2026 年度シラバス

科目分類/Subject Categories			
学部等/Faculty	/大学院工芸科学研究科（博士前期課程）：/Graduate School of Science and Technology (Master's Programs)	今年度開講/Availability	/有 ：/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	/秋学期 ：/Fall 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	0			
科目番号 /Course Number	61760021			
単位数/Credits	2			
授業形態 /Course Type	講義・演習 ：Lecture/Practicum			
クラス/Class				
授業科目名 /Course Title	High-performance fibers for composites, sportswear and protection : High-performance fibers for composites, sportswear and protection			
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 will give an overview of technical fibers. Materials properties, manufacturing technologies and applications will be described, with particular emphasis to the latest advances in different fields, such as composites, advanced sportswear and protective textiles. By completing the course, the student will gain knowledge of high performance fibrous materials used in the industry, in consumer goods, in sports gear and protective apparel. He/she will be able to select the most suitable fibers for different applications. He/she will gain knowledge of the manufacturing processes to produce high-performance fibers, yarns and fabrics. He/she will understand the role of apparel in the human body thermal balance

学習の到達目標 /Learning Objectives	
日	To understand an overview of technical fibers
英	To understand an overview of technical fibers

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	Milestones in the development of technical textiles	Market overview: worldwide consumption of technical textiles by product type and by application. Mechanical properties of textiles: definition of linear density, tensile strength, tenacity, elongation, yield points, modulus, elastic recovery. High perfor
2	日		
	英	High performance fibers(1)	Liquid crystal polymers: lyotropic and thermotropic liquid crystals. Dry-jet wet spinning of high-strength fibers. Para-aramids. Liquid crystal heterocyclic fibers (PBO Zylon, PBT). Liquid crystals aromatic copolyester (Vectran). Applications of para-aram
3	日		
	英	High performance fibers(2)	High strength- high modulus polyethylene (Dyneema). Gel spinning. Superdrawing.
4	日		
	英	High performance fibers(3)	Carbon fibers: Application of carbon fibers in composites manufacturing.
5	日		
	英	High performance fibers(4)	High performance fibers(4)
6	日		
	英	Composite	Use of fibers in composites, mechanical properties of composites, effect of yarn interlacing on composites properties.
7	日		
	英	Heat and flame protection	Inherently flame retardant fibers (Basofil, Kynol, arimid, modacrylics), chemically modified fibers (intumescent systems, FR finishing of cotton, viscose, wool).
8	日		
	英	Textiles for sportswear	Introduction to thermo-physiological comfort. Effect of environment, metabolism and clothing on thermal comfort.
9	日		.
	英	Criteria for designing high-performance sportswear	Wicking properties and liquid management of fabrics, water vapour permeability, air permeability, thermal resistance.
10	日		
	英	Models for predicting comfort	Fanger model and predictive mean vote. Heat and mass balance across the human body.
11	日		
	英	Smart textiles	Stimuli-responsive polymers for smart textiles, phase-change materials, shape-memory materials.
12	日		
	英	Wearable technologies	Electronic textiles, conductive polymers, screen printing technique. Use of smart and wearable technologies to improve safety and performance at work and during sports activities.
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	Sustainable development goal.The course will be made of lectures and work groups during which the students will focus on specific applications of high performance fibers (for instance, agrotextiles, medical textile, etc..) and will deliver a presentation to the class-mates at the end of the course.

教科書／参考書 /Textbooks/Reference Books	
日	
英	AA.VV. Textiles for Sporswear, Woodhead publishing, 2016 AA.VV. Handbook of Technical Textiles, Woodhead Publishing, 2015 AA.VV. Smart textiles for Protection, Woodhead Publishing, 2013

成績評価の方法及び基準 /Grading Policy	
日	
英	Compulsory oral exam; The exam will be an individual online oral assessment (24/30 maximum grade) plus an online team work presentation (6 points max), which will be discussed by the team members during the scheduled lectures. Written test; The exam will be an onsite individual written assessment (24/30 maximum grade) plus the online team work presentation (6 points max), which will be discussed by the team members during the scheduled lectures

留意事項等 /Point to consider	
日	
英	