

# **SAMPLE SYLLABUS**

This syllabus is to be used as a guideline only. The information provided is a summary of topics to be covered in the class. Information contained in this document such as assignments, grading scales, due dates, office hours, required books and materials may be from a previous semester and are subject to change. Please refer to your instructor for the most recent version of the syllabus.

## ABET Course Syllabus EEE434

1. **Course: EEE 434 Quantum Mechanics for Engineers**
2. **Credits and Contact Hours:** 3 Credit Hours (lecture), Topics: Engineering
3. **Course Coordinator:** D. Vasileska, Professor
4. **Textbook:** D. Ferry, *Quantum Mechanics: An Introduction for Device Physicists and Electrical Engineers*, Institute of Physics Publishing, 1995.  
**Supplemental materials:** None
5. **Specific course information**
  - a. **Catalog description:** Angular momentum, wave packets, Schrodinger wave equation, probability, problems in one dimension, principles of wave mechanics, scattering, tunneling, central forces, angular momentum, hydrogen atom, perturbation theory, variational techniques.
  - b. **Prerequisites or co-requisites:** EEE 241; EEE 352.
  - c. **Required/elective/selected elective:** Elective
6. **Specific goals for the course**

Students are conversant with the concepts of quantum mechanics as they apply to semiconductors and semiconductor devices.

  - a. **Outcomes of instruction:**
    - Students are conversant with the major postulates that arise in quantum mechanics, the Schrödinger equation and its applications to situations encountered in microelectronic devices
  - b. **Outcomes of Criterion 3 addressed by the course:**

(1) There is significant math, science and engineering background taught in the lectures. The students are exposed to contemporary simulation tools as applied to realistic device structures, they are able to define a problem and recognize the appropriate solution. They are also able to appropriately apply modern computer-based analysis tools.
7. **Brief list of topics to be covered**
  - Historical orientation
  - Waves, Fourier transforms, and Wave Packets
  - Schrodinger equation
  - Interpretation of wave function and probabilities
  - Operators and their expectation values
  - Uncertainty principle
  - Piecewise constant potentials in one dimension
  - Tunneling and tunnel diodes
  - WKB approximation
  - Harmonic oscillator. Central forces and angular momentum
  - Perturbation theory
  - Variational techniques

### Computer Usage:

Use of contemporary simulation tools as applied to realistic device structures; integrated in homework.

**Laboratory Experiments:** None.

**Course Contribution to Engineering Science and Design:**

This course will introduce students to the basic concepts of quantum mechanics as applied to real semiconductor device structures. An example includes understanding the operation of double-barrier structure used in resonant tunneling diodes.

Person preparing this description and date of preparation: Dragica Vasileska, K. Tsakalis, June, 2021.