

## Course Number and Title: ELC 228 Microcontroller Applications

**Campus Location:**

Georgetown, Dover, Stanton

**Effective Date:**

2022-51

**Prerequisite:**

ELC 227

**Co-Requisites:**

none

**Course Credits and Hours:**

4.00 credits

3.00 lecture hours/week

4.00 lab hours/week

**Course Description:**

This course introduces the practical aspects of using a microcontroller for real-time embedded applications and develops the skills to interface the microcontroller with peripherals such as timers, stepper motors, analog-to-digital converters, keypads, and light-emitting diode or liquid crystal displays using project-based content.

**Required Text(s):**

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

**Additional Materials:**

TI-84+ or TI-89 Calculator, Multimeter, Electronics Parts Kit

**Schedule Type:**

Classroom Course

**Disclaimer:**

None

**Core Course Performance Objectives (CCPOs):**

1. Develop real-time programs for microcontrollers using integrated development environments (IDE). (CCC 1, 2, 3, 6; PGC 1, 2, 3, 4)
2. Write and debug software programs for microcontrollers using common peripherals such as timers, serial communications, analog-to-digital converters, motors, light-emitting diodes, and pulse width modulation. (CCC 1, 2, 3; PGC 1, 2, 3, 4)
3. Design, construct, and produce a project that interfaces the microcontroller with external devices. (CCC 1, 2, 3, 5, 6; PGC 1, 2, 3, 4, 6)
4. Arrange and evaluate a job shadow or field experience opportunity in the major field of study. (CCC 3, 4, 5; PGC 5)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

**Measurable Performance Objectives (MPOs):**

Upon completion of this course, the student will:

1. Develop real-time programs for microcontrollers using integrated development environments (IDE).
  1. Use an IDE to create and debug programs.
2. Write and debug software programs for microcontrollers using common peripherals such as timers, serial communications, analog-to-digital converters, motors, light-emitting diodes, and pulse width modulation.
  1. Apply the basics of interfacing a microcontroller system.
  2. Describe various microcontroller interfacing protocols such as serial peripheral interface (SPI), inter-integrated circuit (I<sup>2</sup>C), universal asynchronous receiver/transmitter (UART), and controller area network (CAN).
  3. Write and debug a program that uses a microcontroller interfacing protocol.
3. Design, construct, and produce a project that interfaces the microcontroller with external devices.
  1. Identify project goals, objectives, measurement criteria, and constraints pertinent to the embedded system project.
  2. Compare and contrast several possible design concepts using the defined objectives, criteria, and constraints.
  3. Construct integrated circuits using appropriate electronic components to interface with a microcontroller to create interactive projects such as a digital tachometer, flashing light-emitting diodes, pulse width modulation control of a motor, infrared control, solar power supply, digital thermometer, sound wave generator, controlling servos, and humidity measurements.
  4. Construct circuits and software program within time and budget constraints as a member of a team.
  5. Critique the performance of the design, and recommend potential improvements.
4. Arrange and evaluate a job shadow or field experience opportunity in the major field of study.
  1. Arrange a field experience or job shadowing opportunity in field of study.
  2. Participate in job shadowing or field experience.
  3. Appraise job shadowing experience.

**Evaluation Criteria/Policies:**

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

**Final Course Grade:**

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: 3-4 Exams (equally weighted)	35%
Formative: 8-12 Laboratory Experiments (points vary)	35%
Summative: Capstone Project	20%
Summative: Job Shadowing	10%
TOTAL	100%

**Core Curriculum Competencies (CCCs are the competencies every graduate will develop):**

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

**Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):**

1. Perform the duties of an entry-level technician using the skills, modern tools, theory, and techniques of the electronics engineering technology.
2. Apply a knowledge of mathematics, science, engineering, and technology to electronics engineering technology problems that require limited application of principles but extensive practical knowledge.
3. Conduct, analyze, and interpret experiments using analysis tools and troubleshooting methods.
4. Identify, analyze and solve narrowly defined electronics engineering technology problems.
5. Explain the importance of engaging in self-directed continuing professional development.
6. Demonstrate basic management, organizational, and leadership skills which commit to quality, timeliness and continuous improvement.

**Disabilities Support Statement:**

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.