

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	/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	/機能物質化学専攻：/Master's Program of Functional Chemistry	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				
科目番号 /Course Number	61960023			
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	Colloids and Interfaces : Colloids and Interfaces			
担当教員名 / Instructor(s)	/機能物質化学専攻関係教員：Related teacher of the Master's Program of Functional Chemistry			
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	<p>The study of the properties of colloids is necessary for understanding the structure and behavior of a wide range of complex systems that are used both in many industrial applications (food, pharmaceutical, cosmetics, paints, etc.) and in modern nano-bio -technologies. The aim of the course is a detailed overview on the study of the surface and stability of the colloidal systems.</p> <p>The laboratory module of the course of Colloids and Interfaces consists of a series of laboratory experiments concerning the synthesis of nanoparticles and molecules endowed with functionalities to give association phenomena in solution, their study and the analysis of their aggregation and colloidal stability properties from a molecular point of view. The course is mandatory within the degree in Bio and Nanomaterials as it allows the student directly to engage with the preparation of nanometric systems of different nature, understanding and measuring the properties of mutual interaction and carrying out the relative characterization in solution.</p>

学習の到達目標 Learning Objectives	
日	
英	<p>To know the theoretical basis and the the properties of a surface and of colloidal systems</p> <p>To know ructural parameters of the colloid systems, the specific surface area, and select the suitable surfactants</p> <p>Ability to evaluate, in a reasoned manner, experimental results associated to surfaces or colloidal system</p>

	To use in an appropriate way the terminology and the symbolism learnt during the course
	To take notes during classes in a proper way, evidencing the topics according to their importance

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	Colloids and surface chemistry: general aspects.	Lecture on colloids and surface chemistry from general aspects.
2	日 英	Specific surface area; Sedimentation and diffusion.	Lecture on specific surface area. Lecture on sedimentation and diffusion.
3	日 英	Solution thermodynamics; Osmotic and Donnan equilibria	Lecture on solution thermodynamics. Lecture on osmotic and Donnan equilibria.
4	日 英	Rheology of fluids and dispersions; Static and dynamic light scattering	Lecture on rheology of fluids and dispersions. Lecture on static and dynamic light scattering.
5	日 英	Surface tension and contact angle; Surfactants	Surface tension and contact angle; Surfactants
6	日 英	Emulsions; Colloidal structures	Lecture on emulsions. Lecture on colloidal structures.
7	日 英	Adsorption at gas-solids interfaces	Lecture on adsorption at gas-solids interfaces.
8	日 英	Introduction to nuclear magnetic resonance spectrometry	Theory and application for spectral interpretation, assignment of signals and study of the interaction between molecules by monitoring the value of chemical shift with concentration and two-dimensional diffusion spectra.
9	日 英	Weak attractive interactions	Lessons on weak attractive interactions between chemical species, hydrogen bonding, electrostatic interaction, ion-dipole interaction, dipole interaction, van der Waals interactions, ion-aryl interaction, pi-pi interaction, halogen bonding, classic and no
10	日 英	Description of the laboratory experiments (1)	Description of the laboratory experiments related to the preparation of metal nanoparticles, the synthesis of organic molecules able to form supramolecular aggregates (micelles and capsules).
11	日 英	Description of the laboratory experiments (2)	Recommendations on the proper behavior to be kept in the laboratory.
12	日 英	Laboratory experiences (1)	Synthesis of silver nanoparticles of controlled nanometric size and spectrophotometric characterization
13	日 英	Laboratory experiences (2)	Determination of the critical micellar concentration of a surfactant by NMR analysis

14	日 英	Laboratory experiences (3)	Synthesis of resorcinarene and study of aggregation in solution and interaction with guest molecules
15	日 英	Laboratory experiences (4)	Synthesis of a molecule able to form liquid crystals and study of the aggregation

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	The prerequisites of the course are the training objectives of the Physical Chemistry courses. It is necessary for the students to know the theoretical foundations and basic applications of the differential and integral calculus, the kinematics, the dynamics and the physical chemistry, in particular thermodynamics.

教科書／参考書 Textbooks/Reference Books	
日	
英	P.C Hiemenz and R. Rajagopalan, Principles of Colloid and Surface Chemistry (Marcel Dekker, 1997).J. Lyklema, Fundamentals of Interface and Colloids Science (Academic Press,1991).D. Myers, Surfaces, Interfaces and Colloids (Wiley-VCH,1999).Autori Vari Chi

成績評価の方法及び基準 Grading Policy	
日	
英	The exam consists of a written test based on three open questions. The test lasts one hour and half and the use of notes, books and electronic devices is not allowed.

留意事項等 Point to consider	
日	
英	