113學年度第1學期 課程教學大綱

中文名稱	模糊邏輯控制與水下載具應用			課號	UT543
英文名稱	FUZZY LOGIC CONTROL AND ITS APPLICATION TO UNDERWATER VEHICLES				
課程類別	講授類	必選修	選修	系所	海下科技研究所碩士班
授課教師	周佑誠			學分	3

因應嚴重特殊傳染性肺炎(武漢肺炎)，倘若後續需實施遠距授課，授課方式調整如下：

☑ 同步遠距【透過網路直播技術，同時進行線上教學，得採Microsoft Teams、Adobe connect等軟體進行】
☐ 同步遠距含錄影【透過網路直播技術，同時進行線上教學並同時錄影，課程內容可擇日再重播，得採Microsoft Teams、Adobe connect等軟體進行】
☐ 非同步遠距【課堂錄影或錄製數位教材放置網路供學生可非同時進行線上學習，得採EverCam、PPT簡報錄影、錄音方式進行】

★遠距教學軟體操作說明連結

因應嚴重特殊傳染性肺炎(武漢肺炎)，倘若後續需實施遠距授課，評分方式調整如下：

1.Midterm exam：60%
2.Final project：40%

課程大綱 Course syllabus

本課程講授模糊邏輯之數學理論及其在水下載具控制方面之應用。
This course illustrates mathematical theory of fuzzy logic and its application to control of underwater vehicles.

課程目標 Objectives

1. 模糊集合與歸屬函數
Fuzzy sets and membership functions
2. 模糊關係
Fuzzy relations
3. 模糊邏輯
Fuzzy logic
4. 基於模糊規則之系統
Fuzzy rule-based systems
5. 模糊控制系統
Fuzzy control systems
6. 模糊分類與圖樣辨識
Fuzzy classification and pattern recognition
7. 模糊非線性模擬
Fuzzy nonlinear simulation
8. 水下載具動態系統數學建模
Dynamic system modeling of underwater vehicles
9. 水下載具運動控制器設計
Design of motion controllers for underwater vehicles
10. 水下載具模糊控制案例探討
Case studies on fuzzy control of underwater vehicles

授課方式 Teaching methods

課堂講授、討論與實作。
Lectures, discussions, and project practices.

評分方式〔評分標準及比例〕Evaluation (Criteria and ratio)

1.Midterm exam：60%
2.Final project：40%

參考書/教科書/閱讀文獻 Reference book/ textbook/ documents〔請遵守智慧財產權觀念，不可非法影印〕

序號 No.	作者 Auther	書名 Title	出版社 Publisher	出版年 Year of publish	出版地 Publisher place	ISBN# ISBN#
1	Timothy J. Ross	Fuzzy Logic with Engineering Applications 4/e	Wiley	2017	USA	978-1-119-23586-6
2	Li-Xin Wang	A Course in Fuzzy Systems and Control	Prentice-Hall	1997	USA	978-0-135-40882-7

彈性暨自主學習規劃:Alternative learning periods :

本門課程是否有規劃實施學生彈性或自主學習內容（每1學分2小時）
Is any alternative learning periods planned for this course (with each credit corresponding to two hours of activity)?

☐ 否：教師需於「每週課程內容及預計進度」填寫18週課程進度（每1學分18小時之正課內容）。
No:The instructor will include an 18-week course plan in the weekly scheduled progress (each credit corresponds to 18 hours of instruction)

☑ 是：教師需於「每週課程內容及預計進度」填寫16週課程內容（每1學分16小時之正課內容），並於下列欄位填寫每1學分2小時學生彈性或自主學習內容。
Yes:The instructor will include a 16-week course plan in the weekly scheduled progress (each credit corresponds to 16 hours of instruction);
the details of the planned alternative learning periods are provided below (each credit corresponds to two hours of activity).

本門課程規劃學生彈性或自主學習內容（每1學分2小時）：
Alternative learning periods planned for the course (each credit corresponds to two hours of activity):

學生彈性或自主學習活動 Alternative learning periods	勾選或填寫規劃內容 Place a check in the appropriate box or provide details	時數 Number of hours
學生分組實作及討論 Group work and discussion	☑	6
參與課程相關作業、作品、實驗 Participation in course-related assignments, work, or experiments	☐	
參與校內外活動（研習營、工作坊、參訪）或競賽 Participation in on- or off-campus activities (e.g., seminars, workshops, and visits) or competitions	☐	
課外閱讀 Extracurricular reading	☐	
線上數位教材學習 Learning with online digital learning materials	☐	
其他（請填寫規劃內容） Other (please provide details)	☐	

