

Robotics Technology

COURSE OUTLINE

1. Course Title: Robotics Technology

2. CBEDS Title: Robotics

3. CBEDS Number: 5612

4. Job Titles:

Instrumentation Technician	Systems Integration Technician
Fieldbus Software Engineer	Product Engineer
Controls Engineer	Automation Engineer
Controls Programmer	Automation Technician
Electrical Technician	Automation Software Engineer
Electrical Engineer	Field Service Engineer
Electronics Maintenance Technician	Electrical Control Specialist
Technical Support Engineer	Technical Sales Representative
Software Developer	

5. Course Description:

SET Engineering Robotics Technology is an advanced level SET program course. Students will gain level advanced proficiency in electrical and mechanical engineering as well as programming in “C” language. The intent of this course is to provide students with prerequisite skills essential for an entry level position in the industry and/or for entry to engineering programs at a four year college or university. Through long-term projects focusing on the development of functioning robots, students will practically apply advanced engineering concepts to power supplies; pneumatic and electronic controls; and computer programmed control operations. In addition, students will incorporate engineering design strategies and evaluations as well as advanced mathematics and physics. As an integral part of this class learning experience, students will develop a robot for regional and statewide competitions. Honors credit available for students who complete honors challenges.

Student Outcomes and Objectives:

Students will:

1. Students will learn the proper operation and safety for common technical fabrication apparatuses found in industrial settings.
2. Students will identify the different engineering subsystems used in modern robots.
3. Students will know the fundamentals of electrical and electronic systems to include: AD/DC components; semi-conductor devices; digital logic; micro controller programming; and electric motors.
4. Students will know the fundamentals of fluid power systems to include: pressure and flow theory; control devices; activators; and hydraulic/pneumatic motors and cylinders.
5. Student will know the fundamental of mechanical systems, to include: the six simple machines; levers; linkages; and cams.
6. Students will understand key concepts of group dynamics and team conflict resolution. They will demonstrate cooperative working relationships.
7. Students will demonstrate problem solving ability through competition-based applications and projects of robotics principles.
8. Students will know to prepare drawings, schematics, and develop reports for typical robotic designs.

Integrated throughout the course are career preparation standards, which include basic academic skills, communication, interpersonal skills, problem solving, workplace safety, technology, and employment literacy.

Pathway

Recommended Sequence	Course
Introductory	Electronics 1 & 2
Skill Building	Electronics 3 & 4
Advanced Skill	Robotics Technology

6. Hours: *Students receive up to 180 hours of classroom instruction.*

7. Prerequisites: Electronics 2 or consent of instructor

8. Date (of creation/revision): July 2011

Italicized references “negotiated” curriculum; all other references “guaranteed” curriculum.

