基本情報/Course Schedule Information

開講区分(開講学期)／Semester	Spring and Summer Term
曜日・時間／Day and Period	Fri5
開講科目名／Course Name (Japanese)	応用理工学入門
開講科目名(英)／Course Name	Introduction of Mechanical, Materials and Manufacturing Science
授業形態／Type of Class	講義科目/Lecture
単位数／Credits	2
担当教員／Instructor	Shuichi Ino, Yasuhiro Mizutani, Yutaka Nomaguchi, Kimiaki Washino, Naoki Mori, Tsukasa Hori, Kunio Fujiwara, Hisashi Ishihara, Yuichiro Koizumi, Masataka Mizuno, Satoru Yoshimura, Kazufumi Nomura

※メディア授業科目について

授業回数の半数以上を、多様なメディアを高度に利用して教室等以外の場所で行う授業を「メディア授業科目」としています。

学部学生が「メディア授業科目」を卒業要件に算入できるのは60単位が上限です。

なお、非該当の場合であっても、メディアを利用した授業を実施する場合があります。

授業担当教員一覧

詳細情報/Detailed Syllabus Information

授業サブタイトル／Course Subtitle	
開講言語／Language of the Course	English
学習方法／Learning Method 右の8つの学習方法のうち、該当するものにチェックをつけてください。 「その他（自由記述）」を選択した場合は、右の黄色セルに具体的な内容を入力してください。	聴講・視聴/Listening and watching face-to-face/online class,発表/Presentation ☑ Listening and watching face-to-face/online class: Listening and watching a lecture, video, or demonstration, face-to-face or via online (e.g., attending a face-to-face lecture, watching an on-demand video) ☐ Reading: Reading books and academic papers (e.g., summarizing an academic paper, reading information on a website) ☐ Discussion: Learning through question-and-answer interactions and exchanges of opinions among students and between students and the instructor (e.g., pair/group discussion, online chat, one-on-one guidance for writing an academic paper) ☐ Collaborative work: Working as a pair or a group (e.g., producing a poster through group work) ☐ Research: Collecting information from books and academic papers; gathering and analyzing data by fieldwork (e.g., review of previous research, fieldwork) ☐ Experience/practice: Learning from experience- and practice-based activities, and feedback on such activities (e.g., solving problems; laboratory work using instruments; on-campus and off-campus practical training; skills practice including sporting skills; project-based learning; internship) ☑ Presentation: Writing papers, making presentations, and creating works (e.g., report writing, oral/poster presentation, creation of works, portfolio development) ☐ Others(free description)
授業の目的と概要／Course Objective	The aim of this course is to provide foreign students with the overview of the Division of Mechanical, Materials and Manufacturing Science from various representative topics.
履修条件・受講条件／Requirement / Prerequisite	Prior knowledge of Japanese language is required to attend classes.
出欠席及び受講に関するルール／Attendance and Student Conduct Policy	
教科書・指定教材／Textbooks	To be distributed from each instructor as necessary.
参考図書・参考教材／Reference	
成績評価に関する補足情報／Additional Information on Grading	
特記事項／Special Note	For each lecture, instructors will ask you to submit a report paper. The subject of the report paper will be announced in each lecture. The deadline of the submission of the report paper is one week after the lecture. The report is to be submitted to Collaboration and Leaning Environment (CLE) system.
オフィスアワー／Office Hour	
実務経験のある教員による授業科目／Course conducted by instructors with practical experience	

※　合理的配慮は定型文につき除外。

学習目標・成績評価詳細情報/Learning Goals &Grading Policy Information

学習目標(1)／Learning Goal(1)	Students can master the overview of the Division of Mechanical, Materials and Manufacturing Science.
学習目標(2)／Learning Goal(2)	
学習目標(3)／Learning Goal(3)	
学習目標(4)／Learning Goal(4)	
学習目標(5)／Learning Goal(5)	

↑　5行以上必要な場合は、行を挿入してください。

	評価方法／Evaluation Method　（プルダウンで選択してください。「その他（自由記述）」を選択した場合は、カッコ内に具体的な内容を入力してください。）				
学習目標／Learning Goals	レポート・論文/Report/paper	学習への参加度/Learning Engagement			
学習目標(1)／Learning Goal(1)	○	○			
学習目標(2)／Learning Goal(2)					
学習目標(3)／Learning Goal(3)					
学習目標(4)／Learning Goal(4)					
学習目標(5)／Learning Goal(5)					
評価割合(%)／Grade Breakdown	80%	20%	%	%	%

