Course Title	*Robotics and Programming 8*	**Course Code**	*J0006*

Transcript Title:	*Robotics and Programming 8*	Grades Levels:	*8*	Board Adoption Date:	*05/22/2018*
Content Area:	*Elective*	**GPA Scale:**	*4.0*	**Date Course Submitted:**	*3/29/18*
Credential Required:	*CTE*	Graduation Subject Areas:	*N/A*		
UC/CSU "A-G" Area Approvals:		School Site/person that wrote and submitted the course:		*Ensign- Michael Sciacca*	
Recommend Skills:	*Robotics/Engineering/ Computer Programing*				
Next course(s):	*Computer Programming*				

Robotics and Programming 8

DATE:	March 2018
INDUSTRY SECTOR:	Information and Communication Technology
PATHWAY:	Software and Systems Development (174)
CBEDS TITLE:	Intro to Information and Communication Technologies
CBEDS Code:	8100

HOURS:

Total	Classroom	Laboratory/CC/CVE
180	60 hours	120 hours

JOB TITLE	ONET CODES	JOB TITLE	ONET CODES
N/A			

COURSE DESCRIPTION: Robotics and Programming 8 is a course that builds on students' engineering knowledge and abilities through the use of VEX Robotics and introduces the core concepts of programming with the UC Davis C-STEM Center's Linkbots and Ch programming language. Students will first design, build, and modify robots, then craft programs of increasing levels of complexity and interactivity.

PREREQUISITES:

High School Name:	Site Prerequisite:
N/A	

A – G APPROVAL: ☐ Yes ☒ No ☐ Desired

ARTICULATION:

High School Name:	College Name:	College Course Title:
N/A		

LEVEL: [x] Introductory   [ ] Concentrator   [ ] Capstone

CERTIFICATION:

High School Name:	Embedded/Leads to:	Description:
N/A		

METHOD OF STUDENT EVALUATION:

- ✓ Pre and Post test
- ✓ Student Projects
- ✓ Written work
- ✓ Observation record of student performance
- ✓ Completion of assignments and worksheets

METHOD OF INSTRUCTION:

- ✓ Lecture
- ✓ Group and individual applied projects
- ✓ Demonstration
- ✓ Field Trips
- ✓ Guest Speaker

RECOMMENDED TEXTS:

Learning Robot Programming with Linkbot for the Absolute Beginner - Harry H. Cheng,
UC Davis Center for Integrated Computing and STEM Education (C-STEM),
University of California-Davis (update to the current edition as they are released to match software updates - free to download with program fees).

MODEL CTE PATHWAY:
Exploratory course to feed into Engineering or CS courses in H S

Information and Communication Technology/Digital Media
KNOWLEDGE AND PERFORMANCE ANCHOR STANDARDS

1.0 Academics

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Information and Communication Technologies academic alignment matrix for identification of standards.

2.0 Communications

Acquire and accurately use Information and Communication Technologies sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

2.1 Recognize the elements of communication using a sender–receiver model.
2.2 Identify barriers to accurate and appropriate communication.
2.3 Interpret verbal and nonverbal communications and respond appropriately.
2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.
2.7 Use technical writing and communication skills to work effectively with diverse groups of people.
2.8 Understand the principles of a customer-oriented service approach to users.

3.0 Career Planning and Management

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
3.3 Explore how information and communication technologies are used in career planning and decision making.
3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
3.7 Recognize the importance of small business in the California and global economies.
3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

4.0 Technology

Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Information and Communication Technologies sector workplace environment. (Direct alignment with WS 11-12.6)

4.1 Use electronic reference materials to gather information and produce products and services.
4.2 Employ technology based communications responsibly and effectively to explore complex systems and issues.
4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent

of the associated sources.

4.5 Research past, present, and projected technological advances as they impact a particular pathway.

4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

5.0 Problem Solving and Critical Thinking

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Information and Communication Technologies sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

5.1 Identify and ask significant questions that clarify various points of view to solve problems.

5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.

5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.

