Texas CTE

Robotics I

General requirements. This course is recommended for students in Grades 9 and 10. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course R.A

A **General requirements. This course is recommended for students in Grades 9 and 10. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course** R.A

Introduction. R.B

1 **Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** R.B.1

2 **The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.** R.B.2

3 **In Robotics I, students will transfer academic skills to component designs in a project-based environment through implementation of the design process. Students will build prototypes or use simulation software to test their designs. Additionally, students will explore career opportunities, employer expectations, and educational needs in the robotic and automation industry.** R.B.3

4 **Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.** R.B.4

5 **Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.** R.B.5

Knowledge and skills. R.C

1 **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:** R.C.1

- a demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession; R.C.1.A
- b demonstrate the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome; R.C.1.B
- c present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions; R.C.1.C
- d demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; R.C.1.D
- e demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed. R.C.1.E

2 **The student demonstrates the skills necessary for success in a technical career. The student is expected to:** R.C.2

- a distinguish the differences among an engineering technician, engineering technologist, and engineer; R.C.2.A
- b identify employment and career opportunities; R.C.2.B
- c identify industry certifications; R.C.2.C
- d discuss ethical issues related to engineering and technology and incorporate proper ethics in submitted projects; R.C.2.D
- e identify and demonstrate respect for diversity in the workplace; R.C.2.E
- f identify appropriate actions and consequences relating to discrimination, harassment, and inequality; R.C.2.F
- g explore robotic engineering careers and preparation programs; R.C.2.G
- h explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training; R.C.2.H
- i discuss Accreditation Board for Engineering and Technology (ABET) accreditation and implications. R.C.2.I

3 **The student participates in team projects in various roles. The student is expected to:** R.C.3

- a explain the importance of teamwork in the field of robotics; R.C.3.A
- b apply principles of effective problem solving in teams to collaboration and conflict resolution; R.C.3.B
- c demonstrate proper attitudes as a team leader and team member. R.C.3.C

4 **The student develops skills for managing a project. The student is expected to:** R.C.4

- a implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project; R.C.4.A
- b develop a project schedule and complete work according to established criteria; R.C.4.B
- c participate in the organization and operation of a real or simulated engineering project; R.C.4.C
- d develop a plan for production of an individual product. R.C.4.D

5 **The student practices safe and proper work habits. The student is expected to:** R.C.5

- a master relevant safety tests; R.C.5.A
- b comply with safety guidelines as described in various manuals, instructions, and regulations; R.C.5.B
- c identify governmental and organizational regulations for health and safety in the workplace related to electronics; R.C.5.C
- d identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations; R.C.5.D
- e dispose of hazardous materials and wastes appropriately; R.C.5.E
- f perform maintenance on selected tools, equipment, and machines; R.C.5.F
- g handle and store tools and materials correctly; R.C.5.G
- h describe the results of improper maintenance of material, tools, and equipment. R.C.5.H

6 **The student develops the ability to use and maintain technological products, processes, and systems. The student is expected to:** R.C.6

- a demonstrate the use of computers to manipulate a robotic or automated system and associated subsystems; R.C.6.A
- b maintain systems to ensure safe and proper function and precision operation; R.C.6.B
- c describe feedback control loops used to provide information; R.C.6.C
- d describe types and functions of sensors used in robotic systems. R.C.6.D

7 **The student develops an understanding of engineering principles and fundamental physics. The student is expected to:** R.C.7

- a demonstrate knowledge of Newton's Laws as applied to robotics such as rotational dynamics, torque, weight, friction, and traction factors required for the operation of robotic systems; R.C.7.A
- b demonstrate knowledge of Newton's Laws as applied to robotics such as rotational dynamics, torque, weight, friction, and traction factors required for the operation of robotic systems; R.C.7.B
- c describe the application of the six simple machines to robotics; R.C.7.C
- d describe the operation of direct current (DC) motors, including control, speed, and torque; R.C.7.D
- e describe the operation of servo motors, including control, angle, and torque. R.C.7.E

8 **The student develops an understanding of the characteristics and scope of manipulators, accumulators, and end effectors required for a robotic or automated system to function. The student is expected to:** R.C.8

- a describe the relationship between robotic arm construction and robot stability; R.C.8.A
- b describe the relationship between robotic arm construction and robot stability; R.C.8.B
- c demonstrate knowledge of linkages and gearing in end effectors used in a robotic arm system. R.C.8.C

9 **The student uses engineering design methodologies. The student is expected to:** R.C.9

- a demonstrate an understanding of and discuss the design process; R.C.9.A
- b think critically, identify the system constraints, and make fact-based decisions; R.C.9.B
- c apply testing and reiteration strategies to develop or improve a product; R.C.9.C
- d apply decision-making strategies when developing solutions; R.C.9.D
- e identify quality-control issues in engineering design and production; R.C.9.E
- f describe perceptions of the quality of products and how they affect engineering decisions; R.C.9.F
- g use an engineering notebook to document the project design process as a legal document; R.C.9.G
- h interpret industry standard system schematics. R.C.9.H

10 **The student learns the function and application of the tools, equipment, and materials used in robotic and automated systems through specific project-based assessments. The student is expected to:** R.C.10

- a use tools and laboratory equipment in a safe manner to construct and repair systems; R.C.10.A
- b use precision measuring instruments to analyze systems and prototypes; R.C.10.B
- c use multiple software applications to simulate robot behavior and present concepts. R.C.10.C

11 **The student produces a product using the appropriate tools, materials, and techniques. The student is expected to:** R.C.11

- a identify and describe the steps needed to produce a prototype; R.C.11.A
- b identify and use appropriate tools, equipment, machines, and materials to produce the prototype; R.C.11.B
- c construct a robotic or automated system to perform specified operations using the design process; R.C.11.C
- d test and evaluate the design in relation to pre-established requirements such as criteria and constraints; R.C.11.D
- e refine the design of a robotic or automated system to ensure quality, efficiency, and manufacturability of the final product; R.C.11.E
- f present the final product using a variety of media. R.C.11.F