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:

Leadership: Theory and Practice, P.G. Northouse, Sage Publishing, 2016.

Leadership in Project Management (2nd ed.), M. Arora and H. Baronikian, Leadership Publishing House, 2013.

What Every Engineer Should Know about Accounting and Finance, JK Shim and N Henteleff, CRC Press, 1994.

Developing the Leader within You, J.C. Maxwell, Thomas Nelson Publishing, 2012.

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)