ECE383 – Microcomputers
ABET Syllabus

Catalog Data: ECE 383: Microcomputers. Four (4) credit hours. Microprocessors, microcontrollers, assembly language programming, interrupts, polling, and hardware interfaces. Computing proficiency is required for a passing grade in this course.

Prerequisite: ECE 380. Prerequisite topics: Knowledge of switching theory, logic elements, and design of combinational and sequential networks. High level programming (C and/or C++ or other high-level language experience).

Textbook: R. Reese, J. W. Bruce, B. Jones, MICROCONTROLLERS: From Assembly Language to C Using the PIC24 Family, 2nd Edition, Cengage Learning, 2014.

Contact Hours and Additional Course Information:

The course meets multiple lecture periods weekly with a total of 150 minutes of lecture contact per week and 170 minutes of lab contact per week. The course is required in the electrical engineering program and is required in the computer engineering option.

Relationship of Course Toward Meeting ABET Student Outcomes:

The course supports instruction for Student Outcomes A, B, C, and K as required by ABET Criterion 3 and ABET Program Criteria. The relationships are indicated in the Course Learning Objectives.

The course supports assessment for Student Outcomes A, B, and C as required by ABET Criterion 3 and ABET Program Criteria. The relationships are indicated in the Student Outcome Measure Assessments.

Course Learning Objectives:

The overall course objective is to teach electrical engineering, computer engineering, and computer science students microprocessors, assembly language programming, and peripheral interface design. At the end of this course, students are expected to be able to:

1. Demonstrate a fundamental knowledge of microprocessors. (Outcome A)
2. Demonstrate a fundamental knowledge of assembly language programming. (Outcome A)
3. Demonstrate a fundamental knowledge of microcomputer systems including microprocessors, peripherals, and hardware interfaces. (Outcome A)
4. Develop an ability to conduct experiments, as well as analyze and interpret data. (Outcome B)
5. Design a system, component, or process to meet a set of specifications. (Outcome C)
6. Recognize the need to use modern tools to assist solving problems. (Outcome K)
7. Find up-to-date engineering tools or existing solutions using classical and modern search techniques (library, Web, etc.). (Outcome K)
8. Use modern CAD, analysis and simulation software. (Outcome K)

Student Outcome Measure Assessments:

During this course, learning assessment will be performed using specific Student Outcome Measures that demonstrate students are able to:

1. Demonstrate a fundamental of microprocessors, assembly-language programming, microcomputer systems, and hardware interfaces. (Outcome A, Measure A9)

2. Discuss the operation of standard lab equipment, define the terminology used to define specification, indicate typical specification values for standard lab equipment. (Outcome B, Measure B2)
3. Write design specifications (quantitative and measureable) based on general description of a system component, or process. (Outcome C, Measure C2)
4. Design a system, component, or process or meet a set of specifications. (Outcome C, Measure C5)

Contribution of Course to Meeting the ABET Professional Component:

- Skills required, used, and developed include digital microprocessor system design, programming and peripheral interfacing.
- Estimated Content: Engineering Science: 1.0 credit, Engineering Design 3.0 credits

Relationship of Course to Program Educational Objectives:

The course supports Program Educational Objective 1 by developing knowledge of basic microcomputer software, hardware and interfacing; increasing the ability to design a system, component or a process to meet specified needs; and increasing the ability to conduct experiments.

Topics Covered During Class:

1. Course organization and requirements (1.25 hrs)
2. Software architecture of the PIC24 microprocessor (3.75 hrs)
   a. Internal microprocessor architecture
   b. Memory Addressing
   c. Addressing modes: data addressing, program addressing, stack addressing
3. Program design using assembly language and C (8.75 hrs)
   a. Data movement instruction
   b. Arithmetic and logic instructions
   c. Program control instructions
   d. Program design and examples
   e. Program design involving stacks and subroutines
4. Interrupts (5.00 hrs)
   a. Basic interrupt processing, interrupt service routines and hardware interrupts
5. PIC24 microprocessor hardware (8.75 hrs)
   a. PIC24 pinout specifications and pin functions
   b. Hardware modules (PWM, A/D, D/A, I2C, SPI, etc.)
6. Peripheral Interfacing (12.50 hrs)
   a. Introduction to peripheral interfaces (SPI, I2C, etc.)
   b. Peripheral examples
7. Examinations (3.75 hrs)
8. Final comprehensive examination (2.50 hrs)

Laboratory: Eight to ten laboratory projects related to the course material are performed throughout the semester.

Prepared by: Jeff Jackson Date: 5/3/2016