9. Course Outline

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Upon successful completion of this course, students will be able to demonstrate the following skills necessary for entry-level employment.				
Instructional Units and Competencies	Course Hours	Model Curr. Standards	CA Academic Content Standards	CAHSEE
<p>I. CAREER PREPARATION</p> <p>A. Career Planning and Management.</p> <ol style="list-style-type: none"> 1. Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers. <ol style="list-style-type: none"> a. Students will identify skills needed for job success b. Students will identify the education and experience required for moving along a career ladder. 2. Understand the scope of career opportunities and know the requirements for education, training, and licensure. <ol style="list-style-type: none"> a. Students will describe how to find a job. b. Students will select two jobs in the field and map out a timeline for completing education and/or licensing requirements. 3. Know the main strategies for self-promotion in the hiring process, such as completing job applications, resume writing, interviewing skills, and preparing a portfolio. <ol style="list-style-type: none"> a. Students will write and use word processing software to create a resume, cover letters, thank you letters, and job applications. b. Students will participate in mock job interviews. 4. <i>Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.</i> <ol style="list-style-type: none"> a. <i>Students will conduct a self—assessment and explain how professional qualifications affect career choices.</i> 5. <i>Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.</i> <ol style="list-style-type: none"> a. <i>Contact two professional organization and identify the steps to become a member.</i> 6. <i>Understand the past, present and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.</i> <ol style="list-style-type: none"> a. <i>Students will describe careers in the business industry sector.</i> b. <i>Students will identify work-related cultural differences to prepare for a global workplace.</i> <p>B. Technology.</p> <ol style="list-style-type: none"> 1. Understand past, present and future technological advances as they relate to a chosen pathway and on selected segments of the economy. 2. Understand the use of technological resources to gain access to, manipulate, and produce information, products and services. 3. Use appropriate technology in the chosen career pathway. <p>C. Problem solving and Critical Thinking.</p> <ol style="list-style-type: none"> 1. Understand the systematic problem-solving models that incorporate input, process, outcome and feedback components, and apply appropriate problem-solving strategies and critical thinking to work-related issues and tasks. 	<p>10</p> <p>Additional hours are integrated throughout the course</p>	<p>Engineering & Design Industry</p> <p>Information Technology</p> <p>Manufacturing & Product Development Industry</p> <p>3.0, 4.0, 5.0, 6.0 7.0 , 8.0, 9.0</p>	<p><u>Language Arts</u> (8)</p> <p>R 1.3, 2.6 W1.3, 2.5, LC 1.4,1.5 1.6 LS1.2, 1.3, (9/10) R2.1,2.3,2 W2.5 LC1.4 LS 1.1, 2.3 (11/12) R2.3 W2.5 LC1.2 <u>Math</u> (7) NS1.2, 1.7 MR 1.1,1.3 2.7,2.8, 3.1</p>	<p>Lang. Arts R 8.2.1 (9/10) R 2.1, 2.3 W2.5 Math (7) NS 1.2, 1.3, 1.7 MR 1.1, 2.1, 3.1</p>

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<p>2. Use and apply critical thinking and decision making skills to make informed decisions, solve problems, and achieve balance in the multiple roles of personal, home, work and community life.</p> <p>D. Health and Safety.</p> <ol style="list-style-type: none"> 1. Know policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities. 2. Understand critical elements of health and safety practices related to a variety of business environments. <p>E. Responsibility & Flexibility.</p> <ol style="list-style-type: none"> 1. Understand the qualities and behaviors that constitute a positive and professional work demeanor. 2. Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles and how individual actions can affect the larger community. 3. Understand the need to adapt to varied roles and responsibilities. <p>F. Ethics and Legal Responsibilities</p> <ol style="list-style-type: none"> 1. Know the major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations. 2. Understand the concept and application of ethical and legal behavior consistent with workplace standards. <ol style="list-style-type: none"> a. <i>Contact a business and obtain a copy of their rules for employment.</i> b. <i>Role play difference ethical scenarios.</i> 3. Understand the role of personal integrity and ethical behavior in the workplace. <p>G. Leadership and Teamwork.</p> <ol style="list-style-type: none"> 1. Understand the characteristics and benefits of teamwork, leadership, citizenship in the school, community, and workplace settings for effective performance and attainment of goals. 2. Understand the ways in which professional associations, such as FBLA and competitive career development activities enhance academic skills, career choices, and contribute to promote employability. 4. Know multiple approaches to personal conflict resolution and understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others. 				
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Instructional Units and Competencies	Hours	Model Curr. Standards.	CA Academic Standards	CAHSEE
<p>1. Principles of Robotics</p> <ul style="list-style-type: none"> a. Introduction <ul style="list-style-type: none"> i. Early Robotics ii. First Industrial Robot iii. What is an Industrial Robot iv. Types of Automation b. Fundamentals of Robotics <ul style="list-style-type: none"> i. The parts of a Robot ii. Degrees of Freedom iii. Robot Configuration c. Programming the Robot <ul style="list-style-type: none"> i. Motion Control ii. Programming Methods iii. Programming Languages iv. Types of Programming v. Voice Recognition d. Industrial Applications <ul style="list-style-type: none"> i. Integrating Robots into the Manufacturing Process ii. Selecting the Right Robot iii. Uses for Robots in Industry e. The role of Robots in Today’s Manufacturing <ul style="list-style-type: none"> i. Common Misconceptions about Robots ii. Where do Robots work best? iii. The Automotive Industry iv. Evaluating potential uses for Robots v. Preparing and Implementing a Robot System 	40	<p>Engineering & Design Industry</p> <p>Engineering Technology Pathway D5.6 D8.1 D9.3</p> <p>Information Technology Industry Sector</p> <p>Programming & Systems Development D2.1</p>	<p>H/SS. 9-12; Analysis Skills; Chron. & Spatial; 1 & 2</p> <p>ELA. 9-10; R; 2.6</p> <p>H/SS. 9-12; Analysis Skills; Historical Interpretation; 1.</p> <p>S. 9-12; ES; 4a & b</p>	
<p>2. Power Supplies and Movement Systems</p> <ul style="list-style-type: none"> a. Electromechanical Systems <ul style="list-style-type: none"> i. The Automated Systems Model ii. Mechanical Systems iii. Electrical Systems b. Fluid Power Systems <ul style="list-style-type: none"> i. Systems Model ii. Characteristics of Fluid Power Systems iii. Principles of fluid power iv. Basic Equipment c. Maintaining Robotic Systems <ul style="list-style-type: none"> i. General Servicing techniques ii. Troubleshooting iii. Preventive Maintenance 	35	<p>Engineering & Design Industry</p> <p>Engineering Technology Pathway D3.0, 3.4 D4.0,4.3,4.4</p>	<p>S. 9-12; Physics; 1a, b,c,d,f,g ,h,i & j</p> <p>S. 9-12; Physics; 5a,b,c,d, f & o</p> <p>M. 8-12; Algebra 1; 3.0</p>	

