

2025 年度シラバス

科目分類/Subject Categories			
学部等/Faculty	/大学院工学科学研究科（博士前期課程）： /Graduate School of Science and Technology (Master's Programs)	今年度開講/Availability	/無：/Not available
学域等/Field	/物質・材料科学域：/Academic Field of Materials Science	年次/Year	/1～2年次：/1st through 2nd Year
課程等/Program	/材料制御化学専攻：/Master's Program of Material's Properties Control	学期/Semester	/春学期：/Spring term
分類/Category	/授業科目：/Courses	曜日時限/Day & Period	/：/

科目情報/Course Information				
時間割番号 /Timetable Number				
科目番号 /Course Number	61760025			
単位数/Credits	2			
授業形態 /Course Type	講義・演習・実験：Lecture/Practicum/Lab			
クラス/Class				
授業科目名 /Course Title	Metal forming technologies : Metal forming technologies			
担当教員名 / Instructor(s)	/トリノ工科大学教員（材料創製化学専攻および材料制御化学専攻ダブル・ディグリープログラムコース）： Related teacher of Polytechnic University of Turin (Double Degree Program course in the Master's Program of Innovative Materials and Material's Properties Control)			
その他/Other	インターンシップ実施科目 Internship	国際科学技術コース提供科目 IGP	PBL 実施科目 Project Based Learning	DX 活用科目 ICT Usage in Learning
	実務経験のある教員による科目 Practical Teacher			
科目ナンバリング /Numbering Code				

授業の目的・概要 Objectives and Outline of the Course	
日	
英	The course is aimed at deepening the knowledge related to the metal forming processes and technologies. After an introduction of the fundamental principles related to the different techniques, processes and the equipment used in metal forming will be examined. The manufacturing of finished parts, made of metal alloys and metal based composites, is studied and analyzed, particularly in terms of the applications of technology in different industrial sectors

学習の到達目標 Learning Objectives	
日	deepening the knowledge related to the metal forming processes and technologies
英	deepening the knowledge related to the metal forming processes and technologies

学習目標の達成度の評価基準 / Fulfillment of Course Goals (JABEE 関連科目のみ)	
日	
英	

授業計画項目 Course Plan			
No.		項目 Topics	内容 Content
1	日		

	英	FOUNDRY	Principles of solidification of the alloys. Flow diagram and processing cycle typical of a foundry. Models, shapes and dies, traditional and special forming methods. Gravity casting, centrifugal casting and die casting. Investment Casting. Squeezecasting,
2	日 英	PLASTIC DEFORMATION	Mold Casting and continuous casting. Recall of the theory of plasticity and of the theoretical fundamentals of the plastic deformation. Hot, semi-hot and cold deformation. Primary and secondary rolling. Forging, pressing, direct and inverse extrusion, dra
3	日 英	POWDER METALLURGY(1)	Production Techniques and characterization of the product Pressing in molds: obtainable shapes and limits. Special compaction processes, cold and hot isostatic pressing. Sintering in furnaces: thermodynamic aspects of the process, furnaces and sintering a
4	日 英	POWDER METALLURGY(2) POWDER METALLURGY(2)	Metal Injection Molding: characteristics and applications, raw materials and production cycle. FAST Techniques: SPS, EDS, CDS Free-form processes and 3D printing. Additive Manufacturing: main techniques and typical products.
5	日 英	MACHINING	MACHINING
6	日 英	SPRAYING	Spraying techniques. General rules for spraying processes. Characteristics of different processes and typical microstructures.
7	日 英	DESIGN CRITERIA AND COST ANALYSIS(1)	Technical/economic comparison among the different alternative technologies and selection criteria for process optimization. Cost indexes. Design of a forming process, tools and form factors.
8	日 英	DESIGN CRITERIA AND COST ANALYSIS(2)	The characteristics of formability, properties and microstructural characteristics of the materials will be examined by means of practical/virtual labs, as function of the different technologies adopted, with the observation and analysis of finished piece
9	日 英	DESIGN CRITERIA AND COST ANALYSIS(3)	The characteristics of formability, properties and microstructural characteristics of the materials will be examined by means of practical/virtual labs, as function of the different technologies adopted, with the observation and analysis of finished piece
10	日 英	Presentation(1)	Presentations of group exercised and laboratories in this course.
11	日 英	Presentation(2)	Presentations of group exercised and laboratories in this course.
12	日 英	Presentation(3)	Presentations of group exercised and laboratories in this course.
13	日 英		
14	日 英		
15	日 英		

履修条件 Prerequisite(s)

日	
英	

授業時間外学習（予習・復習等）

Required study time, Preparation and review

日	
英	Analysis of a set of functional components, with the investigation of the different component parts, examination of the most proper materials for the manufacturing, choice of the molding process and design of the production cycle.

教科書／参考書 Textbooks/Reference Books	
日	
英	Kalpajian, Mechanical Technology, Pearson, 2014 J. Beddoes, Principles of Metals Manufacturing Processes, Elsevier, 2006 A. Salak, Ferrous Powder Metallurgy, Cambridge International Science Pub., 1995 G. Dieter, Mechanical Metallurgy, McGraw.Hill, Tokio,

成績評価の方法及び基準 Grading Policy	
日	
英	Expected learning results: Comprehension of the topics illustrated and ability to couple the parts' shape, size and material characteristics to the most proper metal forming process Ability to summarize the most relevant characteristics of each production

留意事項等 Point to consider	
日	
英	