(2)

ROWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: [illegible]

___UNDERGRADUATE ___X___GRADUATE ___4___CREDIT HOURS

SPONSOR(S): [illegible]

DEPARTMENT & TELEPHONE# [illegible]

CHECK ONE: _X_COURSE ___MINOR PROGRAM ___CONCENTRATION ___SPECIALIZATION

___ACHIEVEMENT CERTIFICATE ___CERTIFICATION PROGRAM ___MAJOR PROGRAM

STEP #1 (DEPARTMENT)

_X_APPROVED/DATE: 10/1/95

___NOT APPROVED/DATE:

[signature]
DEPT. CURRICULUM CHR.

_X_REVIEWED/DATE: 10/1/95

[signature]
DEPT. CHR.

STEP #2 (RECEIPT)

SCC# 05-96-56

DATE RECEIVED:

SENATE

OCT 19 1995

RECEIVED

[signature]
SENATE CURRICULUM CHR.

STEP #3 (SCHOOL)

REVIEWED DATE:- 2/2/96

✓ ___RECOMMEND TO APPROVE

___RECOMMEND NOT TO APPROVE

FORWARD FOR OPEN HEARING

___WITHOUT RESERVATIONS

___WITH RESERVATIONS

COMMENTS:

[signature]
SCHOOL COMMITTEE CHR.

STEP #4 (ACADEMIC DEAN)

___RECOMMEND

___NOT RECOMMEND

___CONDITIONALLY RECOMMEND
(SEE COMMENTS)

COMMENTS:

DATE & SIGNATURE, DEAN OF SCHOOL [signature] 2/2/96

RECEIVED
FEB 1996
OFFICE OF THE DEAN
ARTS AND SCIENCES

X

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING ___

APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 3/12/96

___RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

STEP #6 (SENATE)

DATE PRESENTED TO SENATE 3/26

___APPROVED ___NOT APPROVED

NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE) ___

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE [signature]

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 4/12/96

APPROVED: ___YES ___NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 4

FACULTY LOAD HOURS 4

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST _____

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 14 May 96

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 1902.57C

DATE/SIGNATURE OF REGISTRAR B L Kelsey 14 May 96

NOTIFICATION FORWARD:

___SENATE CURRICULUM COMMITTEE CHAIRPERSON

___DEPARTMENT CHAIRPERSON(S)

___ACADEMIC DEAN(S)

___REGISTRAR

___SPONSOR(S)

Principles of Quantum Mechanics

1. Details:

Course Title:	Quantum Physics (1902.5 × ×)
Sponsors:	Hong Yuan Ling, Eduardo Flores, Karen Magee-Sauer, Jeff Hettinger, Department of Chemistry and Physics
Credit Hours:	4 s. h.
Course Level:	Graduate
Curricular Effect:	Elective
Prerequisites:	Physics I, II, and III [1902.200 (or 1902.202), 1902.201 (or 1902.203), 1902.563]; Calculus II (1701.131); Mathematical Methods in Physics (1902.525).
Time of Implementation:	Fall 1996
Adequacy of Resources:	Present faculty, facilities and library holdings are adequate. However, we will make further efforts to enhance the library collections in the area of quantum mechanics.

2. Rationale:

The study of physics is a logical progression. The required curriculum is remarkably uniform from program to program not only on a national level, but on a international level as well. Students begin their study with introductory courses in Mechanics, Heat, Waves and Optics, Electricity and Magnetism, and Quantum Physics. Then, they take intermediate/advanced courses in these same five areas to complete the "core" of their program. The core of the program is usually covered by advanced courses in Mechanics, Electricity and Magnetism, Quantum Physics, and Statistical Physics. Upper level electives complement and expand on these five basic areas as well.

Quantum Physics solves the problems in physics where Newtonian (classical) physics fails. Quantum Physics is extremely successful in describing the behavior of matter on a microscopic scale. Its importance to our society has become even more evident since much new technology is based on the principles of Quantum Physics. We believe that Quantum Physics is an integral part of the graduate curriculum in the study of physics and should be

made available to our graduate students pursuing science teaching degree with physical science concentration. We thus propose this course to be added to the graduate curriculum.

3. Essence of the course:

(a) Objectives:

After taking this course the student will be able to:

- Understand the foundation of the Quantum Physics and its necessity.
- Solve problems such as the finite square well, simple harmonic oscillator, and other simple potential energy functions.
- State and understand the implications of the Uncertainty Principle.
- Utilize the Schrodinger equation and understand eigenvalues and wavefunctions.
- Solve the hydrogen atom problem and its related quantum numbers, and extend these concepts to more complicated atoms.
- Use perturbation theory to solve problems, such as the probability of the atom making a transition from a high to low energy level.

(b) Topical Outline:

Possible text: Principles of Quantum Physics by Hans C. Ohanian.

The course will include the following selected topics:

1. The Origin of Quantum Physics
   Early Quantum Theory, Wave and Matrix Mechanics, Wave particle duality
2. The Free Particle in Wave Mechanics
   Wave Equation: Solution to the Free-Particle Wave Equation, Expectation Values, Momentum and Position as Operators, Measurement in Quantum Physics
3. Particles in Potentials
   Schrodinger equation with potential:Stationary states, The infinite and finite square well, the energy representation, barrier penetration
4. Axiomatic Formulation of Quantum Physics
   Operators, Eigenvectors, Compatible observables
5. Particles in three dimensions and angular momentum
   Free Particle, Harmonic Oscillator, The Hydrogen Atom
6. Spin and the exclusion principle
   Spin of the Electron, Magnetic Moment, Addition of Angular Momentum, Fermions and Bosons, Exclusion Principle, and the Periodic Table
7. Perturbation theory

Time - independent Perturbations, Degenerate Perturbations, Time-dependent perturbations

8. Scattering and Resonance
   Elastic scattering in One Dimension, Scattering by a Square Well, Resonance

(c) Evaluation Procedures:
Students will be evaluated by homework, exams, class participation, and a final.

(d) Course Evaluations:
The departmental course evaluation form will be used at the end of the course.

4. Consultations

Consultation letters were sent to
Robert Newland, Chairman, Department of Chemistry and Physics
Pearl Bartelt, Dean, School of Liberl Arts and Sciences
Gary Itzkowitz, Chairman, Department of Mathematics.
The responses were positive.

Catalog Description:

Quantum Physics (1902. 5 × ×) 4 s.h.
(Prerequisite: 1902.200 (or 1902.202), 1902.201 (or 1902.203), 1902.563, 1701.131, and 1902.525)

This is an introductory graduate course. Students will learn basic concepts in Quantum Physics as well as the approaches to problems that require the use of Quantum Physics. Topics selected for study include: Origin of Quantum Physics, Wave Mechanics, Axioms of Quantum Physics, Schrodinger Equation, Particles in Potentials, Spin and the Exclusion Principle, Angular Momentum, and Scattering. The requirements of this course include a laboratory project and/or graduate research paper. Admission to the course will be at the discretion of the graduate adviser. This course may not be offered annually.