5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

5.5 Use a logical and structured approach to isolate and identify the source of problems and to resolve problems.

5.6 Know the available resources for identifying and resolving problems.

5.7 Work out problems iteratively and recursively.

5.8 Create and use algorithms and solve problems.

5.9 Deconstruct large problems into components to solve.

5.10 Use multiple layers of abstraction.

5.11 Understand the concept of base systems, including binary and hexadecimal.

5.12 Apply the concepts of Boolean logic to decision making and searching.

6.0 Health and Safety

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Information and Communication Technologies sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.

6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.

6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.

6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.

6.6 Maintain a safe and healthful working environment.

6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

6.8 Maintain a safe and healthful working environment.

6.9 Dispose of e-waste properly, understanding the health, environmental, and legal risks of improper disposal.

6.10 Act conscientiously regarding the use of natural resources (e.g., paper, ink, etc.)

6.11 Conserve energy while computing (e.g., turn off equipment at night, power-saving settings, etc.)

7.0 Responsibility and Flexibility

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Information and Communication Technologies sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

7.1 Recognize how financial management impacts the economy, workforce, and community.

7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace

roles.

7.3 Understand the need to adapt to changing and varied roles and responsibilities.

7.4 Practice time management and efficiency to fulfill responsibilities.

7.5 Apply high-quality techniques to product or presentation design and development.

7.6 Demonstrate knowledge and practice of responsible financial management.

7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.

7.8 Explore issues of global significance and document the impact on the Information and Communication Technologies sector.

8.0 Ethics and Legal Responsibilities

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

8.1 Access, analyze, and implement quality assurance standards of practice.

8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Information and Communication Technologies industry sector.

8.3 Demonstrate ethical and legal practices consistent with Information and Communication Technologies sector workplace standards.

8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.

8.5 Analyze organizational culture and practices within the workplace environment.

8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.

8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Information and Communication Technologies sector laws and practices.

8.8 Identify legal and ethical issues that have proliferated with increased technology adoption, including hacking, scamming, and breach of privacy.

9.0 Leadership and Teamwork

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution such as those practiced in the Future Business Leaders of America and SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)

9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.

9.2 Identify the characteristics fo successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams and career technical student organization activities.

9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.

9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities. 9.5 Understand that the modern world is an international community and requires an expanded global view.

9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.

9.7 Participate in interactive teamwork to solve real Information and Communication Technologies sector issues and problems.

10.0 Technical Knowledge and Skills

Apply essential technical knowledge and skills common to all pathways in the Information and Communication Technologies sector, following procedures when carrying out experiments or performing technical tasks.(Direct alignment with WS 11-12.6) 10.1 Interpret and explain terminology and practices specific to the Information and Communication Technologies sector. 10.2 Comply with the rules, regulations, and expectations of all aspects of

the Information and Communication Technologies sector.

10.3 Construct projects and products specific to the Information Communication Technologies sector requirements and expectations.

10.4 Collaborate with industry experts for specific technical knowledge and skills.

10.5 Understand the major software and hardware components of a computer and a network and how they relate to each other.

10.6 Understand data sizes of various types of information (text, pictures, sound, video, etc.) and data capacity of various forms of media.

10.7 Understand the SI (metric) prefixes commonly used in computing including, at least, kilo, mega, giga, and tera.

10.8 Understand security concepts including authorization, rights, and encryption.

10.9 Use common industry-standard software and their applications including word processing, spreadsheets, databases, and multimedia software.

10.10 Manage files in a hierarchical system.

10.11 Know multiple ways in which to transfer information and resources (e.g., text, data, sound, video, still images) between software programs and systems.

10.12 Know appropriate search procedures for different types of information, sources, and queries.

10.13 Evaluate the accuracy, relevance, and comprehensiveness of retrieved information.

10.14 Analyze the effectiveness of online information resources to support collaborative tasks, research, publications, communications, and increased productivity.

11.0 Demonstration and Application

Demonstrate and apply the knowledge and skills contained in the Information and Communication Technologies anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through career technical student organizations such as Future Business Leaders of America and SkillsUSA.

11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Information and Communication Technologies sector program of study.

11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.

11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.

11.4 Employ entrepreneurial practices and behaviors appropriate to Information and Communication Technologies sector opportunities.

