

2025 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	/独立専攻：/Fibro/BBM	年次/Year	/1～2年次：/1st through 2nd Year
課程等/Program	/先端ファイブ科学専攻：/Master's Program of Advanced Fibro-Science	学期/Semester	/春学期：/Spring term
分類/Category	/授業科目：/Courses	曜日時限/Day & Period	/集中：/Intensive

科目情報/Course Information				
時間割番号 /Timetable Number	65109913			
科目番号 /Course Number	65160206			
単位数/Credits	2			
授業形態 /Course Type	講義：Lecture			
クラス/Class				
授業科目名 /Course Title	テキスタイルとナノテクノロジー：Nanotechnology in the Textile Branch			
担当教員名 / Instructor(s)	/山田 和志/(Dana Kremenakova)：YAMADA Kazushi/Dana Kremenakova			
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	M_AF6111			

授業の目的・概要 Objectives and Outline of the Course	
日	Upon successful completion of the course, the students will be able to understand the principles of nanotechniques used in different textile processes and know the developments and innovations in this quickly growing area. Keywords: nanotechnology, size effect, nanophysics, nanoparticles, nanocomposites, nanofibres, surface nanostructures
英	Upon successful completion of the course, the students will be able to understand the principles of nanotechniques used in different textile processes and know the developments and innovations in this quickly growing area. Keywords: nanotechnology, size effect, nanophysics, nanoparticles, nanocomposites, nanofibres, surface nanostructures

学習の到達目標 Learning Objectives	
日	To understna nanotechnology, size effect, nanophysics, nanoparticles, nanocomposites, nanofibres, surface nanostructures
英	To understna nanotechnology, size effect, nanophysics, nanoparticles, nanocomposites, nanofibres, surface nanostructures

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	
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授業計画項目 Course Plan			
No.		項目 Topics	内容 Content
1	日	Part 1: refreshments	The lecture will be focused on following topics: electrons an photons, types of bonds, polymeric chains physics, cohesive energy density, macromolecule in solution,

	英	Part 1: refreshments	chains flexibility, molecular mass related properties, random walk, viscosity, basic force The lecture will be focused on following topics: electrons and photons, types of bonds, polymeric chains physics, cohesive energy density, macromolecule in solution, chains flexibility, molecular mass related properties, random walk, viscosity, basic force
2	日	Part 2: general aspects of nano	The lecture will be focused on following topics: development of nanotechnology, differences between nano and micro, surface volume ratio, portion of atoms on surface, filling of space, packing density, cohesion
	英	Part 2: general aspects of nano	The lecture will be focused on following topics: development of nanotechnology, differences between nano and micro, surface volume ratio, portion of atoms on surface, filling of space, packing density, cohesion
3	日	Part 3: nanoscale phenomena	The lecture will be focused on topics: AFM and STM microscopy, characterization of nano, mean free path, porosity, forces in nano scale, electrical effects, stickiness in nano, quantum effect, tunnelling self organization, nano objects density differences, small s
	英	Part 3: nanoscale phenomena	The lecture will be focused on topics: AFM and STM microscopy, characterization of nano, mean free path, porosity, forces in nano scale, electrical effects, stickiness in nano, quantum effect, tunnelling self organization, nano objects density differences, small s
4	日	Part 4: physics in nano scale	The lecture will be focused on following topics: clusters of atoms, coordination number, solubility, transport properties, Knudsen diffusion, thermal properties, thermodynamic in nano range, nano physics
	英	Part 4: physics in nano scale	The lecture will be focused on following topics: clusters of atoms, coordination number, solubility, transport properties, Knudsen diffusion, thermal properties, thermodynamic in nano range, nano physics
5	日	Part 5: myths about nano	The lecture will be focused on following topics: relative surface area, weakness and thermal resistance of nanofibers, melting point, yield strength, nano fibrous assemblies geometry
	英	Part 5: myths about nano	Part 5: myths about nano
6	日	Part 6: carbon nano structures	The lecture will be focused on following topics: types of carbon, properties of CNT, fullerenes and graphene, preparation of carbon materials, physical and chemical functionalization of carbon structures
	英	Part 6: carbon nano structures	The lecture will be focused on following topics: types of carbon, properties of CNT, fullerenes and graphene, preparation of carbon materials, physical and chemical functionalization of carbon structures
7	日	Part 7: nanoparticles	The lecture will be focused on following topics: size and shape effect, nanoparticles classification, geometry of splitting of particles, interparticle distance, optical effect, energy gap, nano dots, surface plasmon, fabrication of nanoparticles, stability
	英	Part 7: nanoparticles	The lecture will be focused on following topics: size and shape effect, nanoparticles classification, geometry of splitting of particles, interparticle distance, optical effect, energy gap, nano dots, surface plasmon, fabrication of nanoparticles, stability
8	日	Part 8: nanocomposites	The lecture will be focused on following topics: nano fillers, mechanical properties, special effects, radius of gyration, compatibility, enhancing of matrix mechanical properties, threshold effect, nano indentation
	英	Part 8: nanocomposites	The lecture will be focused on following topics: nano fillers, mechanical properties, special effects, radius of gyration, compatibility, enhancing of matrix mechanical properties, threshold effect, nano indentation
9	日	Part 9: nanotechnology in textiles	The lecture will be focused on following topics: textile structures interrelations, nano coating, nano finishing, activation of surfaces, flame retardancy, dyeing by nanoparticles, thermal effects, electrical conductivity, nanoparticles coloration, intelligence
	英	Part 9: nanotechnology in textiles	The lecture will be focused on following topics: textile structures interrelations, nano coating, nano finishing, activation of surfaces, flame retardancy, dyeing by nanoparticles, thermal effects, electrical conductivity, nanoparticles coloration, intelligence
10	日	Part 10 nanomaterials	The lecture will be focused on following topics: aerogels structure, preparation and

