

## Engineering Technology –ECET Option

**Course Number and name:** ET 444 Hardware and Software Senior Design

**Credits & Contact Hours:** ET 444 is 3cr. Each week has two lectures of 50 min(3 cr ). Total semester contact hours are approximately 45 hr.

The accompanying laboratory is a 3p lab and meets for 2hr and 40 min each week in one lab session per week

**Instructor's name:** Lynn Kelly

**Recommend references:** *Digital Design*, Peter J. Ashenden, Morgan Kaufman, 2007; Altera's supporting tutorials.

**Additional Materials:** Altera's DE-1 and DE-2 board.

### **Specific Course Information:**

- a) **Course Catalog Description** – The design, development, implementation, documentation and formal demonstration of a microprocessor-based application to solve an engineering problem. Emphasis on microprocessor architectural concepts and software interfacing. A student project is required. **Co- or Prerequisite:** ET 344 (Pre), ET 398(Pre)
- b) This course is required only for the ECET degrees. It can be taken as part of the Digital Applications Minor.

### **Course Goals & Objectives:**

Advanced methods of digital design including the use of programmable logic devices (PLDs) and memory devices (SDRAM). Use of digital design tools such as Altera's Quartus II and Nios software using the computer languages such as VHDL, assembly and C. The student will have the opportunity throughout the semester to demonstrate their ability to design and assemble complex digital systems.

**Related ABET Objectives and Outcomes:** The department of Engineering Technology and Survey Engineering ECET option has an objective of having its graduates possess the following skills and knowledge.

1. An appropriate mastery of the knowledge, techniques, skills and the modern tools of their disciplines including:
  - **Digital circuit analysis and design techniques**, architecture and applications of microcomputer systems, and the building, testing, operation and maintenance of electronic and computer systems.
  - The use of **Boolean mathematics in support of** the analysis, design, and application of electronic systems.
2. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology;

3. Project management techniques and teamwork necessary for successful electronic and/or computer system designs and implementations, and the effective use of communication skills to prepare technical reports, memos, and presentations.

**Course topics and lecture hours devoted to each topic:**

<b>TOPICS</b>	<b>HRS.</b>
• Review and Introduction to SOPC Builder DE-1	3
• Review Assembly code using DE-1	3
• Build architecture for DE-2; program, PIO usage	6
• Implement architecture for SDRAM; Jtag usage	6
• Problem Solving techniques putting it all together	9
• Project	18
• Tests Review, Problem Solving and Examples	8

**Laboratory Projects:** There is approximately 8 laboratory sessions per semester. Each Lab consists architecture construction, programming and demonstration on the Altera DE2/DE1 board. Laboratory exercises are done in conjunction with the reference readings and the lecture materials. The laboratories are designed to apply the theory of the analysis with the application and simulation of the circuits. Students must take a problem specification, design a digital circuit, build the architecture, build the VHDL program and using assembly language verify the design by testing via the DE2/DE2 board. The Labs end mid semester and the students will begin work on the final project, implementing skills learn in the course and previous courses. At the end of the semester the Student presents their project and reports.

NOTE\*\*\* In the spring of 2011 the students will take part in a project that will design, implement and present a payload system for Space Launch program.

**Prepared by: Lynn Kelly**

**Date: 9/1/10**