

CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

NEW COURSE PROPOSAL

DATE: SEPTEMBER 13, 2006
 PROGRAM AREA MATH AND APPLIED PHYSICS

1. Catalog Description of the Course. *[Follow accepted catalog format.]*

Prefix PHYS Course# 401 Title QUANTUM MECHANICS Units (3)

35 hours lecture per week

☒ Prerequisites PHYS 306, MATH 350

☐ Corequisites

Description An introduction to quantum theory, beginning with the Schroedinger equation and the statistical interpretation of the wave function. One-dimensional applications, including the infinite square-well and the harmonic oscillator; in three dimensions, the theory of angular momentum, central potentials, and the hydrogen atom; time-independent perturbation theory, spin, identical particles, and the Pauli exclusion principle. Applications to bound states, tunneling, and the harmonic oscillators applied to photons and phonons in cavities.

☐ Gen Ed ☐ CR/NC ☐ Repeatable for up to _____ units
 Categories
☐ Lab Fee Required ☒ A - Z Total Completions Allowed
☐ Mission Based Learning Objectives: ☐ Interdisciplinary ☐ International ☐ Multicultural ☐ Service Learning
☐ Title V Section 40404: ☐ Government ☐ US Constitution ☐ US History

2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment	Graded Component	CS # (filled in by Dean)
Lecture	3	1	24	☒	_____
Seminar	_____	_____	_____	☐	_____
Laboratory	_____	_____	_____	☐	_____
Activity	_____	_____	_____	☐	_____

3. Justification and Learning Objectives for the Course. (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

This course is an elective for applied physics majors who wish to pursue graduate study in physics, applied physics or engineering.

Students who successfully complete this course will be able to

- explain the advanced concepts of quantum physics
- apply differential equation solutions real world quantum physics problems
- explain the key differences between quantum and classical physics and know when to apply each
- graph and interpret graphs of wavefunctions
- apply problem solving skills to practical problems in quantum mechanics

The course does not meet the University Writing and/or Language requirements.

4. Is this a General Education Course YES ☐ NO ☒

If Yes, indicate GE category and attach GE Criteria Form:

A (English Language, Communication, Critical Thinking)

A-1 Oral Communication ☐

A-2 English Writing ☐

A-3 Critical Thinking ☐

B (Mathematics, Sciences & Technology)

B-1 Physical Sciences ☐

B-2 Life Sciences – Biology ☐

B-3 Mathematics – Mathematics and Applications ☐

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|---|--------------------------|
| B-4 Computers and Information Technology | ☐ |
| C (Fine Arts, Literature, Languages & Cultures) | |
| C-1 Art | ☐ |
| C-2 Literature Courses | ☐ |
| C-3a Language | ☐ |
| C-3b Multicultural | ☐ |
| D (Social Perspectives) | ☐ |
| E (Human Psychological and Physiological Perspectives) | ☐ |
| UD Interdisciplinary | ☐ |

5. Course Content in Outline Form. *[Be as brief as possible, but use as much space as necessary]*

Schrodinger Equation
 Wave function interpretation
 1-D solutions to Schrodinger equation
 3-D solutions to Schrodinger equation
 Quantum angular momentum
 Hydrogen Atom
 Perturbation theory
 Pauli Exclusion principle
 Tunneling

Does this course overlap a course offered in your academic program? YES ☐ NO ☒
 If YES, what course(s) and provide a justification of the overlap?

Does this course overlap a course offered in another academic area? YES ☐ NO ☒
 If YES, what course(s) and provide a justification of the overlap?
 Signature of Academic Chair of the other academic area is required on the consultation sheet below.

6. Cross-listed Courses (Please fill out separate form for each PREFIX)

List Cross-listed Courses

Signature of Academic Chair(s) of the other academic area(s) is required on the consultation sheet below

Department responsible for staffing: Physics

7. References. *[Provide 3 - 5 references on which this course is based and/or support it.]*

Introduction to Quantum Mechanics, 2/E David J. Griffiths, Reed College Pearson/Prentice Hall (ISBN: 131244051)
 Introductory Quantum mechanics, 4th Edition, Richard L. Liboff, Addison Wesley, 2003, (ISBN: 0-8053-8714-5)
 Principles of Quantum Mechanics, R. Shankar, Springer 2003 (ISBN: 0306447908))

8. List Faculty Qualified to Teach This Course.

Physics Faculty

9. Frequency.

a. Projected semesters to be offered: Fall ☒ Spring ☐ Summer ☐

10. New Resources Required. YES ☐ NO ☒

If YES, list the resources needed and obtain signatures from the appropriate programs/units on the consultation sheet below.

a. Computer (data processing), audio visual, broadcasting needs, other equipment)

b. Library needs

c. Facility/space needs

11. Will this new course alter any degree, credential, certificate, or minor in your program? YES ☒ NO ☐

If, YES attach a program modification form for all programs affected.

Dr. Gregory G. Wood

Proposer of Course

5/24/2006

Date

Approvals

Program Chair

Date

Curriculum Committee Chair

Date

Dean

Date

California State University Channel Islands
New Course Proposal Consultation Sheet

1. Course Title: PHYS 401 Quantum Mechanics

2. Program Area: Math and Applied Physics

Recommend Approval

Program Area/Unit	Program/Unit Chair	YES	NO (attach objections)	Date
Art				
Biology				
Business & Economics				
Education				
English				
History				
Liberal Studies				
Mathematics & CS				
Multiple Programs				
Psychology				
Library				
Information Technology				