

# 강 의 계 획 서(Syllabus)

## [1] 기본 정보(Basic Information)

### ■ 강의 정보(Course Information)

교과목명 (Course Title)	양자역학 I (QUANTUM MECHANICS I)	강의유형 (Course Type)	이론 (Theoretical course)
------------------------	------------------------------------	-----------------------	-------------------------

## [2] 학습 목표/성과(Learning Objectives/Outcomes)

### ■ 과목 설명(Course Description)

This course covers the first part of quantum mechanics. Topics include the basic concepts of quantum mechanics including a mathematical framework, schroedinger equation, and angular momentum. The significance of the symmetry in a description of physics is emphasized.

### ■ 학습 목표(Learning Objectives)

It is aimed that the graduate students after this course are acquainted with the concepts of quantum physics as scientific background. The students are expected to understand a theoretical framework of quantum physics enough to be qualified for their research areas, where modern quantum physics is essential.

### ■ 학습 성과(Learning Outcomes)

After completed course, the student should master the formalism and methods of quantum mechanics in order to

- perform theoretical studies and calculations with applications on atomic and subatomic phenomena.
- evaluate experimental results in terms of quantum mechanics
- account for its potential applications in emerging technologies

## [3] 강의 진행 정보(Course Methods)

### ■ 강의 진행 방식(Teaching and Learning Methods)

강의 진행 방식	추가 설명
오프라인 강의	ppt와 white board를 이용한 설명과 유도 위주의 강의. 강의노트는 pdf 파일로 제공

### ■ 수업 자료(Textbooks, Reading, and other Materials)

수업 자료	제목	저자	출판일/게재일	출판사/학회지
Textbooks	Modern Quantum Physics	J. J. Sakurai and Jim Napolitano	2017.09	Cambridge University Press

#### [4] 수업 일정(Course Schedule)

차시	강사명	수업주제 및 내용	제출 과제	추가 설명
1	최광용	Survey on classical mechanics	Reading lecture note Chapter 0	
2	최광용	Fundamental concepts I (Stern-Gerlach Experiment, Kets, Bras, and Operators, Matrix Representations)	Reading Sakurai Chapter 1.1, 1.2 and 1.3	
3	최광용	Fundamental concepts II (Measurements, Observables, Uncertainty Relations, change of Basis)	Reading Sakurai Chapter 1.4 and 1.5	
4	최광용	Fundamental concepts III (Position, Momentum, and Translation, Wave Functions in Position and Momentum Space)	Reading Sakurai Chapter 1.6 and 1.7	
5	최광용	Quantum Dynamics I (Schroedinger equation, Schroedinger vs Heisenberg picture)	Reading Sakurai Chapter 2.1 and 2.2	
6	최광용	Quantum Dynamics II (Simple Harmonic Oscillator; Schroedinger's wave equation)	Reading Sakurai Chapter 2.3 and 2.4	
7	최광용	Quantum Dynamics III (Propagators, Path Integrals, Gauge Transformations)	Reading Sakurai Chapter 2.5	
8	최광용	Quantum Dynamics IV (Potentials and Gauge Transformations)	Reading Sakurai Chapter 2.6	
9	최광용	Angular Momentum I (Rotations and $S=1/2$ Systems)	Reading Sakurai Chapter 3.1 and 3.2	
10	최광용	Angular Momentum II ( $O(3)$ , $Su(2)$ , Euler Rotations, and Density Operators)	Reading Sakurai Chapter 3.3 & 3.4	
11	최광용	Angular Momentum III ( Eigenvalues of Angular Momentum)	Reading Sakurai Chapter 3.5	
12	최광용	Angular Momentum IV (Orbital Angular Momentum; Addition of Angular Momenta)	Reading Sakurai Chapter 3.6 and 3.7	
13	최광용	Schwinger's Oscillator Model of Angular Momentum and Bell's Inequality	Reading Sakurai Chapter 3.8, 3.9	

#### [5] 수강생 학습 안내 사항

강의노트는 Sakurai 책을 충실히 따르고 모든 공식을 자세히 유도하고 있다. 일부 연습문제 풀이도 포함하고 있다.