Florida CTE

Engineering & Technology Education (2023-24): Exploration of Robotics Technology (8600070)

Demonstrate an understanding of the characteristics and scope of technology.--The student will be able to: 1.0

1. **Develop new products and systems to solve problems or to help do things that could not be done without the help of technology.** 1.01
2. **Describe the development of technology as a human activity that is the result of individual or collective needs and the ability to be creative.** 1.02
3. **Explain how technology is closely linked with creativity, which has resulted in innovation.** 1.03
4. **Demonstrate how corporations can often create demand for a product by bringing it onto the market and advertising it.** 1.04

Demonstrate an understanding of the core concepts of technology.--The student will be able to: 2.0

1. **Describe technological systems including input, processes, output, and, at times, feedback.** 2.01
2. **Apply systems thinking, involving considering how every part relates to others.** 2.02
3. **Identify control systems having no feedback path and requiring human intervention, and control systems using feedback.** 2.03
4. **Explain how technological systems can be connected to one another.** 2.04
5. **Repair malfunctions of any part of a system that may affect the function and quality of the system.** 2.05
6. **Compare and contrast requirements or parameters placed on the development of a product or system.** 2.06
7. **Compare and contrast trade-offs as a decision process recognizing the need for careful compromises among competing factors.** 2.07
8. **Describe different technologies that involve different sets of processes.** 2.08

	9 Perform basic maintenance as the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability. 2.09
	10 Utilize controls and mechanisms or particular steps that people perform using information about the system that causes systems to change. 2.1
Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.--The student will be able to: 3.0	1 Modify the way technological systems interact with one another. 3.01
	2 Apply a product, system, or environment developed for one setting in another setting. 3.02
	3 Explain how knowledge gained from other fields of study has a direct effect on the development of technological products and systems. 3.03
Demonstrate an understanding of the cultural, social, economic, and political effects of technology.--The student will be able to: 4	1 Identify the ways that use of technology affects humans, including their safety, comfort, choices, and attitudes about technology's development and use. 4.01
	2 Explain that technology, by itself, is neither good nor bad; but decisions about the use of products and systems can result in desirable or undesirable consequences. 4.02
	3 Identify ethical issues associated with the development and use of technology. 4.03
	4 Identify the economic, political, and cultural issues that are influenced by the development and use of technology. 4.04
Demonstrate an understanding of the effects of technology on the environment.--The student will be able to: 5	1 Describe the management of waste produced by technological systems as an important societal issue. 5.01
	2 Describe how technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and systems. 5.02
	3 Make decisions about the development and use of technologies that put environmental and economic concerns in direct competition with one another. 5.03
Demonstrate an understanding of the role of society in the development and use of technology.--The student will be able to: .6.0	1 Describe the development of technologies that has resulted from the demands, values, and interests of individuals, businesses, industries, and societies. 6.01
	2 Describe changes in society and the creation of new needs and wants caused by the use of inventions and innovations. 6.02

	3 Understand social and cultural priorities and values that are reflected in technological devices. 6.03
	4 Explain how meeting societal expectations is the driving force behind the acceptance and use of products and systems. 6.04
Demonstrate an understanding of the influence of technology on history.--The student will be able to: 7	1 Identify inventions and innovations that have evolved by using slow and methodical processes of tests and refinements. 7.01
	2 Explain how the specialization of function has been at the heart of many technological improvements. 7.02
	3 Identify the design and construction of structures for service or convenience evolving from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships. 7.03
	4 Investigate how, that in the past, an invention or innovation was not usually developed with the knowledge of science. 7.04
Demonstrate an understanding of the attributes of design.--The student will be able to: 8	1 Use design as a creative planning process that leads to useful products and systems. 8.01
	2 Explain why there is no perfect design. 8.02
	3 Evaluate criteria and constraints that are requirements for a design. 8.03
Demonstrate an understanding of engineering design.--The student will be able to: 9	1 Utilize the design process involving a set of steps, which can be performed in different sequences and repeated as needed. 9.01
	2 Employ brainstorming as a group problem-solving design process in which each person in the group presents his or her ideas in an open forum. 9.02
	3 Model, test, evaluate and modify designs to transform ideas into practical solutions. 9.03
Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.--The student will be able to: 10	1 Use troubleshooting as a problem-solving method used to identify the cause of a malfunction in a technological system. 10.01
	2 Describe invention as a process of turning ideas and imagination into devices and systems and innovation as the process of modifying an existing product or system to improve it. 10.02
	3 10.03 Identify technological problems that are best solved through experimentation. 10.03

