Georgia CTAE

Embedded Computing 11.42700 (2021)

Demonstrate employability skills required by business and industry. IT-EP-1	1 **Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities** IT-EP-1.1
	2 **Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.** IT-EP-1.2
	3 **Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.** IT-EP-1.3
	4 **Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.** IT-EP-1.4
	5 **Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.** IT-EP-1.5
	6 **Present a professional image through appearance, behavior and language.** IT-EP-1.6
Explain Embedded Computing (EC) and the Internet of Things (IoT). IT-EP-2	1 **Define the basic terminology of EC/IoT.** IT-EP-2.1
	2 **Create a glossary of basic EC/IoT terminology.** IT-EP-2.2
	3 **Compare and contrast microprocessors and microcontrollers.** IT-EP-2.3
	4 **Research and report on popular microcontrollers and EC/IoT platforms (e.g., Arduino, Raspberry Pi, spark.io, BASIC Stamp, Espruino, LightBlue Bean, LittleBits Arduino).** IT-EP-2.4
Demonstrate a working knowledge of basic networking protocols for industry, homes, and the internet including speed, power requirements, and popularity in industry	1 **Compare and contrast Radio Frequency (RF) networking technologies, (e.g., Wi-Fi, bluetooth, BLE, Zigbee, Zwave) including speed, power requirements, and popularity in industry and personal devices.** IT-EP-3.1
	2 **Explain advantages and disadvantages of wireless networking compared to wired networking.** IT-EP-3.2

and personal devices. IT-EP-3	3 **Demonstrate a working knowledge of serial networking technologies used by microcontrollers (e.g., I2C, RS-232, RS-422, RS-485, SPI, master/slave).** IT-EP-3.3
Develop and investigate interfacing circuits. IT-EP-4	1 **Explain the difference between a source and a sink.** IT-EP-4.1
	2 **Identify the differences between analog and digital circuits.** IT-EP-4.2
	3 **Describe the function of a pull-up resistor.** IT-EP-4.3
	4 **Calculate the current draw of series and parallel circuits.** IT-EP-4.4
	5 **Build an operational LED circuit with a switch to turn it on/off, giving examples of why this is helpful in an IoT scenario.** IT-EP-4.5
	6 **Research and report the current and voltage I/O limitations of the embedded platform/microcontroller used in the class.** IT-EP-4.6
	7 **Discuss the characteristics of digital input and output ports on a microcontroller** IT-EP-4.7
	8 **Demonstrate an understanding of analog to digital (ADC) and digital to analog ports (DAC) on a microcontroller.** IT-EP-4.8
Classify and categorize multiple kinds of sensors. IT-EP-5	1 **Classify and explain examples of the following kinds of sensors: temperature, distance, light, sound, contact, pressure, position – GPS (Global Positioning System), encoders, potentiometer, gyro, and accelerometer.** IT-EP-5.1
	2 **Explain the basic functioning principles of the sensors above and their possible uses.** IT-EP-5.2
Manipulate, connect, and examine performance aspects of motors. IT-EP-6	1 **Demonstrate an understanding of stepper motors.** IT-EP-6.1
	2 **Explain how a servo motor operates.** IT-EP-6.2
	3 **Describe the operation of brushed motor controller** IT-EP-6.3
	4 **Explain how a brushless motor controller works** IT-EP-6.4
	5 **Demonstrate an understanding of pulse width modulation (PWM) control of motors.** IT-EP-6.5
	6 **Select the proper motor and controller for a given task, including exceptions that require a different action (if/then scenarios).** IT-EP-6.6
Investigate and draw connections within the context of programming as it relates to Embedded	1 **Identify and utilize popular programming languages used for EC/IoT applications.** IT-EP-7.1

Computing/Internet of Things. IT-EP-7	2 **Analyze the process of software development for an embedded application.** IT-EP-7.2
	3 **Compare and contrast interpreted and compiled applications.** IT-EP-7.3
	4 **Define real time programming and interrupt driven programming.** IT-EP-7.4
	5 **Analyze and explain when integer and floating point numbers are needed.** IT-EP-7.5
	6 **Design the use of a finite state machine using real-world examples (e.g. vending machines, assisted GPS on smartphones, various radio/connectivity states).** IT-EP-7.6
Interpret debugging techniques in hardware and software. IT-EP-8	1 **Gather, organize, and interpret data to identify simple bugs in EC/IoT applications.** IT-EP-8.1
	2 **Utilize proper methods for debugging, including systematically changing, then checking, one item at a time.** IT-EP-8.2
	3 **Evaluate the breakpoint, interrupt, main loop, event driven, and race condition in EC/IoT applications.** IT-EP-8.3
	4 **Prove how to debug an actual program using a debugging tool and explain the reasons behind the steps taken.** IT-EP-8.4
Compare, contrast, and utilize Cloud Service features. IT-EP-9	1 **Debate Security/Privacy concerns of EC/IoT applications.** IT-EP-9.1
	2 **Explore available cloud-based application program interfaces (APIs).** IT-EP-9.2
	3 **Develop an application that connects with one or more cloud-based services/storage solutions (e.g., Twitter, IFTTT [If This Then That], Dropbox, Google)** IT-EP-9.3
Design an embedded computing application that solves a current problem (e.g., robotics, artbotics, visual, and kinetic art). IT-EP-10	1 **Design, develop, and debug an embedded computing application interfacing to an external sensor, switch, LED, or other device.** IT-EP-10.1
	2 **Design, develop, and debug an external application on a PC or mobile device accessing data from a remote embedded computer.** IT-EP-10.2
Examine how related student organizations are integral parts of career and technology education courses through leadership development, school and community service	1 **Explain the goals, mission, and objectives of the career-technical student organization (CTSO).** IT-EP-11.1
	2 **Explore the impact and opportunities a student organization can develop to bring business and education together in a positive working relationship through innovative leadership and career development programs.** IT-EP-11.2

projects and competitive events. IT-EP-11

3 **Explore the local, state, and national opportunities available to students through participation in related student organization including but not limited to conferences, competitions, community service, philanthropy, and other CTSO activities.** IT-EP-11.3

4 **Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.** IT-EP-11.4

5 **Explore the competitive events related to the content of this course and the required competencies, skills, and knowledge for each related event for individual, team, and chapter competitions.** IT-EP-11.5