Year	Second semester 2025
Course	Lecture on Basic Solid State Physics and Statistical Physics
Day/Period	Tue.2Period
Credit(s)	2Credits
Instructor	SHUNSUKE SATO
Eligible Participants	Not specified (For all grades)
Course code/number	SPH-PHY511B
Main Subjects	
Course of Media Class	
Practical business	
Language Used in Course	Japanese／English
Course Title	Basics of condensed matter physics
Purpose/Abstract	The goal is to acquire fundamental knowledge necessary for advancing studies and research in solid-state physics. This course covers the basics of crystal structures of solids, band theory, electronic properties, and phonon properties.
Goal	The aim of the course is to understand the band structure of electronic states in periodic systems, such as solids, and their effects on physical properties. Additionally, it aims to provide a fundamental understanding of phonon modes.
Contents and progress schedule of the class	1st Lecture: Fundamental Properties of Many-Fermion Systems 2nd Lecture: Hartree-Fock Approximation 3rd Lecture: Atomic Shell Structure 4th Lecture: Born-Oppenheimer Approximation, Molecular Orbitals, and Molecular Vibration Modes 5th Lecture: Crystal Lattice Vectors and Bloch's Theorem 6th Lecture: Band Theory I 7th Lecture: Band Theory II 8th Lecture: Density Functional Theory I 9th Lecture: Density Functional Theory II 10th Lecture: Fundamentals of Phonons I 11th Lecture: Fundamentals of Phonons II 12th Lecture: Semi-Classical Models of Optical and Transport Properties 13th Lecture: Quantum Theory of Optical and Transport Properties 14th Lecture: Time-Dependent Mean-Field Theory 15th Lecture: Collective Excitation Modes and Excitons
Grading	Submitted reports, attendance and so on are evaluated.
Books required/referenced	The textbook will not be used. Class materials will be distributed.
Contents of preparation and review	Deepen understanding by deriving equations and other calculations based on the materials distributed in class.
Study time for preparation and review	Standard Hours for Preparation/Review per class: *Lectures 4 hour *Seminar 2-4 hour *Experiment, Laboratory Work, and Skill Test 2 hours
How to contact and Google Classroom Code	If needed, please contact the following email address: shunsuke.sato@tohoku.ac.jp
Remarks	
Last Update	

One-credit courses require 45 hours of study. In lecture and exercise-based classes, one credit consists of 15-30 hours of class time and 30-15 hours of preparation and review outside of class. In laboratory, practical skill classes, one credit consists of 30-45 hours of class time and 15-0 hours of preparation and review outside of class.