<table>
<tr><td>Course Code</td><td>PHY6007</td><td>* Teaching Hours</td><td>64</td><td>* Credits</td><td>4</td></tr>
<tr><td rowspan="2">* Course Name</td><td colspan="5"></td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>* Instruction Language</td><td colspan="5"></td></tr>
<tr><td>* School</td><td colspan="5"></td></tr>
<tr><td>Prerequisite</td><td colspan="5"></td></tr>
<tr><td rowspan="4">Instructors</td><td>Name</td><td>Title</td><td colspan="2">Department</td><td>E-mail</td></tr>
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<tr><td>* Course Description</td><td colspan="5"></td></tr>
<tr><td>* English Course Description</td><td colspan="5">Quantum mechanics is the fundamental theory of physics used to describe the physical properties of nature at the scale of atoms and subatomic particles. It serves as the foundation for all disciplines of quantum physics, including quantum chemistry, quantum field theory, quantum materials, quantum technologies, and quantum information science. Advanced quantum mechanics does not have an essential difference from quantum mechanics; it emphasizes establishing a bridge between quantum mechanics and other disciplines of quantum physics based on the fundamental concepts of quantum mechanics. The contents of this course include the basic concepts of quantum mechanics, quantum dynamics, symmetry and angular momentum theory, perturbation theory, composite quantum systems and quantum entanglement, second quantization, scattering theory, and relativistic quantum mechanics. Through this course, students can gain a deeper understanding of the basic concepts of quantum mechanics and learn to apply these concepts to analyze and understand the fundamental phenomena in quantum physics, as well as master the basic methods for solving quantum physics problems.</td></tr>
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	Week	Content	Hours	Format	Instructor
* Schedules	1.5	1. 1.1 Warmup: 1.2 1.3 1.3.1 1.3.1.1 1.3.1.2 1.3.2 1.3.3 1.3.4 1.3.5 1.4 1.4.1 1.4.2 1.4.3 1.4.4 1.4.5 1.4.6 1.4.7 1.4.8 -1/2 1.4.8.1 -1/2 1.4.8.2 SG 1.4.9 1.4.10 1.4.10.1 1.4.10.2 1.4.10.3 1.4.10.4 1.4.10.5 d 1.5 1.6	6		
	1.5	2 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.7.1 2.7.2 2.7.3 2.8 2.8.1	6		

		2.8.2 2.8.3 Aharonov-Bohm 2.8.4 2.8.5 2.8.6			
	2.5	3. 3.1 Wigner 3.2 3.3 3.4 3.4.1 3.4.2 3.4.3 3.4.3.1 3.4.3.2 3.4.3.3 SO(3) vs SU(2) 3.4.3.4 3.4.3.5 3.5 3.5.1 3.5.1.1 3.5.1.2 3.5.1.3 3.5.2 3.5.2.1 3.5.2.2 3.5.2.3 3.5.2.4 Kramer's 3.5.3 3.6 3.6.1 3.6.2 3.6.3 3.6.4 Wigner-Eckart	10		
	1.5	4 4.1 4.1.1 4.1.2 4.1.3 SO(4) 4.2 4.2.1 4.2.1.1 4.2.1.2 4.2.1.3	6		

		4.2.1.4 4.2.1.5 Fock 4.2.1.6 4.2.1.7 4.2.1.8 4.2.1.9 4.2.2 4.2.2.1 4.2.2.2 Fock 4.2.2.3 4.2.2.4 U(1) 4.2.2.5 4.2.2.6 BCH 4.2.2.7 4.2.2.8 4.2.3 4.2.3.1 4.2.3.2 4.2.3.3 4.2.3.4 Fock 4.2.3.5 4.2.3.6 U(3)			
	2	5 5.1 5.2 5.2.1 5.2.1.1 5.2.1.2 5.2.1.3 5.2.1.4 5.2.1.5 5.2.1.6 5.2.1.7 EPR Bell 5.2.2 5.2.2.1 5.2.2.2 5.2.2.3 5.2.2.4	8		
	2.5	6 6.1 6.2 6.3 6.3.1 6.3.2 6.3.3 Hartree-Fock 6.3.4 6.4 6.4.1 Thomas-Fermi 6.4.2 Hohenberg-Kohn 6.4.3 v- N-	10		

		6.4.4 Levy 6.4.5 Kohn-Sham 6.5 6.5.1 6.5.1.1 6.5.1.2 6.5.1.3 Fock 6.6 6.6.1 6.6.2 6.6.3 6.6.4 6.6.5 6.6.6 6.7 6.8 6.8.1 6.8.2 6.9 6.9.1 BEC 6.9.2 Hartree-Fock			

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7.1

7.1.1

7.1.2

7.1.2.1 Hellmann-Feynman

7.1.2.2

7.1.2.3

7.1.2.4

7.1.3

7.1.3.1

1.5

7.1.3.2 Hellmann-Feynman

7.1.3.3

7.2

7.2.1

7.2.1.1 Dyson

7.2.1.2

7.2.1.3

7.2.2. yson

	1.5	8 8.1 8.1.1 8.2 S 8.2.1 I epsilon prescription 8.2.2 S 8.2.3 8.3 8.3.1 8.4	6		
	1.5	9 9.1 9.2 Klein-Gordon Klein-Gordon 9.2.1 Klein-Gordon 9.2.2 9.3 Dirac 9.3.1 Lorentz 9.3.2 Dirac 9.3.3	6		

* Grading Policy	(50%)+ (50%)
* Textbooks & References	[1] Modern Quantum Mechanics, J. Sakurai and J. Napolitano, Cambridge University Press, 3rd edition, 2020 [2] Quantum Mechanics: Fundamentals, K. Gottfried, Springer, 2nd edition, 2004 [3] Quantum Theory I, Senthil Todadri, MIT course 8.321, Fall 2017 [4] Graduate Quantum Mechanics I, Yi-Zhuang You, UCSD Physics 212a, Fall 2021 [5] Graduate Quantum Mechanics II, Yi-Zhuang You,UCSD Physics 212b, Winter 2020 [6] Advanced Quantum Mechanics, John McGreevy, UCSD Physics 212C, Spring 2020
Notes	

1 *

2 300-500