1. **ECE 4810: Electrical/Computer Engineering [Senior] Design I**

2. **Credit Hours:** 2; **Contact Hours:** 2 (plus time spent with project advisor)

3. Damon Miller, PhD, Associate Professor


5. **Course Information [WMU catalog]**
   1. First of a two-semester sequence on engineering design in which students work in teams on approved design projects. A preliminary design is expected at the conclusion of this course. This course, along with ECE 4820, are approved as writing-intensive courses which may fulfill the baccalaureate-level writing requirement of the student’s curriculum.
   2. **Prerequisites:** completion of IME 3160/ECE 3550 or ECE 4510 (for CpE students); completion of ECE 2510/IME 3160/ECE 3200 or ECE 3300 (for EE students);
   3. **Required**

6. **Course Goals:**
   1. ABET student learning outcomes assigned to this course according to ECE Assessment Plan: f, g, and h.
   2. an appreciation of the importance of using notebooks to document engineering work (g)
   3. an ability to develop a needs analysis (a, c, e, h, j)
   4. a working knowledge of sources for engineering design specifications (c, e);
   5. an ability to develop a comprehensive set of quantitative and qualitative engineering design specifications based on a needs analysis (a, c, e, h, j)
   6. an ability to apply and understand the advantages and disadvantages of the three primary methods of engineering design: synthesis, repeated analysis, and device evolution (a, c, e, k)
   7. an ability to conduct a physical and economic feasibility study for a proposed device or system (a, b, c, e, k)
   8. an ability to conduct a literature and patent search to support an engineering design project (a, b, c, e, k)
   9. an ability to design a device or system to meet a specified need using knowledge of mathematics, science, and engineering, while considering (as listed by ABET) economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political issues (a, b, c, e, h, j, k)
   10. an ability to effectively function as a member of a design team (c, d, g)
   11. an ability to develop a strategy for designing a device or system based on a precedence matrix (a, b, c, e, k)
   12. an ability to use physical and/or mathematical models to verify that a designed device or system satisfies design specifications (a, b, c, e, k)
13. an ability to provide effective documentation for an engineering design project (g)
14. an ability to estimate time needed to complete an engineering project using the critical path method and the program evaluation and review technique (c, k)
15. a knowledge of the role that human factors engineering has in engineering design (a, c)
16. an ability to determine the tolerance on a device or system based on the tolerances of the individual components comprising that device or system (a, c, e, k)
17. a basic understanding of mechanisms to protect intellectual property, including patents, copyrights, trademarks, semiconductor masks, and trade secrets (c, e, k)
18. an understanding and appreciation of engineering ethics, including an ability to cite examples where engineering ethics were compromised with disastrous consequences (f)
19. a knowledge of the IEEE and the NSPE Code of Ethics (f)
20. an understanding of the importance of, and how to obtain, a professional engineering license (f)
21. an appreciation for the role engineers play in society (f, h, i, j)
22. an awareness of basic electronic system prototyping techniques (k)
23. an ability to correctly and effectively communicate via the written word (d, g, k).

7. Course Topics
   1. Design team formation
   2. Senior design project identification and selection methods and guidelines
   3. Needs analysis and design specifications
   4. Engineering design methodologies
   5. Feasibility studies
   6. Project planning and the critical path method
   e. Human factors engineering
   f. Formal engineering proposal preparation
   g. Intellectual property including patents and copyrights
   h. Engineering ethics, professionalism, and engineering registration
   i. Basic electronic system prototyping techniques
   j. Attend ECE department seminar(s) and Conference on Senior Engineering Design Projects (f, h, i, j)
   k. Students are encouraged to utilize a variety of software packages (some available in the Computer Aided Engineering Center) for project scheduling, design and analysis of analog and digital circuits and systems, physical drawings, mathematics, etc., in their homework and proposal preparation activities (k)