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Instructional Units and Competencies	Hours	Model Curr. Standards.	CA Academic Standards	CAHSEE
3. Sensing and End-Of-Arm Tooling <ul style="list-style-type: none"> a. Sensing Systems <ul style="list-style-type: none"> i. Kinds of Sensing ii. Types of Sensing iii. Types of Transducers b. End-Of-Arm Tooling <ul style="list-style-type: none"> i. End Effector Design ii. Grippers iii. Tools iv. Changeable End Effectors v. Custom designed End Effectors 	45	Engineering & Design Industry Engineering Technology Pathway D9.2	S. 9-12; Physics; 5a,b,c,d, f & o	
4. Control Systems <ul style="list-style-type: none"> a. Digital Electronic <ul style="list-style-type: none"> i. Electronic Information Processing ii. Binary Logic Circuits b. Programmable Logic Controllers <ul style="list-style-type: none"> i. Development of PLCS ii. Controller Systems iii. Programming c. Robot Interfacing and vision systems <ul style="list-style-type: none"> i. Interfacing ii. Machine Vision d. The Future of Robotics <ul style="list-style-type: none"> i. The factory of the future ii. Artificial Intelligence (AI) and Expert Systems iii. Impacts on Society iv. Your Future in Robotics 	50	Mfg. & Product Development Industry Sector Machine & Forming Pathway C7.0 C7.3	M. 8-12; Algebra 1; 3.0 ELA 8; W; 2.6. ELA. 11 & 12; W; 1.1, 1.3, 1.4, 1.7, 1.8, 1.9	

10. Additional recommended/optional items

- a. Articulation: None
- b. Academic credit: None
- c. Instructional strategies:
 - Methods of Instruction:
 - a. Lecture and Discussion
 - b. Laboratory & Experiments
 - c. Demonstrations
 - d. Projects
 - e. Community Resources (speakers) & (mentor)
 - f. Regional & Statewide Competitions
- d. Instructional materials: Text: Robotics Technology, Masterson, Towers and Fardo
- e. Certificates: None

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