Miami Dade College

Course Description

ETS1603C | Introduction to Robotics | 4.00 credits

This is an introductory level course designed as an introduction to robotics and robotic applications. Students learn topics related to robotic design including robotic terminology, robotic programming, sensing and sensors, actuators, modeling and sensing, robotic platforms, and the application of artificial intelligence in robotics. Laboratory activities provide hands-on application of concepts and theories.

Course Competencies

Competency 1: The student will demonstrate an understanding of robotics and the history of robotics by:

1. Describing the major parts of a robotic system
2. Identifying and discussing the differences between autonomous and remote/control robots
3. Discussing the design steps followed to develop a robotic system
4. Identifying and discussing the various disciplines involved in the construction of or application of robotics
5. List and describe the classification of robots by power-supply control methods (i.e. electrical, pneumatic, and hydraulic) and motion control methods (i.e. limited sequence, point to point, continuous path, etc)
6. Explaining the basic types of robot controls including drum, air logic, programmable, microcontroller, and microprocessor controllers
7. Discussing the past, present, and future of robotic systems, motion control systems, and artificial intelligence application

Competency 2: The student will demonstrate basic robotic programming skills by:

1. Writing pseudo code for program development before writing the code
2. Using descriptive and meaningful names in programming assignments
3. Creating programs that use if, else if, and else statements to control a robot
4. Creating programs that use loops to control a robot
5. Creating programs that use interrupts to control a robot
6. Creating application programs to make the robot perform simple tasks
7. Downloading programs to a robot platform to make the robot perform simple tasks

Competency 3: The student will demonstrate an understanding of input (sensors) and their functions in a robotic system by:

1. Analyzing the correlation between human sensors and robotic sensors
2. Applying human and animal sensing principles to robotics design
3. Identifying discrete sensors (such as proximity sensors, photo sensors, ultrasonic sensors, other vision sensors such as cameras) in a robotics project
4. Using sensors such as ultrasonic sensors for simple tasks such as distance sensing
5. Identifying analog sensors (i.e. thermal, PH, pressure, speed, flow, etc.) in a robotics project
6. Describing shaft encoding and infrared sensing

Competency 4: The student will demonstrate an understanding of output devices and their functions in a robotic system by:

1. Describing the difference between and theory of AC, DC, stepper, vector AC drivers, and/or servo motors in a robotics project
2. Describing the operation of motor gearing and electronic control
3. Using DC motors to make a robot move
4. Applying appropriate methods to control a power circuit that powers electric motors

Competency 5: The student will demonstrate an understanding of robotic platforms by:

1. Identifying different battery technologies (e.g. Lead-Acid, Li-Ion, Li-Po, etc)
2. Identifying battery limitations such as voltage rating, current rating, and capacity rating
3. Explaining serial communication and data collection

4. Constructing robotic platforms
5. Using robotic platforms to perform simple tasks such as line following or wall following

Competency 6: The student will be able to demonstrate problem solving skills by:

1. Determining a probable cause of a problem
2. Performing diagnostic tests on hardware and software systems
3. Interpreting diagnostic results
4. Identifying recommendations to solve the immediate problem and root cause of issue or failure of component
5. Testing, Implementing, and monitoring recommended solutions
6. Documenting all changes and corrections made to the design

Competency 7: The student will demonstrate an understanding of Artificial Intelligence (AI) in Robotics by:

1. Understanding the history, application, and evolution of AI in robotics
2. Describing the fundamental elements that comprise AI such as learning, natural language, planning and problem-solving, inference, vision, and knowledge presentation
3. Compare and contrast the various types of AI in terms of their application to robotics
4. Describing the role of decision logic in robotics
5. Describing the role of Boolean logic as used in robotics
6. Solving simple Boolean logic problems

Learning Outcomes:

- Solve problems using critical and creative thinking and scientific reasoning
- Demonstrate knowledge of ethical thinking and its application to issues in society
- Use computer and emerging technologies effectively