

COURSE OFFERED IN THE DOCTORAL SCHOOL

Code of the course		Name of the course	Polish		
			English	Artificial Intelligence and Human-Machine Interactions	
Type of the course					
Course coordinator		Course teacher	Takafumi Matsumaru (Waseda Univ, Japan)		
Implementing unit		Scientific discipline / disciplines*			
Level of education	Doctoral studies	Semester	Spring 2023		
Language of the course	English				
Type of assessment	Evaluation of submitted reports	Number of hours in a semester	20	ECTS credits	2
Minimum number of participants		Maximum number of participants		Available for students (BSc, MSc)	Yes

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week					
	in a semester	20h				
Estimated date for the implementation of the course	day of the week	1-1. 07-Mar-2023, Tue 09:15-10:00 EST (17:15-18:00 JST)		Teaching location	Building	Room number
		1-2. 07-Mar-2023, Tue 10:15-11:00 EST (18:15-19:00 JST)				
		2-1. 09-Mar-2023, Thu 09:15-10:00 EST (17:15-18:00 JST)				
		2-2. 09-Mar-2023, Thu 10:15-11:00 EST (18:15-19:00 JST)				
		3-1. 14-Mar-2023, Tue 09:15-10:00 EST (17:15-18:00 JST)				
		3-2. 14-Mar-2023, Tue 10:15-11:00 EST (18:15-19:00 JST)				
		4-1. 16-Mar-2023, Thu 09:15-10:00 EST (17:15-18:00 JST)				
		4-2. 16-Mar-2023, Thu 10:15-11:00 EST (18:15-19:00 JST)				
		5-1. 21-Mar-2023, Tue 09:15-10:00 EST (17:15-18:00 JST)				
		5-2. 21-Mar-2023, Tue 10:15-11:00 EST (18:15-19:00 JST)				
6-1. 23-Mar-2023, Thu 09:15-10:00 EST (17:15-18:00 JST)						
6-2. 23-Mar-2023, Thu 10:15-11:00 EST (18:15-19:00 JST)						
7-1. 28-Mar-2023, Tue 09:15-10:00 EST (17:15-18:00 JST)						
7-2. 28-Mar-2023, Tue 10:15-11:00 EST (18:15-19:00 JST)						
8-1. 30-Mar-2023, Thu 09:15-10:00 EST (17:15-18:00 JST)						
8-2. 30-Mar-2023, Thu 10:15-11:00 EST (18:15-19:00 JST)						
9-1. 4-Apr-2023, Tue 09:15-10:00 EST (17:15-18:00 JST)						
9-2. 4-Apr-2023, Tue 10:15-11:00 EST (18:15-19:00 JST)						
10-1. 6-Apr-2023, Thu 09:15-10:00 EST (17:15-18:00 JST)						

		10-2. 6-Apr-2023, Thu 10:15-11:00 EST (18:15-19:00 JST)			
	hours	As given above		online	

* Does not apply to the Researcher's Workshop

1. Prerequisites

No specific prerequisites are required, the student should:

- # Understand of the role and position of your field of expertise in the world/society.
- # Possess the interest in society and humans, and their relationship to technology

2. Course objectives

- # Increase the student knowledge of robotics mechatronics system hardware.
- # Explore and discuss the relationship between robotic hardware and AI software.
- # Examine AI for Human-coexistence and Human-symbiotic systems.

3. Course content (separate for each type of classes)

Lecture

The feature of this course is **Active learning** and **Flipped classroom**.

The procedure of each lecture is divided into three parts: <1> **Pre-learning**, <2> **Classwork**, and <3> **Post-learning**.

<1> Pre-learning [3 hours for students]

- Students should download the materials (lecture **note**, explanation **videos**, list of key **points**) from an Online storage (which will be informed to students at a later date).
- After studying the lecture note and explanation videos, students should prepare their own answers to the list of key points.

<2-1> Classwork-1 (1st period of the class day) --- lecturing [1 hour for students]

- Lecture by the lecturer based on the lecture note.
- Exchanges of learning outcomes among students.

<2-2> Classwork-2 (2nd period of the class day) --- discussion [1 hour for students]

- Extracting contents related to AI technology.
- Discussing application and the light and dark of AI technology.

