Tamkang University Academic Year 114, 1st Semester Course Syllabus

Course Title	INTRODUCTION TO AUTONOMOUS DRIVING	Instructor	JOE-MEI FENG
Course Class	TEIEM1A MASTER'S PROGRAM IN INTELLIGENT COMPUTING AND APPLICATION, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING, 1A	Details	◆ General Course ◆ Selective ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG8 Decent work and economic growth SDG9 Industry, Innovation, and Infrastructure		

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 networking and communication.

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 networking and communication.(ratio:10.00)

E. Project execution and control ability.(ratio:10.00)

F. Lifelong self-directed learning ability.(ratio:20.00)

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 introduces autonomous driving systems, covering perception, localization, path planning, decision-making, control, and in-vehicle communication. Students will learn to know sensors (LiDAR, radar, camera, GPS, IMU), simulation platforms (CARLA, LGSVL, SUMO), and open-source frameworks (Autoware, Apollo). Emphasis is on practical implementation, system integration, and deployment on in-vehicle computing platforms. Assessment includes projects, simulations, and presentations.

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	Through the study of autonomous driving, students will acquire foundational knowledge related to autonomous vehicle technologies and develop the essential competencies required for research and development. They will be prepared to pursue further academic inquiry or professional work in the field, gain a global perspective on the autonomous driving industry, and recognize the importance of teamwork and collaboration.	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	Study Assignments, Discussion(including classroom and online), Practicum, Report(including oral and written), Activity Participation

Course Schedule

Week	Date	Course Contents	Note

1	114/09/15 ~ 114/09/21	Course introduction, SAE levels, system overview; lecture & case discussion.	
2	114/09/22 ~ 114/09/28	Sensor principles (Camera, LiDAR, Radar, GPS/IMU, calibration); demos & exercises.	
3	114/09/29 ~ 114/10/05	Visual perception (lane detection, object recognition, deep learning); image detection experiments.	
4	114/10/06 ~ 114/10/12	Sensor fusion (EKF/UKF, multi-modal fusion, tracking); ROS examples.	
5	114/10/13 ~ 114/10/19	Localization & mapping I (GNSS, GPS, IMU , Camera, LiDAR odometry)	
6	114/10/20 ~ 114/10/26	Localization & mapping II (SLAM, HD Map, urban localization); fusion, SLAM demo.	
7	114/10/27 ~ 114/11/02	Path planning I (A*, D*, RRT*); algorithm exercises.	
8	114/11/03 ~ 114/11/09	Path planning II (dynamic environment, decision-making, reinforcement learning); planning simulation.	
9	114/11/10 ~ 114/11/16	Control systems I (longitudinal/lateral control, PID); Carla following experiment.	參與工學院機械系舉辦之熊貓講座活動
10	114/11/17 ~ 114/11/23	Control systems II (MPC, vehicle dynamics); MPC demo.	
11	114/11/24 ~ 114/11/30	Embedded Systems & Automotive Chips; Software Architecture & Communication Protocols; (ROS2, DDS; CAN, Ethernet)	
12	114/12/01 ~ 114/12/07	Simulation softwares; CARLA, LGSVL, Prescan, CarSim; Testing & validation (SIL/HIL, scenario generation); driving simulation; Docker	
13	114/12/08 ~ 114/12/14	Extension Topic: Autonomous Parking	
14	114/12/15 ~ 114/12/21	Extension Topic: Autonomous Driving	
15	114/12/22 ~ 114/12/28	Extension Topic: AR/VR; Robotics	
16	114/12/29 ~ 115/01/04	Presentation	
17	115/01/05 ~ 115/01/11	Presentation	
18	115/01/12 ~ 115/01/18	Presentation	

Key capabilities	self-directed learning International mobility Information Technology Problem solving Interdisciplinary
Interdisciplinary	STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist) Competency-based education 'competency exploration' sustained competency or global issues STEEP (Society, Technology, Economy, Environment, and Politics) In addition to teaching content of the teacher's professional field, integrate other subjects or invite experts and scholars in other fields to share knowledge or teaching
Distinctive teaching	Special/Problem-Based(PBL) Courses
Course Content	Computer programming or Computer language (students have hands-on experience in related projects) Intellectual Property (learning intellectual property) Logical Thinking Environmental Safety AI application
Requirement	Use is allowed if properly attributed.
Textbooks and Teaching Materials	Self-made teaching materials:Presentations, Handouts Using teaching materials from other writers:Textbooks, Presentations, Handouts, Videos, Worksheets
References	
Grading Policy	◆ Attendance： 60.0 % ◆ Mark of Usual：40.0 % ◆ Midterm Exam： % ◆ Final Exam： % ◆ Other〈 〉： %
Note	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. ※"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.