			properties, cyclodextrins, dendrimers, supermolecular systems, surface nanocoating by metals, thin films, molecular magnitudes, nanofluids
	英	Part 10 nanomaterials	The lecture will be focused on following topics: aerogels structure, preparation and properties, cyclodextrins, dendrimers, supermolecular systems, surface nanocoating by metals, thin films, molecular magnitudes, nanofluids
11	日	Part 11: nanofibrous assemblies	The lecture will be focused on following topics: nanofibrous assemblies geometry, mechanical properties and special effects, limits
	英	Part 11: nanofibrous assemblies	The lecture will be focused on following topics: nanofibrous assemblies geometry, mechanical properties and special effects, limits
12	日	Part 12: nano in medicine	The lecture will be focused on following topics: nanoparticles and cells, antimicrobials, diseases due to nanoparticles, non-implantable materials primary and secondary, drug delivery, biodegradability
	英	Part 12: nano in medicine	The lecture will be focused on following topics: nanoparticles and cells, antimicrobials, diseases due to nanoparticles, non-implantable materials primary and secondary, drug delivery, biodegradability
13	日	Part13: nanocellulose	The lecture will be focused on following topics: cellulose peculiarities and structure, sources of cellulose, isolation of nanocellulose, properties of nanocellulose, application of nanocellulose, cellulose nanocrystals, fillers
	英	Part13: nanocellulose	The lecture will be focused on following topics: cellulose peculiarities and structure, sources of cellulose, isolation of nanocellulose, properties of nanocellulose, application of nanocellulose, cellulose nanocrystals, fillers
14	日	Part 14: toxicity of nanomaterials	The lecture will be focused on following topics: viruse and bacteria composition and structure, basic mechanisms of toxicity, body exposures by nanoparticles, ros and corona effects, metallic oxides toxicity, titania case, depositon in human body, bio per
	英	Part 14: toxicity of nanomaterials	The lecture will be focused on following topics: viruse and bacteria composition and structure, basic mechanisms of toxicity, body exposures by nanoparticles, ros and corona effects, metallic oxides toxicity, titania case, depositon in human body, bio per
15	日	Part 15: future trends	The lecture will be focused on following topics: future society, sustainability and nano, life cycle of nano, renewable and non-renewable sources, cost, wastes containing nano particles
	英	Part 15: future trends	The lecture will be focused on following topics: future society, sustainability and nano, life cycle of nano, renewable and non-renewable sources, cost, wastes containing nano particles

履修条件 Prerequisite(s)	
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授業時間外学習（予習・復習等） Required study time, Preparation and review	
日	Initial competences: • Bsc level in mathematics, organic chemistry, physical chemistry, general process engineering, textile technology and materials engineering
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教科書／参考書 Textbooks/Reference Books	
日	Mishra, R. and Militký J. Nanotechnology in Textiles. Duxford: Woodhead Publishing 2018 Satler K.D. Handbook of nanophysics 7 volume set, CRC Press 2011 Vajtai R. Springer handbook of nanomaterials, Springer 2013, Bhushan B. Springer han
英	Mishra, R. and Militký J. Nanotechnology in Textiles. Duxford: Woodhead Publishing 2018 Satler K.D.

	Handbook of nanophysics 7 volume set, CRC Press 2011 Vajtai R. Springer handbook of nanomaterials, Springer 2013, Bhushan B. Springer han
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成績評価の方法及び基準 Grading Policy	
日	End-of-term evaluation and continuous assessment Examination methods in case of periodic evaluation during the first examination period: Written Examination Examination methods in case of periodic evaluation during the second examination period: Written
英	End-of-term evaluation and continuous assessment Examination methods in case of periodic evaluation during the first examination period: Written Examination Examination methods in case of periodic evaluation during the second examination period: Written

留意事項等 Point to consider	
日	Teaching language is English. For each lecture it will be at disposal comprehensive ppt presentations. This is an intensive course.
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