

Tamkang University Academic Year 112, 2nd Semester Course Syllabus

Course Title	ALGORITHMIC GAME THEORY	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:20.00) B. Independent innovative thinking ability.(ratio:20.00) C. Research paper writing and presentation ability.(ratio:20.00) D. Research & development (R&D) ability in information engineering.(ratio:20.00) E. Project execution and control ability.(ratio:10.00) F. Lifelong self-directed learning ability.(ratio:10.00)			
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			
1. A global perspective. (ratio:10.00) 2. Information literacy. (ratio:20.00) 3. A vision for the future. (ratio:10.00) 4. Moral integrity. (ratio:10.00) 5. Independent thinking. (ratio:20.00) 6. A cheerful attitude and healthy lifestyle. (ratio:10.00) 7. A spirit of teamwork and dedication. (ratio:10.00) 8. A sense of aesthetic appreciation. (ratio:10.00)			

Course Introduction	This course focuses on theoretical aspects and applications of game theory. Game theory is ubiquitous in real world and has extensively applied in multiagent mechanism design and building machine learning models such as generative-adversarial network (GAN). We expect the students to learn solid theoretical foundation and also be capable of implementing several projects on simulating import equilibria for several practical games.
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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	Basic Solution Concepts	Cognitive
2	Matrix Form and Extensive Form	Cognitive
3	Equilibrium Computation	Cognitive
4	Inefficiency of Equilibria	Cognitive
5	Network Formation Games	Cognitive
6	Social Choice	Cognitive
7	Introduction of Online Learning Algorithms	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	Study Assignments, Discussion(including classroom and online)
2	ABCDEF	12345678	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)

3	ABCDEF	12345678	Lecture, Discussion	Study Assignments, Discussion(including classroom and online), Practicum
4	ABCDEF	12345678	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
5	ABCDEF	12345678	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
6	ABCDEF	12345678	Lecture, Discussion	Study Assignments, Discussion(including classroom and online)
7	ABCDEF	1234568	Lecture, Discussion	Study Assignments, Discussion(including classroom and online), Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	113/02/19 ~ 113/02/25	Course Introduction	
2	113/02/26 ~ 113/03/03	Basic Solution Concepts (I)	
3	113/03/04 ~ 113/03/10	Basic Solution Concepts (II)	
4	113/03/11 ~ 113/03/17	Maximin and Minimax Principle (I)	
5	113/03/18 ~ 113/03/24	Maximin and Minimax Principle (II)	
6	113/03/25 ~ 113/03/31	Fixed-Point Theorems & Nash Equilibria (I)	
7	113/04/01 ~ 113/04/07	Fixed-Point Theorems & Nash Equilibria (II)	
8	113/04/08 ~ 113/04/14	Fixed-Point Theorems & Nash Equilibria (III)	
9	113/04/15 ~ 113/04/21	Social Choice (I)	
10	113/04/22 ~ 113/04/28	Social Choice (II)	
11	113/04/29 ~ 113/05/05	Midterm Report/Presentation	
12	113/05/06 ~ 113/05/12	Inefficiency of Equilibria (I)	
13	113/05/13 ~ 113/05/19	Inefficiency of Equilibria (II)	
14	113/05/20 ~ 113/05/26	Introduction to Online Learning Algorithms (I)	
15	113/05/27 ~ 113/06/02	Introduction to Online Learning Algorithms (II)	

16	113/06/03 ~ 113/06/09	Selected Topic(s)	
17	113/06/10 ~ 113/06/16	Final Paper Presentation (I)	
18	113/06/17 ~ 113/06/23	Final Paper Presentation (II)	
Key capabilities	self-directed learning Information Technology Problem solving		
Interdisciplinary	In addition to teaching content of the teacher's professional field, integrate other subjects or invite experts and scholars in other fields to share knowledge or teaching		
Distinctive teaching			
Course Content	Logical Thinking AI application		
Requirement	Understanding of algorithm design, Calculus, linear algebra and basic probability theory.		
Textbooks and Teaching Materials	Self-made teaching materials:Presentations Using teaching materials from other writers:Textbooks Name of teaching materials: Twenty Lectures on Algorithmic Game Theory. Tim Roughgarden. Cambridge University Press. 2016.		
References	Essentials of Game Theory: A Concise, Multidisciplinary Introduction (Synthesis Lectures on Artificial Intelligence and Machine Learning). Leyton- Brown and Kevin, Shoham. Cambridge University Press. 2008. Algorithmic Game Theory. Noam Nisan, Tim Roughgarden, Eva Tardos, and Vijav V. Vazirani. Cambridge University Press. 2011.		
Grading Policy	◆ Attendance : 10.0 % ◆ Mark of Usual : 30.0 % ◆ Midterm Exam : 30.0 % ◆ Final Exam : 30.0 % ◆ 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.		