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	/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	61960024			
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	Condensed Matter Physics : Condensed Matter Physics			
担当教員名 / Instructor(s)	/ベニス大学教員（機能物質化学専攻ダブル・ディグリープログラムコース）：Related teacher of Ca' Foscari University of Venice (Double Degree Program course in 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	This course is offered during the first semester of the second year, and is a core (i.e. required) for all second year students. It builds upon previous courses (Principles of Physical Chemistry, Mathematical Methods of Physics) to set up a rigorous theory of molecular and solid state physics. The course is roughly divided in three parts. The first part deals with basic elements of statistical mechanics; the central part is devoted to atomic and molecular theory. The last part hinges upon Solid State theory at the level appropriate to a second level degree.

学習の到達目標 Learning Objectives	
日	Identify characteristic length and energy scales of a problem Identify the correct theoretical approach for any given problem Perform exact analytical calculation using advanced mathematical techniques Be familiar with approximate methods (e.g. perturbation theory) Identify the limitations of an approximate methods and use them properly Be able to read any advanced paper/book on this topic on their own
英	

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	THERMODYNAMIC POTENTIALS (1)	Legendre transform, Euler and Gibbs-Duhem equations,
2	日		
	英	THERMODYNAMIC POTENTIALS (2)	Helmholts and Gibbs potentials, grand-potentials
3	日		
	英	STATISTICAL MECHANICS	Kinetic Theory, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distributions
4	日		
	英	TRANSPORT THEORY	Drude Theory, Thermal and electrical conductivity, Fermi ideal gas, Sommerfeld theory, Wiedeman-Franz law
5	日		
	英	EXACT SOLUTION FOR HYDROGEN ATOM	EXACT SOLUTION FOR HYDROGEN ATOM
6	日		
	英	ATOMISTIC AND MOLECULAR THEORY	Perturbation theory, ground state of Helium atom, parahelium and orthohelium
7	日		
	英	CRYSTAL STRUCTURE	Bravais lattice, Reciprocal lattice, Brillouin zone
8	日		
	英	BAND THEORY	Bloch theorem, two-levels example and bands
9	日		
	英	HARMONIC CRYSTAL	Harmonic potential, Normal modes for a biatomistic molecule
10	日		
	英	QUANTUM CRYSTAL	Lecture on quantum crystal
11	日		
	英	Additional topics (1)	DIAMAGNETISM AND PARAMAGNETISM
12	日		
	英	Additional topics (2)	ELECTRON INTERACTIONS AND FERROMAGNETISM
13	日		
	英	Discussion and presentation	Discussion and presentation on the above topics
14	日		
	英	Oral exam	Oral examination of on the above topics
15	日		
	英	Written exam	Written examination on the above topics

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	Course prerequisites Knowledge of all mathematical tools at the level of those offered by the course of Mathematical Methods of Physics or

	similar, is required. Also required is the knowledge of classical physics (Classical Mechanics, Thermodynamics, Electromagnetism) as covered in conventional scientific first degree programs. Useful, but not necessary, is a previous exposition to the principle of quantum mechanics at the level of that covered by the course of Principle of Physical Chemistry or similar.

教科書／参考書 Textbooks/Reference Books	
日	
英	Solid State Physics N. W. Ashcroft e N. D. Mermin: Solid State Physics (Saunders College 1976) C. Kittel: Introduction to Solid State Physics (J. Wiley & Sons, Canada 1971) J. R. Hooke e H.E. Hall: Solid State Physics (J. Wiley & Son, 1999) Atomic and Molecular Physics I. Schiff: Quantum Mechanics (Mc. Graw-Hill 1968) C. Cohen, B. Diu, F. Laloe: Quantum Mechanics Vol 1 e 2 (Wiley Hermann 1977) R. Feynman, R. Leighton e M. Sands: La Fisica di Feynman Vol III (Masson Italia Editori, Milano 1985) M.Blinder: Introduction to Quantum Mechanics (Elsevier 2004) James E. House: Fundamental of Quantum Chemistry (Elvevier 2004) Statistical Thermodynamics F. Reif: Fundamental of Statistical and Thermal Physics (MC Graw Hill 1987) C. Kittel e H. Kroemer: Termodinamica Statistica (Boringhieri 1985) L. Reichl: A Modern Course in Statistical Physics (University of Texas 1980) H. B. Callen: Thermodynamics and an Introduction to Thermostatics (Wiley & Son 1985)

成績評価の方法及び基準 Grading Policy	
日	
英	Assessment methods Written and oral exams Detailed description of the assessment methods Final grade will be the average of an oral exam (worth 50% of the final grade) and of the average grade reported on homeworks that will be assigned during the semester (and worth the additional 50% of the final grade). All homeworks must be handed in within the due date. Failure to do that will result into the impossibility of taking the oral exam. Later turning in will be penalized in terms of grades. The allotted time for each homework will be on average three weeks.

留意事項等 Point to consider	
日	
英	