

ECE 4001 – Engineering Practice and Professionalism (2-0-2)

Prerequisites: ECE3040 and (CEE/ISYE/MATH 3770 or ISYE 3027) and (ECON 2100 or ECON 2101 or ECON 2105 or ECON 2106)

Catalog Description: Technical tools and professional issues for engineering practice and early career development. Engineering ethics, design tools, financial and economic principles, project management, probabilistic and statistical techniques, and decision making.

Textbook(s): (1) “Fundamentals of Engineering Design – 2nd Edition”, Barry Hyman, (2) Note sets available to students for topic areas not covered in Hyman’s text

Topics to be included in the course:

Introduction to Engineering Design (Chapter 1 of Hyman with supplemental notes on ECE hardware and software design)

- Definition of engineering design
- Engineering design processes
- Design models and tools: hierarchy, modularity, partitioning, concurrent design
- Engineering design methods
- Hardware design
- Software design
- Systems design

Problem Formulation Tools (Chapter 2 of Hyman and supplemental notes on QFD)

- Needs, requirements, specifications
- Develop objectives
- Formulate criteria from objectives
- Functional analysis
- Qualify function deployment (QFD)
- Risk/reward trade-offs, risk analysis

Project Management (Chapter 7 of Hyman with supplemental notes)

- Project scheduling and time estimation
- Allocation of resources
- Project budgeting and job costing
- Project documentation

Probabilistic Elements in Design (Chapter 5 of Hyman with supplemental notes)

- Basic probability distribution models
- Functions of single and multiple random variables
- Engineering measurement fundamentals
- Population sampling
- Manufacturing variation and the effect on product design
- Defects, yield and reliability

Engineering Economics and Decision Making (Chapter 8 of Hyman with supplemental notes)

- Basic financial principles
- Time value of money
- Applications in engineering design, life-cycle costs
- Cost-benefit analysis
- Financial terms and corporate finances
- Job costing and budgeting

Professionalism, Ethics and Social Implications (Chapter 4 of Hyman with supplemental notes)

- Professional societies and codes of ethics
- Professional licensure, FE/PE exams
- Codes and standards
- Professional and engineering ethics
- Safety and product liability
- Intellectual property
- Product life cycle
- Sustainability and environmental issues

The Design Process: Case Studies (Supplemental note set with ECE case study examples)

- Hardware design
- Software design
- Custom system design

Design Optimization Methods (Chapter 10 of Hyman and supplemental notes – if time permits)

- Dynamic and linear programming
- Experiment based design

Starting a Company (Supplemental note set – if time permits)

- Goals
- Business plan
- Financing

NOTE: While the topics are similar to those in the current ECE 4000, the course will shift from the large lecture, small recitation format to multiple sections, multiple instructors.

Course Educational Objectives:

As part of this course, students:

1. develop an understanding of how ethics, licensure, standards, and other factors relate to the practice of engineering design.
2. are introduced to issues, methods, and tools used in engineering practice.
3. are introduced to models and trade-offs related to product lifecycle and product design.

Course Educational Outcomes:

Upon successful completion of this course, students should be able to:

1. describe factors and constraints associated with product life cycles.
2. describe considerations in professional engineering practice, including standards, intellectual property, liability, ethics, legal issues, and licensure.
3. describe the effect of non-engineering factors, such as corporate structure and financial issues, on engineering practice.
4. apply statistics to analysis of engineering problems, including component and manufacturing variation, project scheduling, and product reliability.
5. solve basic problems in engineering economy, including use of time-value-of-money principles for decision making.