每週課程內容及預計進度 Weekly scheduled progress

週次 Week	日期 Date	授課內容及主題 Content and topic
1	2024/09/08~2024/09/14	Classical sets and fuzzy sets
2	2024/09/15~2024/09/21	Classical relations and fuzzy relations
3	2024/09/22~2024/09/28	Membership functions
4	2024/09/29~2024/10/05	Fuzzy-to-crisp conversions
5	2024/10/06~2024/10/12	Fuzzy arithmetic, numbers, vectors, and the extension principle
6	2024/10/13~2024/10/19	Classical logic and fuzzy logic
7	2024/10/20~2024/10/26	Fuzzy rule-based systems
8	2024/10/27~2024/11/02	Fuzzy rule-based systems (contd.)
9	2024/11/03~2024/11/09	Midterm exam
10	2024/11/10~2024/11/16	Fuzzy control systems
11	2024/11/17~2024/11/23	Fuzzy classification and pattern recognition
12	2024/11/24~2024/11/30	Fuzzy nonlinear simulation
13	2024/12/01~2024/12/07	Dynamic system modeling of underwater vehicles
14	2024/12/08~2024/12/14	Design of motion controllers for underwater vehicles
15	2024/12/15~2024/12/21	Case studies on fuzzy control of underwater vehicles
16	2024/12/22~2024/12/28	Project presentation
17	2024/12/29~2025/01/04	Flexible learning week
18	2025/01/05~2025/01/11	Flexible learning week

課業討論時間 Office hours

時段1 Time period 1:
時間 Time：星期一12:00~ 14:00
地點 Office/Laboratory：MA3045
時段2 Time period 2：
時間 Time：星期二12:00~ 14:00
地點 Office/Laboratory：MA3045

本課程欲培養之系所學生專業能力/全校學生基本素養與核心能力

系所學生專業能力/全校學生基本素養與核心能力 basic disciplines and core capabilities of the department and the university	課堂活動與評量方式 Class activities and evaluation										
	本課程欲培養之能力與素養 This course enables students to achieve.	紙筆考試或測驗 Test.	課堂討論（含個案討論） Group discussion (case analysis).	個人書面報告、作業、作品、實驗 Indivisual paper report/ assignment/ work or experiment.	群組書面報告、作業、作品、實驗 Group paper report/ assignment/ work or experiment.	個人口頭報告 Indivisual oral presentation.	群組口頭報告 Group oral presentation.	課程規劃之校外參訪及實習 Off-campus visit and intership.	證照/檢定 License.	參與課程規劃之校內外活動及競賽 Participate in off-campus/ on-campus activities and competitions.	課外閱讀 Outside reading.
※系所學生專業能力 Basic disciplines and core capabilities of the department											
1.海下科技專業學理知能。 1. Professional skills in undersea technology.	V	V		V		V					V
2.海洋探測作業實務。 2.											

Ability to execute deepsea exploration.											
3.自我學習與解決問題能力。 3. Self-learning and problem solving techniques.	V	V		V		V					V
4.表達溝通能力。 4. Communication skills.	V	V		V		V					V
5.瞭解產學發展趨勢與國際潮流 5. The sense to grasp both local and international industry development trend.	V	V		V		V					V
※全校學生基本素養與核心能力 Basic disciplines and core capabilities of the university											
1.表達與溝通能力。 1. Articulation and communication skills	V	V		V		V					V
2.探究與批判思考能力。 2. Inquisitive and critical thinking abilities	V	V		V		V					V
3.終身學習能力。 3. Lifelong learning	V	V		V		V					V
4.倫理與社會責任。 4. Ethnics and social responsibility											
5.美感品味。 5. Aesthetic appreciation											
6.創造力。 6. Creativity	V	V		V		V					V
7.全球視野。 7. Global perspective											
8.合作與領導能力。 8. Team work and leadership											
9.山海胸襟與自然情懷。 9. Broad-mindedness and the embrace of nature											

本課程與SDGs相關項目

- SDG1-消除貧窮(No Poverty)
- SDG2-消除飢餓 (Zero Hunger)
- SDG3-良好健康與福祉(Good Health and Well-being)
- SDG4-教育品質(Quality Education)
- SDG5-性別平等(Gender Equality)
- SDG6-乾淨水源與公共衛生(Clean Water and Sanitation)
- SDG7-可負擔乾淨能源(Affordable and Clean Energy)
- SDG8-優質工作與經濟成長(Decent Work and Economic Growth)

- [ ] SDG9-工業、創新和基礎建設(Industry,Innovation and Infrastructure)
- [ ] SDG10-減少不平等(Reduced Inequalities)
- [ ] SDG11-永續城市(Sustainable Cities and Communities)
- [ ] SDG12-責任消費與生產(Responsible Consumption and Production)
- [ ] SDG13-氣候行動(Climate Action)
- [ ] SDG14-海洋生態(Life Below Water)
- [ ] SDG15-陸域生態(Life on Land)
- [ ] SDG16-和平、正義和穩健的制度(Peace,Justice And Strong Institutions)
- [ ] SDG17-促進目標實現的全球夥伴關係(Partnership for the Goals)
- [x] 本課程和SDGS無關

本課程校外實習資訊:
This course is relevant to internship:

- [ ] 本課程包含校外實習（本選項僅供統計使用，無校外實習者，得免勾記）
The course includes internship.(For statistical use only. If the course without internship, please ignore this item.)

實習定義：規劃具有學分或時數之必修或選修課程，且安排學生進行實務與理論課程實習，於實習終了取得考核證明繳回學校後，始得獲得學分；或滿足畢業條件者。(一般校內實習請勿勾選此欄位)

Internship: The required or elective courses should include credits and learning hours. Students should participate in the corporative company or institution to practice and learn the real skills. An internship certification must be handed in at the end of internship to get the credits or to fulfil the graduation requirements.

回課程列表