U/G Curriculum Committee

Report back to faculty meeting
Issues with our undergraduate major

• Low Numbers of Physics Graduates
  – opportunity for improved retention with declare on entry

• Applied concentration
  – opportunity coupling with other departments?

• Modernization required?
  – understand current programs
  – add compulsory research component

• Future of undergrad labs?
  – who will take on this role?
Numbers of Physics Majors

• Low numbers of physics majors
  – however, anecdotal evidence of larger class sizes in upper-level classes

• Try to quantify
  – soon all students will need to declare major on entry
Statistics

Number of graduates (majors)

- 311 Mechanics
- 411 QM

* (17 so far in 2013)
Proposed Actions

• Understand current program
  – working on detailed course descriptions.
  – different to syllabus, describes where course fits in the whole program.

• Add tracks
  – “Physics with Science Communication”
  – “Pre-med Physics”
Course Number  PHYS 411
Course Title  Introduction to Quantum Mechanics
Target audience  The course is designed for junior or senior level physics majors; however other engineering and science majors with the correct preparation are very welcome. Nb: this is a course that is mandatory for all Physics Majors. Therefore, this is a course whose audience includes both students who intend to pursue graduate studies, and students who will want to find a job after the BS degree. Topics of choice must take this fact into consideration.
Prerequisites  PHYS 250 and MATH 435
Catalog description  Fundamental principles of quantum mechanics and methods of calculation. Solution of the Schrodinger equation for simple systems. Application to atomic, molecular, nuclear, and condensed matter physics. note this is identical to description for PHYS 412.
Example Detailed Course Description

Expected previous knowledge

**Concepts** wave/particle duality, photoelectric effect, Schrödinger equation, wave functions, simple problems, angular momentum, tunneling, electron spin, Stern-Gerlach experiment.

**Skills** Familiarity with calculus and calculus concepts (vectors, vector, differential and integral calculus), linear algebra (matrices, determinants etc.), differential equations (ODE).

Course Objectives

To familiarize students with the foundations of quantum mechanics, and the development of formalism and techniques.

Sample Text

“Introduction to quantum mechanics”, David J. Griffiths, Pearson Prentice Hall.

Minimum Material Covered

Historical Introduction
Shrodinger’s equation and the wave function
Schrodinger’s equation in one dimension; bound states and scattering states
The formalism of Quantum Mechanics and the uncertainty principle
Quantum Mechanics in three dimensions and the Hydrogen Atom
Angular Momentum
Opportunity

• School of Journalism and Electronic Media science communication courses (WC).
  – 450 Writing about science and medicine.
  – 451 Environmental writing.
  – 456 Science writing as literature (this covers non-fiction science writing).

• Recommendation: all physics majors be advised to take one of these courses as their Gen Ed WC requirement.
Science Communication Track

- work in progress ...
- Use JREM 450 or 451 as WC
- JREM 456 Science writing as literature
- 1 astronomy class
- 2 classes from list of PHYS and JREM courses including “survey of physics”, “science and public policy”, “video production”, “radio reporting and producing”, “web journalism”
Summary

• Trend of improving numbers in our upper-division classes and graduation rates

• Taking programmatic view of our major.

• Job-related additions to program
  – research experience
  – science communication and pre-med tracks