

SOUTHEAST COMMUNITY COLLEGE
ADVANCED TECHNOLOGIES & SKILLED TRADES DIVISION
Electronic Systems Technology Program
Revision Date: August 2025

I. CATALOG DESCRIPTION

Course Number: ELEC2531
Course Title: Microprocessor Applications
Prerequisite(s): ELEC1245
Catalog Description: An Introductory course covering instruction set, bus structures, memory, and I/O interfacing, and data manipulation for microprocessor and microcontroller-based system. Assembly language programming techniques and concepts will be applied using an Integrated Development Environment.

Credit Hours: 3
Class Hours: 30
Lab Hours: 45
Total Contact Hours: 75

II. COURSE OBJECTIVES: *Course will:*

- A. Present to the student the differences between a Microprocessor and Microcontroller.
- B. Familiarize the student with the Integrated Development Environment for programming.
- C. Allow the student to learn the basic concepts of programming using Assembly language.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Apply basic logic circuit principles and applications to interface to microprocessor and microcontrollers.
 - 2. Understand basic microprocessor/microcontroller principles and applications.
 - 3. Understand the microprocessor/microcontroller evolution.
 - 4. Understand how a microprocessor and microcontroller support devices make up a computing system.
 - 5. Understand proper interfacing techniques between microprocessors and microcontrollers support IC's.
 - 6. Understand Microcontrollers concepts using the Microchip PIC18F4520 as an example.
 - 7. Understand Microchip PIC18F4520 microcontroller architecture.
 - 8. Understand assembly language for the Microchip PIC series.
 - 9. Understand how to use the Microchip IDE Simulator and MPLAB Debug Express PICKit 3 to develop and debug microcontroller applications.
 - 10. Understand internal as well as external support devices with the microcontroller.
 - 11. Demonstrate proper test equipment usage with microprocessor and microcontroller circuits.
 - 12. Demonstrate skills using a personal computer to aid in development of laboratory projects.
 - 13. Demonstrate a working knowledge of the Microchip PIC18F4520 microcontroller.
 - 14. Interface various support IC's with a Microchip PIC18F4520 microcontroller.
 - 15. Write assembly language for the Microchip PIC18F4520 microcontroller.
 - 16. Demonstrate skills needed to operate the MPLAB Debug Express PICKit 3 emulator that is used to develop assembly language programs and debug applications.
 - 17. Demonstrate a working knowledge of the Microchip PIC18F4520 microcontroller.

- B. General Learning Outcomes (GELOs)**
 - 1. GELO 4: Problem Solving
Outcome?: The student will demonstrate the ability to define a problem, develop a plan to solve the problem, collect and analyze information, solve the problem, evaluate results, and define any need for further work.
 - 2. GELO 6: Quantitative Reasoning
Outcome?: The student will demonstrate the ability to reason and solve quantitative problems using mathematical applications such as formulas, data sets, graphs, tables, etc.

IV. CONTENT/TOPICAL OUTLINE

- A. Microprocessor principles**
 - 1. Harvard vs. Von Neumann architecture
 - 2. Review bus concepts
 - 3. Microprocessor block diagram
 - 4. Explanation of common internal register operation
 - a. Program Counter
 - b. Flag register
 - c. Stack Pointer
 - d. Memory pointer/Index registers
 - e. General purpose registers
 - f. Accumulator
 - 5. Review bus concepts
 - a. Explanation of peripheral mapped I/O and memory mapped I/O
 - b. Interfacing RAM and ROM memory to microprocessor
 - c. Interfacing techniques for I/O devices
 - 1. Programmed I/O
 - 2. Polled (or Strobe) I/O
 - 3. Interrupt driven I/O
 - 4. Interrupts
- B. Microcontrollers**
 - 1. Microcontrollers in general
 - 2. Microchip PIC18F4520
 - a. What are Microcontrollers?
 - b. How the Microchip PIC18F4520 architecture?
 - c. Instruction set
 - d. Addressing modes
 - e. How to use the IDE emulator
 - f. How to use the IDE assembler
 - g. How to program and use the Microchip PIC18F4520 in a circuit
 - 3. Lab Activities – 30 hrs.
 - a. Basic Instruction concepts and operations
 - b. Memory bank access
 - c. Looping and Branching
 - d. I/O functions
 - e. Data Manipulation (Rotates, FSR's, table functions)
 - f. Internal Timers
 - g. Analog to Digital Conversion
 - h. Interrupts

V. INSTRUCTIONAL MATERIALS

- A. Other Resources: PICKit2Starter Kit Part # DV164120, PIC Microcontroller and Embedded Systems Using Assembly and C for PIC18 (IDBNO-13-119404-6) Lincoln
- B. Supplies: Flash Drive

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Methods of presentation typically include a combination of the following:
 - 1. Technology enhanced lecture
 - 2. Classroom discussion
 - 3. Interactive group activities
 - 4. Audio visual materials
 - 5. Presentation by experts for the Electronics and Networking industry

VII. METHODS OF EVALUATION

- A. Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 - 1. Attendance and participation
 - 2. Daily assignments
 - 3. Written exams and /or quizzes
 - 4. Performance and observational assessment