11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

CR = Classroom   LAB/CC = Laboratory/Shop/Community Classroom

I.	INTRODUCTION	CR	LAB/ CC	STANDARDS

	A. First Day of School Presentations
	B. Syllabus and Classroom Expectations
	D. Safety Instruction
	   1. Responsible Computer Use
	   2. Tool Safety
	   3. Equipment Safety
	   4. Safety Assessment
	C. Team Building Exercises
	   1. Paper-Foundation Tower Building
		4	5	Academic:
				LS 9-10, 11-12.6
				SLS 9-10, 11-12.1, 11-12.1b, 11-12.1d, 11-12.2
				WS 11-12.6 11-12.7

			CR	LAB/CC	STANDARDS
		2. Toothpick Tower Construction 3. Collaborative Design Documentation			RSTS 9-10, 11-12.4 **CTE Anchor:** 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 **CTE Pathway:** C10.0
II	**CLAWBOT CONSTRUCTION AND PRACTICE**		**CR**	**LAB/CC**	**STANDARDS**

	A. Group/Team Selection
	   1. Class vote to choose method
	B. Clawbot Construction
	   1. Distribute Clawbot Kits and Instructions
	   2. Guide Students through the assembly of their Clawbot as needed.
	C. Clawbot Piloting Practice
	   1. Students take turns guiding their Clawbot through various challenges pertaining to the current VEX Robotics Competition (VRC) Game.
	D. Student Reflection
	   1. Students individually write a reflective essay covering what they enjoyed, challenges they overcame, and what they learned about themselves through building the Clawbot.
			5	**10**	**Academic:**
					LS 9-10, 11-12.6
					SLS 9-10, 11-12.1, 11-12.1b
					WS 11-12.6 11-12.7
					RSTS 9-10, 11-12.4
					Math: 7.RP.1-3, 7.G.1, 7.G.4-6, 8.G.1-8
					
					CTE Anchor:
					2.0
					4.0
					5.0
					6.0
					7.0
					9.0
					
					CTE Pathway:
					C9.0

II	**ROBOT REDESIGN AND MODIFICATION**		**CR**	**LAB/CC**	**STANDARDS**

	A. Robot Redesign
	   1. Students research mechanisms that will allow them to be competitive in the current VRC Game.
	   2. Students use a Design Decision Matrix to select the modifications they will implement
			9	**25**	**Academic:**
					LS 9-10, 11-12.6
					SLS 9-10, 11-12.1, 11-12.1b, 11-

		CR	LAB/CC	STANDARDS

	on their robots.
	3. Students create design sketches and 3D renderings to provide documentation of their modifications.
	B. Robot Modification
	  1. Students will follow the Engineering Design Process as they modify and/or rebuild their robots to create a competitive robot.
	    a. Students may need to use the appropriate programming suite to customize their controllers and robot commands.
	  2. The Engineering Design Process will be as follows:
	    a. Define the Problem (As completed in III.A.1.)
	    b. Generate Concepts (As completed in III.A.2.)
	    c. Design a Solution (As completed in III.A.3.)
	    d. Build and Test
	    e. Evaluate Solution
	  3. Students will create a presentation and present their completed robots to the rest of the class.
				12.1d
				WS 11-12.6 11-12.7
				RSTS 9-10, 11-12.4
				Math: 7.RP.1-3, 7.G.1, 7.G.4-6, 8.G.1-8, F-IF.4-7, F-LE.5, N-Q.1-3, N-RN.1-3, G-CO.1-8, G-GMD.4, G-MG.1, G-MG.3, G-SRT.1, G-GPE.5-7
				
				CTE Anchor:
				2.0
				3.0
				4.0
				5.0
				6.0
				7.0
				8.0
				9.0
				10.0
				11.0
				
