Tamkang University Academic Year 101, **2nd** Semester

Course Syllabus

| Course Title | Computer Vision | Instructor | Shwu-Huey Yen |
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| Department/Year/Class | Course Details | | | |
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| CSIE in Networking and communication /first year of master program/ A | ☐Required<br>☑Selective | ☐**0（One Semester）**<br>☐**1（1st Semester）**<br>☑**2（2nd Semester）**<br>☐**3（3rd Semester）** | Credits | 3 |

| Aim of Education | Core Competences |
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| 1. Develop an ability to overcome difficulties and solve problems: Teach students to have abilities to identify, formulate, and solve engineering problems. They would be able to design and conduct experiments, as well as to analyze and interpret data.<br>2. Inspire independent thinking and creative innovation: By studying, understanding, induction and deduction, and information surveying through academic research papers, students would be able to propose their own research theme supported with creative innovation and practical implementation.<br>3. Establish the professional knowledge and practical skills of the network communication technology: Students not only have a solid background of information communication network through diversified engineering professional courses, paper study, seminar discussion and participation; students also have practical implementation skills through project implementation as well as essay writing.<br>4. Understand the international trends of information technology and industry: By creating an international learning and researching environment, and actively participate in international seminars/conferences, students can broaden international perspectives. Promote industry cooperation as well as alumni interaction to insight the global trends and changes of the industry.<br>5. Build a personality of 'Simplicity, Firmness, Perseverance, and Fulfillment', and possess the moral prestige and intelligence: Based on the university motto and governing principles, students are able to immerse themselves in an environment of both technology and humanity. Students would possess a personality of 'Simplicity, Firmness, Perseverance, and Fulfillment', as well as good quality in conduct and intelligence.<br>6. Develop a proactive and lifelong-learning attitude: In response to the rapid growth of knowledge, students are educated to be continuous self-growth, pursuing the truth, and have a proactive and lifelong learning attitude. | A. an ability to think independently, judge and analyze problems, and to enlighten innovative thinking to apply on research issues<br>B. an attitude of facing difficulties and accepting challenges, and an ability to explore independently and to deduct and design methods and tools of solution<br>C. an ability to apply network and communication knowledge and skills in professional fields, so as to be able to plan to analyze, design, fabricate, and integrate information systems.<br>D. abilities in professional technical paper writing and verbal communication<br>E. an ability to plan, write, execute, project, lead, and manage proposals<br>F. an ability to use skills in a foreign language for learning and communication and a knowledge of contemporary global issues, so as to master global trends and change in industry<br>G. an ability to understand the professional ethics and the responsibility of the community , and a responsible attitude to communication (with others), teamwork, coordination, and integrity<br>H. the traits of simplicity, firmness, perseverance, fulfillment, and virtue and wisdom, and the spirit of serving the people<br>I. a recognition of the importance of life-long learning and continuously cultivating the ability of self learning |

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| **Course Introduction (50 to 100 words)** | The principle objectives of this course is to provide an introduction to basic concepts and methodologies for computer vision, and to develop a foundation that can be used as the basis for further study and research in this field. |

**The Relevance among Teaching Objectives, Objective Levels and 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 Core Competences：**

(I)Determine the objective level(s) in any one of the three learning domains (cognitive, psychomotor, and affective) corresponding to the teaching objectives. 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 core competences that correspond to each teaching objective. Each objective may correspond to one or more core competences at a time. (For example, if one objective corresponds to three core competences: A, AD, and BEF, list all of the three in the box.)

| Teaching objectives | Relevance | |
|---|---|---|
| | Objective Levels | Core Competences |
| 1. Students will learn basic definitions and operations on computer vision | C4 | AB |
| 2. Students will learn how to apply various image processing techniques on computer vision | C4 | AB |
| 3. Students will learn how to program related algorithms and problem solving. | C6 | AB |
| 4. Students will survey updated journal papers of related issues and make presentations | C5 | ABDFI |
| 5. Students will learn how to comment pro and con of academic papers | C5 | ABDFI |
| 6. | | |

Teaching Objectives, Teaching Methods and Assessment

| Teaching Objectives | Teaching Methods | Assessment |
|---|---|---|
| 1. Students will learn basic definitions and operations on computer vision | Lecture and discussion | Program writing and class participation |
| 2. Students will learn how to apply various image processing techniques on computer vision | Lecture, discussion, and case study | Program writing and class participation |

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| 3. Students will learn how to program related algorithms and problem solving. | Lecture, discussion, and case study | Project and class participation |
| 4. Students will survey updated journal papers of related issues and make presentations | Discussion | Presentation, report, and class participation |
| 5. Students will learn how to comment pro and con of academic papers | Discussion | Presentation, report, and class participation |
| 6 | | |

This course has been designed to cultivate the following essential qualities in TKU students.

| Essential Qualities of TKU Students | Description |
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| □global perspectives | 翻譯建構中 |
| □a vision for the future | |
| □information literacy | |
| □ethical and moral principles | |
| □independent thinking | |
| □an awareness of healthy living | |
| □effective teamwork | |
| □an appreciation of the arts | |

Course Schedule

| Week | Date | Subject/Topics | Note |
|---|---|---|---|
| 1 | | OpenCV Introduction | |
| 2 | | Getting started: read/write image, video, | |
| 3 | | Basic Image Processing Algorithms- I | |
| 4 | | Basic Image Processing Algorithms- II | |
| 5 | | Image Morphology | |
| 6 | | Image Transforms | |
| 7 | | DFT/DCT | |
| 8 | | No class | |
| 9 | | Histogram Operation | |
| 10 | | Midterm Exam Week | |
| 11 | | Tracking and Motion | |
| 12 | | Camera Models and Calibration | |
| 13 | | Projection and 3D vision | |
| 14 | | Machine Learning | |
| 15 | | Student Presentations- I | |
| 16 | | Student Presentations- II | |
| 17 | | Student Presentations- III | |
| 18 | | Project demo | |

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| Requirement | Programming experiences |
| Teaching Facility | ☑Computer ☑Overhead Projector □Other（ _____ ） |
| Textbook(s) | Computer Vision: Algorithms and Applications” by Richard Szeliski (2010) |
| Suggested Readings | Download the most recent academic papers for survey and presentation. |
| Number of Assignment(s) | 3 related programming homework and one term project. |

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| **Grading Policy** | Participation: 10%; presentation: 25%; homework: 30%; term project: 35% |
| 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/index.asp.<br>**※Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.** |

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