

<b>Course number</b>	U-LAS70 10002 SE50				
<b>Course title (and course title in English)</b>	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 )	<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, AMAR , Julien Samuel		
<b>Group</b>	Seminars in Liberal Arts and Sciences	<b>Number of credits</b>	2	<b>Number of weekly time blocks</b>	1
<b>Class style</b>	seminar (Face-to-face course)	<b>Year/semesters</b>	2026 ・ First semester	<b>Quota (Freshman)</b>	15 (15)
<b>Target year</b>	Mainly 1st year students	<b>Eligible students</b>	For all majors	<b>Days and periods</b>	Tue.5
<b>Classroom</b>	11, Yoshida-South Campus Academic Center Bldg. North Wing			<b>Language of instruction</b>	English
<b>Keyword</b>	Robotic Manipulation / Robotic Control / Robotic Manipulators / Industrial Robots				
<b>[Overview and purpose of the course]</b>					
<p>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?</p> <p>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.</p>					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>- Understand the issues and challenges surrounding robotic manipulation.</li> <li>- Be able to describe mathematically the kinematics and dynamics of robotic manipulators grasping objects.</li> </ul>					
<b>[Course schedule and contents]</b>					
<ol style="list-style-type: none"> <li>1. What does “ Robotic Manipulation ” means? (Week 1)</li> <li>2. Linear algebra as the language of robotics (Week 2-3)</li> <li>3. 3D rigid motion (Week 4)</li> <li>4. Modeling robot links and joints (Week 5)</li> <li>5. Forward and inverse kinematics (Week 6-7)</li> <li>6. Jacobian matrix and singularity problems for manipulators (Week 8-9)</li> <li>7. Mathematical formalisms for robotic manipulators (Week 10-11)</li> <li>8. An introduction to manipulators equations of motion (Week 12)</li> <li>9. Control strategies for manipulators (Week 13)</li> <li>10. Manipulation problems using Grasp Maps (Week 14)</li> <li>11. Feedback (Week 15)</li> </ol>					
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