# Tamkang University Academic Year  112, 2nd Semester  Course Syllabus

| Course Title | INTRODUCTION TO DEEP LEARNING FOR COMPUTER VISION | Instructor | HO THI TRANG |
|---|---|---|---|
| Course Class | TEIBM1A<br>MASTER'S PROGRAM, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM), 1A | Details | ◆ General Course<br>◆ Selective<br>◆ One Semester |
| Relevance to SDGs | SDG5  Gender equality<br><br>SDG9  Industry, Innovation, and Infrastructure<br><br>SDG11 Sustainable cities and communities | | |

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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.

## Subject Departmental core competences

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)

## Subject Schoolwide essential virtues

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 | This course introduces you about applying computer vision techniques to real-world problems. After completing this course, you will be able to cutting-edge research in computer vision starting from a refresher in the basics of image processing, machine learning, neural networks, and computer vision. This course does not require any prior Machine Learning or Computer Vision experience. However, some knowledge of the Python programming language and high school math is necessary. |
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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 | Computer Vision Basics | Cognitive |
| 2 | Concepts of Machine Learning and Deep Learning | Cognitive |
| 3 | Concepts of Object Recognition | Cognitive |
| 4 | Applying Computer Vision Techniques to Real-world Problems | Cognitive |

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

| No. | Core Competences | Essential Virtues | Teaching Methods | Assessment |
|---|---|---|---|---|
| 1 | D | 2 | Lecture, Discussion | Study Assignments, Discussion(including classroom and online), Report(including oral and written) |
| 2 | BDE | 1257 | Lecture, Discussion, Practicum, Experience | Testing, Discussion(including classroom and online), Report(including oral and written) |
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| 3 | ACDF | 1235 | Lecture, Discussion, Practicum, Experience | Study Assignments, Discussion(including classroom and online), Report(including oral and written) |
|---|------|------|------|------|
| 4 | ABDEF | 468 | Lecture, Discussion, Practicum, Experience | Testing, Discussion(including classroom and online), Practicum, Report(including oral and written) |

## Course Schedule

| Week | Date | Course Contents | Note |
|------|------|------|------|
| 1 | 113/02/19 ~ 113/02/25 | Course introduction, introduction to computer vision | |
| 2 | 113/02/26 ~ 113/03/03 | Computer vision basics (1) | |
| 3 | 113/03/04 ~ 113/03/10 | Computer vision basics (2) | Assignment 1 |
| 4 | 113/03/11 ~ 113/03/17 | Image classification and machine learning (1) | |
| 5 | 113/03/18 ~ 113/03/24 | Image classification and machine learning (2) | Assignment 2 |
| 6 | 113/03/25 ~ 113/03/31 | Image classification and machine learning (3) | |
| 7 | 113/04/01 ~ 113/04/07 | Neural network | |
| 8 | 113/04/08 ~ 113/04/14 | Convolutional neural network(1) | |
| 9 | 113/04/15 ~ 113/04/21 | Convolutional neural network(2) | |
| 10 | 113/04/22 ~ 113/04/28 | Midterm Exam | Final project proposal |
| 11 | 113/04/29 ~ 113/05/05 | Convolutional neural network(3) | Assignment 3 |
| 12 | 113/05/06 ~ 113/05/12 | Tips for training a deep learning network: learning rateschedulers, underfitting vs overfitting, checkpointing models | |
| 13 | 113/05/13 ~ 113/05/19 | Object Recognition (1) | |
| 14 | 113/05/20 ~ 113/05/26 | Object Recognition (2) | |
| 15 | 113/05/27 ~ 113/06/02 | Object Recognition (3) | |
| 16 | 113/06/03 ~ 113/06/09 | Case study: pill detection using Mask R-CNN | |
| 17 | 113/06/10 ~ 113/06/16 | Final project presentation | |
| 18 | 113/06/17 ~ 113/06/23 | Flexible week | |

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| Key capabilities | |
| Interdisciplinary | |
| Distinctive teaching | |
| Course Content | Computer programming or Computer language (students have hands-on experience in related projects)<br>Gender Equality Education<br>Logical Thinking<br>AI application |
| Requirement | Python program language, computer with strong configuration. |
| Textbooks and Teaching Materials | Using teaching materials from other writers:Textbooks, Online Course<br>Name of teaching materials:<br>http://cs231n.stanford.edu/ |
| References | |
| Grading Policy | ◆ Attendance： 10.0 ％ ◆ Mark of Usual： ％ ◆ Midterm Exam： 30.0 ％<br>◆ Final Exam： 40.0 ％<br>◆ Other〈Assignment〉：20.0 ％ |
| 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.** |