**PHY 6400** **Quantum Physics I** **Winter 2020**

**Instructor:** Zhi-Feng Huang, 356 Physics Building
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Office hours: Mon & Wed 2:30pm – 3:30pm, or by appointment

**Lecture time**: M W F 1:30pm – 2:20pm

**Prerequisite**: MAT 2150, PHY 3300, PHY 5100

**Textbook**: "Introduction to Quantum Mechanics", 3rd edition, by D. J. Griffiths and D. F. Schroeter, Cambridge University Press

**Supplementary/References**: "Quantum Physics", 3rd edition, by S. Gasiorowicz, Wiley; "Principles of Quantum Mechanics", 2nd edition, by R. Shankar, Springer.

**Homework**: Posted in Canvas course website; Collected in class on due date. Late solutions will NOT be accepted; The lowest homework score will be dropped. You must show your own work and solution steps to receive credits, although group discussions are allowed. Any copy from other sources (e.g., from other students, internet, or elsewhere) is prohibited and will be given 0 credit.

**Exams**: Two midterm exams: to be announced at least 1 week in advance (NO make-up exams); Final exam (Cumulative): April 27 (Monday), 12:30pm – 2:30pm.

**Grading**:

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| 1st exam: | 25% |
| 2nd exam: | 25% |
| Final exam: | 35% |
| Homework: | 15% |

A: 90 – 100%; A-: 85 – 89%
B+: 80 – 84%; B: 75 – 79%; B-: 70 – 74%
C+: 65 – 69%; C: 60 – 64%; C-: 55 – 59%
D+: 50 – 54%; D: 45 – 49%; D-: 40 – 44%
F: 0 – 39%

**Learning outcomes**

From this course students are expected to learn and understand the concepts and methods of Quantum Mechanics and be able to solve the related problems, including wave functions, notions of operators and their eigenfunctions, quantization rules, solution of Schrödinger equation in one and three dimensions, the hydrogen atom, angular momentum, spin, bosons, fermions, and time-independent perturbation theory. Detailed topics include:

- The Schrödinger equation; Superposition principle; Probability and probability density; Probability current; Normalization; Position and momentum; Commutator.
- Time-independent Schrödinger equation; One-dimensional potentials (infinitely deep and finite square wells, harmonic oscillator, delta function); Free particle; Wave packet; Bound and scattering states; One-dimensional scattering and tunneling.
- Hermitian operators; Eigenfunctions and eigenvalues; Uncertainty principle.
- Quantum mechanics in three dimensions; Separation of variables; Degeneracy; The Hydrogen atom.
- Angular momentum and Spin; Bosons and Fermions; Symmetry of the wave function.
- Time-independent perturbation theory.

**Additional Resources**

**Student Disability Services**: If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. The SDS telephone number is 313-577-1851 or 313-202-4216 for videophone use. Once you have met with your disability specialist, I will be glad to meet with you privately during my office hours to discuss your accommodations. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University. You can learn more about the disability office at www.studentdisability.wayne.edu

To register with Student Disability Services, complete the online registration form at: https://wayne-accommodate.symplicity.com/public_accommodation/

**Counseling and Psychological Services (CAPS)**: It is quite common for college students to experience mental health challenges, such as stress, anxiety and depression, that interfere with academic performance and negatively impact daily life. Help is available for any currently enrolled WSU student who is struggling with a mental health difficulty, at WSU Counseling and Psychological Services (caps.wayne.edu; 313 577-3398). Other options, for students and nonstudents, include the Counseling and Testing Center, and the Counseling Psychology Training Clinic, in the WSU College of Education (coe.wayne.edu/tbf/counseling/center-index.php). Services at all three clinics are free and confidential. Remember that *getting help, before stress reaches a crisis point, is a smart and courageous thing to do* – for yourself, and for those you care about. Also, know that the WSU Police Department (313 577-2222) has personnel trained to respond sensitively to mental health emergencies at all hours.

**Academic Dishonesty -- Plagiarism and Cheating**

Academic misconduct is any activity that tends to compromise the academic integrity of the institution or undermine the education process. Examples of academic misconduct include:

- Plagiarism: To take and use another's words or ideas as your own without appropriate referencing or citation.
- Cheating: Intentionally using or attempting to use or intentionally providing unauthorized materials, information or assistance in any academic exercise. This includes copying from another student's test paper, allowing another student to copy from your test, using unauthorized material during an exam and submitting a term paper for a current class that has been submitted in a past class without appropriate permission.
- Fabrication: Intentional or unauthorized falsification or invention of any information or citation, such as knowingly attributing citations to the wrong source or listing a fake reference in the paper or bibliography.
- Other: Selling, buying or stealing all or part of a test or term paper, unauthorized use of resources, enlisting in the assistance of a substitute when taking exams, destroying another's work, threatening or exploiting students or instructors, or any other violation of course rules as contained in the course syllabus or other written information.

Such activity may result in failure of a specific assignment, an entire course, or, if flagrant, dismissal from Wayne State University. https://doso.wayne.edu/conduct/academic-misconduct