# Tamkang University Academic Year 105, 1st Semester Course Syllabus

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| Course Title | MACHINE LEARNING | Instructor | HSU HUI-HUANG |
| Course Class | TEIBM1A<br>MASTER'S PROGRAM, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM), 1A | Details | ◆ Selective<br>◆ One Semester<br>◆ 3 Credits |

## Departmental Aim of Education

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.

## Departmental core competences

A. Independent problem solving ability.

B. Independent innovative thinking ability.

C. Research paper writing and presentation ability.

D. Research & development (R&D) ability in information engineering.

E. Project execution and control ability.

F. Lifelong self-directed learning ability.

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| Course Introduction | This course introduces the concepts and applications of machine learning. Machine learning is an important part of artificial intelligence. It focuses on how to use proper algorithms to let the machine learn how to solve a related problem through the observation of a data set. The students will learn how to use the major ML algorithms in practical problems using ML tools. |

## 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-Charaterizing, 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 | Understand the definition and purpose of machine learning | C4 | ABD |
| 2 | Understand the applications and related information technologies for machine learning | C5 | ABD |
| 3 | Understand the recent research and development on machine learning | C5 | ABD |

### Teaching Objectives, Teaching Methods and Assessment

| No. | Teaching Objectives | Teaching Methods | Assessment |
|---|---|---|---|
| 1 | Understand the definition and purpose of machine learning | Lecture, Discussion | Written test, Participation |
| 2 | Understand the applications and related information technologies for machine learning | Lecture, Discussion, Problem solving | Written test, Report, Participation |
| 3 | Understand the recent research and development on machine learning | Lecture, Discussion, Problem solving | Written test, Report, Participation |
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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 | 105/09/12 ~ 105/09/18 | Introduction | |
| 2 | 105/09/19 ~ 105/09/25 | The Learning Problem | |
| 3 | 105/09/26 ~ 105/10/02 | The Learning Problem | |
| 4 | 105/10/03 ~ 105/10/09 | Training versus Testing | |
| 5 | 105/10/10 ~ 105/10/16 | National Holiday - No class | |
| 6 | 105/10/17 ~ 105/10/23 | Training versus Testing | |
| 7 | 105/10/24 ~ 105/10/30 | The Linear Model | |
| 8 | 105/10/31 ~ 105/11/06 | The Linear Model | |
| 9 | 105/11/07 ~ 105/11/13 | Lab - Machine Learning Tools | |
| 10 | 105/11/14 ~ 105/11/20 | Project Discussion | |
| 11 | 105/11/21 ~ 105/11/27 | Overtting | |
| 12 | 105/11/28 ~ 105/12/04 | Overtting | |

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|---|---|---|---|
| 13 | 105/12/05 ~ 105/12/11 | The Learning Principles | |
| 14 | 105/12/12 ~ 105/12/18 | Project Discussion | |
| 15 | 105/12/19 ~ 105/12/25 | Journal Paper Presentation and Discussion | |
| 16 | 105/12/26 ~ 106/01/01 | Journal Paper Presentation and Discussion | |
| 17 | 106/01/02 ~ 106/01/08 | National Holiday - No class | |
| 18 | 106/01/09 ~ 106/01/15 | Project Discussion | |

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| Requirement | Project * 2 (30% each)<br>Oral Presentation (30%) |
| Teaching Facility | Computer, Projector |
| Textbook(s) | Learning From Data, by Yaser S. Abu-Mostafa, Malik Magdon Ismail and Hsuan-Tien Lin, AMLBook, 2012. |
| Reference(s) | Introduction to Machine Learning, by Ethem Alpaydin, the MIT Press, 2004. |
| Number of Assignment(s) | 2 (Filled in by assignment instructor only) |
| Grading Policy | ◆ Attendance： 10.0 % ◆ Mark of Usual： % ◆ Midterm Exam： %<br>◆ Final Exam： %<br>◆ Other〈Project&Presentation〉：90.0 % |
| 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 .<br>**※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.** |