COURSE OUTLINE

Course Number	Course Title	Credits
EET 263	**Digital Technology - Introduction to Microprocessors and Assembly Language**	**4**

Hours: Lecture/Lab/Other	Pre-requisite	Implementation Semester & Year
3 Lecture/3 Lab	**EET 251**	**Spring 2022**

Catalog description:
Introduces the operation of a simple computer at the physical (electrical) level using gates, registers, and other basic circuits introduced in the prerequisite course. Students gain experience building and programming a simple computer. Covers memory, basic microprocessor architecture, assembly language programming, and analog-to-digital as well as digital-to-analog converters.

General Education Category:
Not GenEd

Course coordinator:
Harry Bittner, 609-570-3751, bittnerh@mccc.edu

Required texts & Other materials:
HCS12 Microcontroller and Embedded Systems, by Muhammad Ali Mazidi and Danny Causey, Prentice Hall, ISBN 978-0136072294

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Describe the basic operation (on a block diagram level) of a simple computer that adds and subtracts 8-bit binary numbers. [ILG # 1, 3, 4, 11; PLO # 1, 6]
2. Describe the operation of digital to analog converters (DACs) and analog to digital converters (ADCs) for interfacing with a microprocessor. [ILG # 1, 3, 4, 10, 11; PLO # 1, 6]
3. Describe how to properly connect memory IC's or modules to a computer system. [ILG # 1, 3, 4, 10, 11; PLO # 1, 6]
4. Converse with understanding about ADC's, DAC's, memory systems and basic microprocessors. [ILG # 1, 3, 4, 10, 11; PLO # 1, 6]
5. Program a microprocessor or a microcontroller. [ILG # 2, 3, 10, 11; PLO # 6, 8]
6. Build and program simple digital systems, both individually and in teams. [ILG # 1, 3, 4, 10, 11; PLO # 3, 8]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.
Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Electronics Engineering Technology (PLO)

1. Communicate effectively in English, both orally and in written form.
3. Work as a team with fellow workers.
6. Demonstrate an understanding of fundamental digital circuits.
8. Set up and operate modern electronic equipment such as DMM, oscilloscope, and signal generators.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Memory** [Supports Course SLO # 1, 3, 4, 6]

Learning Objectives
The student will be able to:

1. Identify the three main buses that connect memory to a CPU.
2. Create a memory circuit having expanded capacity (address and/or word size) using lower capacity memory IC's.
3. Properly wire a memory IC into a circuit given a schematic diagram and/or datasheet.
4. Communicate information about memory circuits including being able to read and understand parameters on datasheets for memory devices.
5. Explain the control signals and machine timing needed for a computer to perform specific operations.
6. Communicate device functionality and limitations using a datasheet.

Unit II **Freescale HCS12 Microcontroller and Digital to Analog Converters Units** [Supports Course SLOs # 2, 4, 5, 6]

Learning Objectives
The student will be able to:

1. Describe how a microcontroller adds and subtracts binary numbers.
2. Utilize the HCS12 instruction set to create assembly language programs.
3. Write programs for a microcontroller using assembly language code.
4. Work with fellow students to complete a joint programming project.
5. Describe the input and output signals involved in operating a DAC or ADC.
6. Describe how basic DAC and ADC systems operate.

Unit III **Intel 8088 Microprocessors and Analog to Digital Converters** [Supports Course SLOs # 2, 4, 5]

Learning Objectives
The student will be able to:

1. Calculate the expected output of a DAC or ADC given the input to the system.
2. Communicate information about converters including being able to read and understand parameters on datasheets for these devices.
3. Describe the operation of the sections of the Intel 8088 computer.
4. Learn the Intel 8088 instruction set for an assembly language programming.
5. Write an assembly language program for the Intel 8088 computer
6. Understand the use of flags and jump commands and subroutines as a part of a computer program.

Evaluation of student learning: [Evaluates SLOs # 1 - 6]

Students' achievement of the course objectives will be evaluated through the use of the following:

- Three unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Lab grade based on individual reports of experimental results.
- Homework.

Evaluation Tools	Percentage Of Grade
3 Unit Tests	60%
Lab Experiments & Reports	20%
Homework	20%
Total	100%