EL 4395 – Design Capstone I: Definition & Exploration

1. 3 Student Credit Hours, 8 Contact Hours

2. Instructor: Roger Gonzalez, Ph.D., P.E.; David Novick, Ph.D., J.D.

3. Texts:


4. Specific course information:

   a. CATALOG DESCRIPTION: This course is the first semester of a two-semester Capstone Design course in Engineering Leadership. Particular focus is on defining (specifications) and exploring (ideation) various project designs in which engineering leadership skills are applied to build a cohesive team and to successfully execute an effective company engineering/research project.

   b. PREREQUISITES: (MATH 2313), (CE 2338), (EL 3304), and 2.5 GPA or better in engineering coursework

   c. EL 4395 is a REQUIRED course in the BS in Engineering Leadership Curriculum.

5. Specific goals for the course:

   a. Specific outcomes of instruction

      • To demonstrate knowledge of the general scope and feasibility of various design constraints and design options to solve a defined problem

      • To demonstrate that the design has met objectives by considering various alternatives and meeting predefined constraints

      • To understand both the impact of engineering solutions in a global and societal context and one’s professional and ethical responsibility

      • To consider multi-disciplinary projects and produce prototypes

      • To consider, develop and apply key aspects of individual and team leadership

      • To explain business acumen related to costs, capital expenditures, and taxation

   b. Explicit Student Outcomes listed in Criterion 3:
• (5) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
• (5) An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately
• (9) An ability to recognize the need for and to apply business acumen in an engineering context

7. Brief list of topics to be covered:

• Understanding real-world problems (decisions and tradeoffs; documentation and reporting; project scheduling and budgeting; vendor relations; sponsor input and change of scope; resource limitations; ethics and safety; confidentiality)
• Leadership and team building (division of work and delegation; authority, responsibility and accountability; resolution of personal conflicts; utilization of a variety of talents and skills; personnel evaluation and feedback)
• Engineering design process (proposal, negotiation, contract, execution, and evaluation; feasibility studies; preliminary design; detailed design; revision; release; field testing; production; salvage)
• Application of course material (recognize applications and limitations; balance analysis, experimentation, computation, simulation, and optimization; assess models using prediction and other validation)
• Gain real-world insights (develop career goals; learn about patents and notebook recording; get acquainted with engineers and companies; sense the complexity, difficulty, and time involved in solving real problems)
• Business acumen (responsibility accounting and cost control through standard costs, relevant costing in non-routine decisions, evaluating capital expenditure projects, how taxes affect business decisions)