

## Tamkang University Academic Year 111, 1st Semester Course Syllabus

Course Title	OPTIMIZATION ALGORITHMS AND METAHEURISTICS	Instructor	CHEN, SHIH-HSIN
Course Class	TEIBM1A MASTER'S PROGRAM, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM),	Details	<ul style="list-style-type: none"> <li>◆ General Course</li> <li>◆ Selective</li> <li>◆ One Semester</li> </ul>
Relevance to SDGs	1A SDG1 No poverty SDG4 Quality education SDG11 Sustainable cities and communities SDG12 Responsible consumption and production		
<b>Departmental Aim of Education</b>			
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.			
<b>Subject Departmental core competences</b>			
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)			
<b>Subject Schoolwide essential virtues</b>			
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:10.00) 5. Independent thinking. (ratio:10.00) 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	<p>Besides machine learning being used to make predictions, numerous tasks required optimization algorithms to obtain an optimal solution or near-optimal one. The well-known problems include the traveling salesman problem, scheduling problem, mathematics problem, and so on. Compared with classic optimization algorithms, metaheuristic is suitable for complex and large-size problems. In this class, we will introduce some famous algorithms, including simulated annealing, genetic algorithm, electromagnetism algorithm, differential equations, and Reinforcement learning.</p>
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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	The students could understand what kind of problem and could be solved by which metaheuristics. In addition, they could invent new approaches to enhance the solution quality.	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, Practicum	Testing, Study Assignments, Discussion(including classroom and online), Practicum

**Course Schedule**

Week	Date	Course Contents	Note
1	111/09/05 ~ 111/09/11	9/5: Course introduction	
2	111/09/12 ~ 111/09/18	9/12: Simulated Annealing	
3	111/09/19 ~ 111/09/25	9/19: Simulated Annealing	
4	111/09/26 ~ 111/10/02	9/26: Genetic algorithm (Part I)	

5	111/10/03 ~ 111/10/09	10/3: Genetic algorithm (Part II)	
6	111/10/10 ~ 111/10/16	10/10: National Holiday.	
7	111/10/17 ~ 111/10/23	10/17: Reinforcement learning for optimization problem (External speaker)	
8	111/10/24 ~ 111/10/30	Report a literature review in SA or GA	
9	111/10/31 ~ 111/11/06	Implementations	
10	111/11/07 ~ 111/11/13	Midterm report	
11	111/11/14 ~ 111/11/20	Mutli-Objective Evolutionary algorithm	
12	111/11/21 ~ 111/11/27	Estimation distribution algorithm	
13	111/11/28 ~ 111/12/04	Electromagnetism-like algorithm (Continuous problem)	
14	111/12/05 ~ 111/12/11	Report a literature review in MOP, EDA, and EM	
15	111/12/12 ~ 111/12/18	Differential equations	
16	111/12/19 ~ 111/12/25	Select cases of optimization problem for MOP, EDA, EM, DE	
17	111/12/26 ~ 112/01/01	Final term project preparation	
18	112/01/02 ~ 112/01/08	Final term presentation	
Requirement			
Teaching Facility	Computer, Projector		
Textbooks and Teaching Materials			
References			
Number of Assignment(s)	4 (Filled in by assignment instructor only)		
Grading Policy	◆ Attendance : 10.0 %   ◆ Mark of Usual : 20.0 %   ◆ Midterm Exam : 35.0 % ◆ Final Exam : 35.0 % ◆ 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>.

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