
Grading Policy	<p>◆ Attendance :            %    ◆ Mark of Usual : 50.0 %    ◆ Midterm Exam :            %</p> <p>◆ Final Exam :    50.0 %</p> <p>◆ Other &lt;   &gt; :            %</p>
Note	<p>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>.</p> <p><b>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</b></p>