<3> Post-learning [1 hour for students]

- Summary of student learning outcomes for this unit.
- Submit the lecturer by e-mail within one day after the lecture.

The grading will be made based on the excellence of students' report, which is submitted as the outcome of post-learning.

1. Introduction.

- 1) Intelligent systems and system autonomy.
- 2) Rules and laws for intelligent systems.

2. Intelligent systems related to AI --- Industrial robots.

- 1) Robots for manufacturing.
- 2) AI technology for dual-arm robots.

3. Dependability/reliability of human-coexistence/symbiotic systems with AI.

- 1) Reliably software, human error,
- 2) AI technology for machine failure prediction / human error recovery.

<p>4. Intelligent Systems related to AI --- Medical.</p> <p>-1) Robotic surgery, today.</p> <p>-2) AI technology used for intelligent diagnosis and autonomous surgery.</p> <p>5. Safety of human-coexistence/symbiotic systems with AI.</p> <p>-1) Risk assessment and reduction of intelligent systems.</p> <p>-2) AI safety for collaborating/cooperating intelligent systems.</p> <p>6. Intelligent systems related to AI --- Humanoid robots for personal assistance.</p> <p>-1) Humanoid robots, today.</p> <p>-2) Robot/AI takeover.</p> <p>7. Affinity/friendliness of human-coexistence/symbiotic systems with AI.</p> <p>-1) Human-coexistence/symbiotic robots.</p> <p>-2) Affinity/friendliness and robot love.</p> <p>8. Intelligent Systems related AI --- Self-driving cars as autonomous mobility.</p> <p>-1) Intelligent vehicles and self-driving cars.</p> <p>-2) Accident responsibility and trolley problem.</p> <p>9. Intelligent systems related to AI --- Military robots in battlefields.</p> <p>-1) Military robots and AI used in battlefields.</p> <p>-2) AI can distinguish the right target?</p> <p>10. Summary and conclusions.</p> <p>-1) Summary talks.</p> <p>-2) Discussions to conclude.</p>
Laboratory /Project

4. Learning outcomes (I will elaborate it with you later)			
Type of learning outcomes	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
K01	Hardware related knowledge especially in robotics and mechatronics	SDW_2, SD_W3	Report
Skills			
S01	Reasoning ability	SD_U7, SD_U8	Report
Social competences			
SC01	Technical ethics	SD_K2	Report

*Allowed learning outcomes verification methods: exam; oral exam; written test; oral test; project evaluation; report evaluation; presentation evaluation; active participation during classes; homework; tests

5. Assessment criteria
Depending on the content of the submitted reports, it is decided whether excellent, excellent, good, or acceptable.

The contents of the submitted report are (1) learning content (especially new knowledge), (2) impressions and opinions (relationship with own research project).

6. Literature

Primary references:

[1] Lecturer's original lecture materials will be distributed through an online storage (Google drive? To be informed). # Document files (PDF file) # Movie files (video file)

Secondary references:

[1] Related materials will be announced in the lectures.

7. PhD student's workload necessary to achieve the learning outcomes**

No.	Description	Number of hours This we will elaborate together with you
1	Prior-learning / Preparation: # Download the Document file to study, while watching the videos (1H) # Gathering information and making notes based on the main items presented (2H)	30H = 3H x 10
2	Class hours (remote lectures using Zoom meeting): # Lecturing the main items with the students' report (1H) # Discussion focused on the relationship between AI technologies and Robotics-Mechatronics (1H)	20H = 2H x 10
3	Posteriori learning / Reviewing: # Additional study, preparation of the summary report, and submission to the lecturer (1H)	10H = 1H x 10
4		
Total number of hours		60H
ECTS credits		

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)

8. Additional information

Number of ECTS credits for classes requiring direct participation of academic teachers	
Number of ECTS credits earned by a student in a practical course	
Please be careful when handling handouts for lectures. For example, please avoid publishing to the unspecified. Since many materials are used online, please be careful not to cause problems such as copyright.	

- Points 0 – 50 : grade 2 (fail)
- Points 51 – 60: grade 3 (sufficient/fair)
- Points 61 – 70: grade 3.5 (more than sufficient)
- Points 71 – 80: grade 4 (good)
- Points 81 – 90: grade 4.5 (more than good)
- Points 91 – 100: grade 5 (very good)