↑　5行以上必要な場合は、行を挿入してください。

評価割合/Allocation of Marks（%）：100%

授業計画/Class Plan Detailed Information

回／Time	題目／Title	内容／Content	授業時間外学習／Independent Study Outside of Class
1	Guidance Fundamentals and Practical Application of Computational Imaging	Overview of this course. In this lecture, in addition to fundamental principles of optics, a wide area of applications enabled by computational approaches will be systematically presented.	Report writing on the subject specified in the lecture.
2	Design Engineering	Introduction of design engineering: Backgrounds and fundamental approaches (product design and innovation).	Report writing on the subject specified in the lecture.
3	Computer Simulation of Multiphase Flows with Particles	This lecture provides an introduction to the computer simulations of particle-fluid multiphase flows, which covers a range of applications from natural phenomena to industrial processes.	Report writing on the subject specified in the lecture.
4	Introduction to Ultrasonics for Nondestructive Material Evaluation	Ultrasonic techniques, known as a familiar method in medical imaging, are also used for integrity assessment of various mechanical structures. This lecture reviews the different physical phenomena and nature of ultrasonic waves in solids, introducing their application to material characterization.	Report writing on the subject specified in the lecture.
5	Combustion Technologies Against Global Warming: The Challenge of Ammonia and Hydrogen	This lecture provides an overview of carbon-free fuels, focusing on ammonia and hydrogen as promising solutions to global warming. It introduces their combustion characteristics, environmental impacts, and challenges for social implementation, while also highlighting recent research trends and future prospects.	Report writing on the subject specified in the lecture.
6	Introduction to Molecular Thermal Fluid Engineering	Understanding thermal and fluid phenomena is central in a variety of engineering processes. In this class, fundamental physics/chemistry and simulation techniques to understand such phenomena at nano-meter scale are presented. The goal is to understand thermal and fluid processes from a view point of molecular perspective.	Report writing on the subject specified in the lecture.

7	Approach to controlling and evaluate android robot faces	The face for android robots is a display device that transmits psychological and social signals for others by deforming its soft continuous covering. Basic mechanism of the human and android faces will be introduced to discuss how we can/should control and evaluate the face in this lecture.	Report writing on the subject specified in the lecture.
8	Materials Design and Processing: Materials in our Life and their Production Processe	This lecture introduces the basic concepts of materials design and processing. We will explore how common materials such as metals, ceramics, and polymers are produced and used in our daily life.	Report writing on the subject specified in the lecture.
9	Materials Design and Processing: Creation of New Materials by Additive Manufacturing (3D Printing)	This lecture focuses on additive manufacturing, also known as 3D printing, as a new approach to materials design and processing. Students will learn how additive manufacturing enables the creation of new materials and structures that cannot be achieved by conventional methods.	Report writing on the subject specified in the lecture.
10	Materials Analysis (1)	Introduction to lattice defects analysis using positron annihilation spectroscopy.	Report writing on the subject specified in the lecture.
11	Materials Analysis (2)	Introduction to lattice defects analysis using first-principles calculations.	Report writing on the subject specified in the lecture.
12	Application of Ion Beam and Plasma Technologies (1)	Introduction of the plasma applications, such as nuclear fusion, catalytic synthesis, and medical applications.	Report writing on the subject specified in the lecture.
13	Application of Ion Beam and Plasma Technologies (2)	We will introduce the latest research on the applications of ion beams, such as semiconductor synthesis, insulating film deposition, catalyst synthesis, and plasma TV applications.	Report writing on the subject specified in the lecture.
14	Non-contact Non-destructive Testing Method Using Laser Ultrasonic (1)	In this lecture, before studying the laser ultrasonic method, you will first learn the details of ultrasonic testing and then gain hands-on experience through demonstration experiments using ultrasonic probes.	Report writing on the subject specified in the lecture.
15	Non-contact Non-destructive Testing Method Using Laser Ultrasonic (2)	In this lecture, we aim to deepen your understanding of the laser ultrasonic method by learning the theory of laser-induced ultrasound generation as an aspect of laser–material interaction, as well as its applications and practical examples.	Report writing on the subject specified in the lecture.
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↑　16行以上必要な場合は、行を挿入してください。

授業担当教員/Instructor(s)

教員氏名／Instructor Name	ふりがな／Name (hiragana)	所属・職名・講座名／Affiliation, Title, Course	居室／Office	内線／Extension	e-mail／E-mail
Shuichi Ino		Mechanical Engineering, Professor			
Yasuhiro Mizutani		Mechanical Engineering, Associate Professor			
Yutaka Nomaguchi		Mechanical Engineering, Associate Professor			
Kimiaki Washino		Mechanical Engineering, Associate Professor			
Naoki Mori		Mechanical Engineering, Associate Professor			
Tsukasa Hori		Mechanical Engineering, Associate Professor			
Kunio Fujiwara		Mechanical Engineering, Associate Professor			
Hisashi Ishihara		Mechanical Engineering, Associate Professor			
Yuichiro Koizumi		Materials and Manufacturing Science, Professor			
Masataka Mizuno		Materials and Manufacturing Science, Associate Professor			
Satoru Yoshimura		Materials and Manufacturing Science, Associate Professor			
Kazufumi Nomura		Materials and Manufacturing Science, Associate Professor			

↑　5行以上必要な場合は、行を挿入してください。