

Course number		U-LAS70 10002 SE50					
Course title (and course title in English)		ILAS Seminar-E2 :Will humanoid robots really replace humans? An introduction to the problems of dexterous robotic manipulation (ヒューマノイドロボットは本当に人間の代わりになりますか？器用なロボット操作の問題点に関する入門編) ILAS Seminar-E2 :Will humanoid robots really replace humans? An introduction to the problems of dexterous robotic manipulation		Instructor's name, job title, and department of affiliation		Graduate School of Engineering Senior Lecturer,AMAR, Julien Samuel	
Group		Seminars in Liberal Arts and Sciences		Number of credits		2	
						Number of weekly time blocks	
						1	
Class style		seminar (Face-to-face course)		Year/semesters		2026・First semester	
						Quota (Freshman)	
						15 (15)	
Target year		Mainly 1st year students		Eligible students		For all majors	
						Days and periods	
						Tue.5	
Classroom		11, Yoshida-South Campus Academic Center Bldg. North Wing				Language of instruction	
						English	
Keyword		Robotic Manipulation / Robotic Control / Robotic Manipulators / Industrial Robots					
[Overview and purpose of the course]							
In the future, one of your co-workers might be a humanoid robot. But how can robots complete the same tasks as humans? More precisely, how can a robot achieve the same dexterity as we do for manipulation tasks, and what are the challenges involved for robots to pick and manipulate objects? In this class, we will explore the underlying physics (working principles and control schemes) for robotic manipulators. This seminar course is based on my own researches in robotic manipulation, so we will also cover recent research evolutions in robotic manipulation.							
[Course objectives]							
- Understand the issues and challenges surrounding robotic manipulation. - Be able to describe mathematically the kinematics and dynamics of robotic manipulators grasping objects.							
[Course schedule and contents]]							
1. What does “ Robotic Manipulation ” means? (Week 1) 2. Linear algebra as the language of robotics (Week 2-3) 3. 3D rigid motion (Week 4) 4. Modeling robot links and joints (Week 5) 5. Forward and inverse kinematics (Week 6-7) 6. Jacobian matrix and singularity problems for manipulators (Week 8-9) 7. Mathematical formalisms for robotic manipulators (Week 10-11) 8. An introduction to manipulators equations of motion (Week 12) 9. Control strategies for manipulators (Week 13) 10. Manipulation problems using Grasp Maps (Week 14) 11. Feedback (Week 15)							

U.S.Seminar 22 Will humanoid robots really replace humans? An introduction to the problems of dexterous robotic manipulation (12-7/12:57) 小松田 誠(マツダ マコト) 小松田 誠(マツダ マコト) 小松田 誠(マツダ マコト) 小松田 誠(マツダ マコト) 小松田 誠(マツダ マコト)

[Course requirements]

Students should be familiar with high-school level mathematics (algebra and calculus), and with basic mechanics.

[Evaluation methods and policy]

The students will be graded based on participation (20%) as well as a final report covering the contents of the class. (80%)

[Textbooks]

Not used

No textbook, handouts will be provided

[Study outside of class (preparation and review)]

Some homework to complete what has been seen in class.

[Other information (office hours, etc.)]

[Essential courses]