Demonstrate the abilities to apply the design process.--The student will be able to: 11	1 **Apply a design process to solve problems in and beyond the laboratory-classroom.** 11.01
	2 **Specify criteria and constraints for the design.** 11.02
	3 **Make two-dimensional and three-dimensional representations of the designed solution.** 11.03
	4 **Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.** 11.04
	5 **Make a product or system and document the solution.** 11.05
Demonstrate the abilities to use and maintain technological products and systems.--The student will be able to: 12	1 **Use information provided in manuals, protocols, or by experienced people to see and understand how things work.** 12.01
	2 **Use tools, materials, and machines safely to diagnose, adjust, and repair systems.** 12.02
	3 **Use computers and calculators in various applications.** 12.03
	4 **Operate and maintain systems in order to achieve a given purpose.** 12.04
Demonstrate the abilities to assess the impact of products and systems.--The student will be able to: 13	1 **Design and use instruments to gather data.** 13.01
	2 **Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.** 13.02
	3 **Identify trends and monitor potential consequences of technological development.** 13.03
	4 **Interpret and evaluate the accuracy of the information obtained and determine if it is useful.** 13.04
Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials.--The student will be able to: 21	1 **Follow classroom/laboratory safety rules and procedures.** 21.01
	2 **Demonstrate good housekeeping at workstations within a classroom/laboratory.** 21.02
	3 **Conduct classroom/laboratory activities and equipment operations in a safe manner.** 21.03
	4 **Exercise care and respect for all tools, equipment, and materials.** 21.04
	5 **Select appropriate tools, machines, and equipment to accomplish a given task.** 21.05
	6 **Identify color-coding safety standards.** 21.06

	7 Safely use hand tools and power equipment. 21.07
	8 Explain fire prevention and safety precautions and practices for extinguishing fires. 21.08
	9 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment. 21.09
Exhibit positive human relations and leadership skills.--The student will be able to: 22	1 Perform roles in a student personnel system or in a career and technical student organization (CTSO). 22.01
	2 Work cooperatively with others. 22.02
Discuss individual interests, aptitudes, and opportunities as they relate to a career.--The student will be able to: 23	1 Identify individual strengths and weaknesses. 23.01
	2 Discuss individual interests related to a career. 23.02
	3 List occupations, job requirements, and job opportunities in robotics technology 23.03
	4 List academic and career programs at the secondary levels in robotics technology. 23.04
Demonstrate an understanding of robotics, its history, applications, and evolution.--The student will be able to: 50	1 Explore robotics history through research of the industry. 50.01
	2 Describe various applications of automation and robotics. 50.02
	3 Describe emerging technologies and their implications on the field of robotics. 50.03
Demonstrate an understanding of basic programming concepts.--The student will be able to: 51	1 Apply the engineering design process to the creation of a program 51.01
	2 Discuss the use of algorithms 51.02
	3 Demonstrate the use of flowcharting in documenting an algorithm 51.03
	4 Demonstrate the use of pseudocode in documenting an algorithm 51.04
	5 Explain the function of conditional execution (eg if, if/else) and their uses 51.05
	6 Explain iterative programming structures (e.g., while, do/while) and their uses. 51.06
	7 Demonstrate the use of testing & debugging in the problem solving process 51.07
	8 Create functional program that satisfies prescribed criteria 51.08

Identify the basic subsystems on a robotic system.--The student will be able to: 52	1	**Define drivetrain, manipulator, and chassis** 52.01
	2	**Understand the difference between Ackermann and skid steering** 52.02
	3	**Identify the difference between Motors and servos** 52.03
	4	**Calculate simple gear ratios and their relationship with torque vs speed** 52.04
	5	**Assess the advantages and disadvantages of wheels vs tank treads** 52.05
	6	**Analyze the characteristics of a sound chassis design** 52.06
Describe the role of sensors in the field of robotics.--The student will be able to: 53	1	**Define sensor.** 53.01
	2	**Describe the basic operation common to all sensors.** 53.02
	3	**Describe the types of sensors and ways in which they can be categorized.** 53.03
	4	**Investigate the types of manipulators used in a robotic system.** 53.04
Build, program, and configure a robot to perform predefined tasks.--The student will be able to: 54	1	**Design a robot.** 54.01
	2	**Create programs as required using robotic software that will allow the robot to perform a set of tasks.** 54.02
	3	**Create a flow chart that visually describes a basic robotic task.** 54.03
	4	**Configure subsystems to operate the robot.** 54.04
	5	**Create a portfolio including drawings and specifications, describing the robot, the tasks and rationale, and the results.** 54.05
Solve problems using critical thinking skills, creativity and innovation.--The student will be able to: 55	1	**Employ critical thinking skills independently and in teams to solve problems and make decisions.** 55.01
	2	**Employ critical thinking and interpersonal skills to resolve conflicts.** 55.02
	3	**Identify and document workplace performance goals and monitor progress toward those goals.** 55.03
	4	**Conduct technical research to gather information necessary for decision-making.** 55.04