				CTE Pathway:
				C1.0
				C3.0
				C5.0
				C9.0

I	**AUTONOMOUS MODE PROGRAMMING**	**CR**	**LAB/CC**	**STANDARDS**

	A. Students will use the appropriate programming suite to create a 15-second autonomous program for their robot to execute.
	  1. Actions performed during the autonomous program will be dictated by the VRC Game goals and the robot's capabilities.
	  2. Additional sensors and hardware may be added to the robot to facilitate the execution of the program.
	B. Students will demonstrate their autonomous program to the rest of the class.
		2	15	**Academic:**
				LS 9-10, 11-12.6
				SLS 9-10, 11-12.1, 11-12.1b, 11-12.1d
				WS 11-12.6 11-12.7
				RSTS 9-10, 11-12.4

		CR	LAB/CC	STANDARDS
	C. Students will write a reflective essay detailing the challenges they faced during the creation and implementation of their programs.			Math: 7.RP.1-3, 7.NS.1-3, 7.G.1, 7.G.4-6, 8.NS.2, 8.EE.5-8, 8.F.1-5, 8.G.1-8, F-IF.4-7, F-LE.5, N-Q.1-3, N-RN.1-3, G-CO.1-8, G-GMD.4, G-MG.1, G-MG.3, G-SRT.1, G-GPE.5-7 **CTE Anchor:** 2.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 **CTE Pathway:** C1.0 C2.0 C3.0 C4.0 C5.0 C6.4 C9.0 C10.0
V	**C-STEM AND LINKBOTS**	**CR**	**LAB/ CC**	**STANDARDS**
	Students will investigate and develop software to interactively control modular robots singularly, in swarms, and in coordinated combinations. The programs and robots will be used to compete a variety of tasks and challenges that will involve algebraic and geometric thinking, scientific principles, engineering design, problem solving, and teamwork. *Students will use Learning Robotics with Linkbot for the Absolute Beginner textbook supplied by the UC*	**30**	**60**	**Academic:** LS 9-10, 11-12.6 SLS 9-10, 11-12.1, 11-12.1b, 11-12.1d WS 11-12.6 11-12.7 RSTS 9-10, 11-12.4

		CR	LAB/CC	STANDARDS
	Davis C-STEM Center. A. Introduction B. Controlling a Linkbot Using The Motion Control Panel C. Getting Started With Programming Linkbots D. Robot Simulation With Robosim E. Using Variables and Generating Robot Programs Using Roboblockly F. Interacting With a Linkbot At Runtime Through Variables and Input/Output Functions G. Writing Programs To Control a Group of Linkbots To Perform Identical Tasks H. Controlling a Linkbot-I as a Two-wheel Robot I. Moving a Single Robot In a Coordinate System J. Writing Programs To Control a Single Linkbot With Different Motion Characteristics K. Writing Advanced Programs To Control a Single Linkbot L. Sensory Information For a Linkbot M. Writing Programs To Control Multiple Individual Linkbots N. Moving Multiple Robots In a Coordinate System O. Writing Programs To Control One or Multiple Groups of Linkbots P. Controlling Multiple Connected Linkbots			Math: 7.RP.1-3, 7.NS.1-3, 7.G.1, 7.G.4-6, 8.NS.2, 8.EE.5-8, 8.F.1-5, 8.G.1-8, F-IF.4-7, F-LE.5, N-Q.1-3, N-RN.1-3, G-CO.1-8, G-GMD.4, G-MG.1, G-MG.3, G-SRT.1, G-GPE.5-7 **CTE Anchor:** 2.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 **CTE Pathway:** C1.0 C2.0 C3.0 C4.0 C5.0 C6.0 C9.0 C10.0

X		CR	LAB/CC	STANDARDS
	EMPLOYMENT PORTFOLIO			

	A. Students will prepare a professional portfolio.
	   1. Portfolio showcases best professional level work
	   2. Portfolio is organized
	   3. Job application
	   4. Resume
	   5. References
		10	5	**Academic:**
				LS 9-10, 11-12.1, 11-12.2, 11-12.3, 11-12.6
				RSIT 11-12.1, 11-12.6, 11-12.7
				RSTS 9-10, 11-12.4
				RLST 11-12.7
				WS 11-12.2, 11-12.6, 11-12.7

			WHSST 11-12.7 SLS 9-10, 11-12.2 **CTE Anchor:** 1.0 2.0 3.0 4.0 7.0 10.0 11.0 **CTE Pathway:** C6.0 C7.0, 7.5 C8.0