

Tamkang University Academic Year 114, 1st Semester Course Syllabus

Course Title	MATHEMATICS FOR MACHINE LEARNING	Instructor	HUANG-WEN HUANG
Course Class	TEIDB4A DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM), 4A	Details	◆ General Course ◆ Required ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG4 Quality education		
Departmental Aim of Education			
I. Comprehend professional knowledge. II. Acquire mastery of Practical Skills. III. Establish creative achievement.			
Subject Departmental core competences			
A. Programming and application ability.(ratio:10.00) B. Mathematical reasoning ability.(ratio:30.00) C. Implementing computer systems ability.(ratio:20.00) D. Computer networking application skills.(ratio:10.00) E. Professional skills for information technology (IT) industry.(ratio:30.00)			
Subject Schoolwide essential virtues			
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:10.00) 6. A cheerful attitude and healthy lifestyle. (ratio:10.00) 7. A spirit of teamwork and dedication. (ratio:20.00) 8. A sense of aesthetic appreciation. (ratio:10.00)			

Course Introduction	This course will briefly review calculus, linear algebra, probability, and statistics as the basis, and introduce basic mathematics of machine learning, including analytic geometry, matrix decomposition, etc., and some advanced topics, such as linear regression, principal component analysis, and support vector machines.
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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	Introduce the basic mathematics for machine learning	Cognitive

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

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDE	12345678	Lecture, Practicum	Testing, Study Assignments, Discussion(including classroom and online), Practicum

Course Schedule

Week	Date	Course Contents	Note
1	114/09/15 ~ 114/09/21	Introduction	
2	114/09/22 ~ 114/09/28	Calculus	
3	114/09/29 ~ 114/10/05	Linear Algebra	
4	114/10/06 ~ 114/10/12	Linear Algebra	
5	114/10/13 ~ 114/10/19	Analytic Geometry	

6	114/10/20 ~ 114/10/26	Analytic Geometry	
7	114/10/27 ~ 114/11/02	Vector Algebra	
8	114/11/03 ~ 114/11/09	Vector Algebra	
9	114/11/10 ~ 114/11/16	Midterm Exam/Midterm Assessment Week (teachers can adjust the week as needed)	
10	114/11/17 ~ 114/11/23	Probability & Distributions	
11	114/11/24 ~ 114/11/30	Regression	
12	114/12/01 ~ 114/12/07	Maximum Likelihood Estimation (MLE)	
13	114/12/08 ~ 114/12/14	Optimization : Gradient Descent)	
14	114/12/15 ~ 114/12/21	Support Vector Machine (SVM)	
15	114/12/22 ~ 114/12/28	Principal Componets Analysis (PCA)	
16	114/12/29 ~ 115/01/04	Final Week of Diverse Assessments	
17	115/01/05 ~ 115/01/11	Final Week of Diverse Assessments/Flexible Teaching Week for Teachers	
18	115/01/12 ~ 115/01/18	Flexible Teaching Week for Teachers	
Key capabilities		self-directed learning International mobility Problem solving Interdisciplinary	
Interdisciplinary		STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)	
Distinctive teaching			
Course Content		Logical Thinking AI application	
Requirement			

Textbooks and Teaching Materials	<p>Self-made teaching materials:Presentations</p> <p>Name of teaching materials:</p> <p>M.P. Deisenroth, Mathematics for Machine Learning, 2020.</p> <p>Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong: Mathematics for Machine Learning. Cambridge University Press. 2020.</p> <p>Howard Anton, Chris Rorres, Anton Kaul: Elementary Linear Algebra. Wiley. 2019.</p> <p>Using teaching materials from other writers:Textbooks</p>
References	
Grading Policy	<p>◆ Attendance : 10.0 % ◆ Mark of Usual : 20.0 % ◆ Midterm Exam : 25.0 %</p> <p>◆ Final Exam : 25.0 %</p> <p>◆ Other 〈quiz〉 : 20.0 %</p>
Note	<p>This syllabus may be uploaded at the website of Course Syllabus Management System at https://web2.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.</p> <p>※"Adhere to the concept of intellectual property rights" and "Do not illegally photocopy, download, or distribute." Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</p>