2011/2012 Student Competency Record
CTE502 -- Robotics Engineering
36 weeks

About the Program
Computer Service and Support prepares students for careers in the Computer industry. The course sequence focuses on duties and tasks performed by professionals in Computer installation and repair occupations, as well as pre-employment and employment skills.

Major Concepts/Content: This program is intended to prepare students for computer support careers. Students enrolled in this course will gain practical experience in assembling a computer system, installing an operating system, troubleshooting computers and peripherals, and using system tools and diagnostic software. They will develop skills in computer networking and resource sharing. Students explore wireless technologies (e.g., Bluetooth, Wi-Fi) and create and configure a network. In addition, students will explore the relationships between internal and external computer components. Customer service skills and career plans will be developed. Upon successful completion of the course, students *may* qualify to take the A+ certification exam.

Major Instructional Activities: Students will be trained to use tools, electronic test equipment, and software to analyze and solve PC problems. This course provides students with training in procedures for optimizing and troubleshooting concepts for computer systems and subsystems. Emphasis is placed on technical proficiency, skill-building, and workplace readiness. During the course, students will analyze defective equipment, determine corrective measures, and make the equipment operational if possible. Students will build a PC as part of the requirements of the course.

Major Evaluative Techniques: Students will demonstrate their knowledge through computer-based instruction and examinations, performance tests, hands-on service, and completion of various repair projects. Demonstration of performance and professionalism are major components of the student's evaluation.

The table below is a competency list for the Computer Service and Support course. The competencies are considered essential and are required of all students.

PTE 502 36 weeks	Robotics Engineering **TASKS/COMPETENCIES**
Implementing DoDEA's CTE Course Requirements	
• 001	Demonstrate DoDEA's Workplace Readiness Skills in course activities.
• 002	Identify Internet safety issues and procedures for complying with acceptable use standards.
• 003	Identify issues relating to this field of study that affect the environment and impact local and global communities.
Setting Expectations for Student Success	
• 004	Demonstrate an understanding of the expectations for successful completion of Robotics Engineering course.
• 005	Demonstrate an understanding of classroom policies and procedures.
• 006	Identify and document personal learning goals.

2011/2012 Student Competency Record
CTE502 -- Robotics Engineering
36 weeks

• 007	Use appropriate computer applications to solve problems.
Relating Safety to Robotics Engineering	
• 008	Adhere to accepted laboratory safety practices.
• 009	Identify safety precautions necessary when using tools and materials.
• 010	Locate and refer to Material Data Safety Sheets (MSDS).
• 011	Match Personal Protective Equipment (PPE) to specific activities.
Investigating the Engineering Profession and Related Careers	
• 012	Explain the purpose and functions of the technological team.
• 013	Participate in group work to manage class and laboratory activities.
• 014	Summarize the characteristics of professional engineers.
• 015	Describe education needed for specialty fields in engineering and technology.
• 016	Demonstrate a professional attitude toward classroom and laboratory activities.
• 017	Describe the management responsibilities of engineers.
Investigating Simple Machines	
• 018	Compare and contrast potential and kinetic energy.
• 019	Describe mechanical advantage and its mathematical relationship to simple machines.
• 020	Describe how simple machines are used to reduce friction and resistance.
• 021	Explain practical applications of various types of conveyor systems.
• 022	Classify and apply different types of gears, wheels, and pullies to simple machines.
• 023	Calculate, measure, and evaluate the mechanical advantage of simple machines that use levers, gears, and pulleys.
• 024	Show how gears are used to change the angle of transmission.
• 025	Apply the use of belts, pulleys, chains and sprockets to everyday life.
• 026	Combine mechanical components to produce more complex machines.
Applying the Design/Engineering Process	
• 027	Articulate the design/engineering process.
• 028	List and define the three phases used in most engineering designs.
• 029	Apply the design/engineering process to address problems that can be solved by robots.
• 030	Define optimum design and explain why one rarely exists.
• 031	Describe the objectives of the feasibility study.
• 032	Explain the use of the evaluation table during the preliminary design phase.
• 033	Determine sources of information available for problem solving.
• 034	Describe the use of sketches and detail and assembly drawings in the design process.
• 035	Use anthropometric tables.
• 036	Select appropriate materials and processes for a design project.
• 037	Formulate an alternate design solution to a problem.
Identifying the Elements of Structural Design	
• 038	Demonstrate how tools are properly used to cut and fasten materials to fabricate structures.
• 039	Characterize materials used to fabricate mechanical structures.
• 040	Apply the elements of structural design to fabricating mechanical structures for robotic systems.

2011/2012 Student Competency Record
CTE502 -- Robotics Engineering
36 weeks

Communicating Technical Information	
• 041	Write a technical report for an engineering activity.
• 042	Sketch possible solutions to a design problem.
• 043	Present technical information through computer-aided design (CAD)
• 044	Present technical information in an oral report.
• 045	Write a business letter to request information or material.
• 046	Conduct an interview to gather information.
Understanding Robot Fundamentals	
• 047	Describe the evolution of the modern robot.
• 048	Identify and define terminology unique to robotic systems.
• 049	Classify robots according to their characteristics.
• 050	Operate basic robotic systems.
Investigating Electrical/Electronic Systems	
• 051	Discuss the nature of electricity and its safe use.
• 052	Identify electronic components and describe their function.
• 053	Explain how electronic components are used in robotic systems.
• 054	Determine how robotic electrical systems are powered.
• 055	Incorporate protective circuits into the distribution of electricity to robotic systems.
• 056	Integrate control devices into mechanical systems in designing a robot.
Understanding Fluidic Power	
• 057	Explain how hydraulic devices and systems work in a robot.
• 058	Apply hydraulic systems to the design of a robot.
• 059	Describe how pneumatic devices and pneumatic systems work in a robot.
• 060	Apply pneumatic systems to the design of a robot.
• 061	Incorporate appropriate fluidic power systems to specific applications of a robot.
Applying Motors and Actuators	
• 062	Differentiate between DC and AC motors.
• 063	Classify different types of DC motors.
• 064	Apply transmissions and gearboxes to desired torque and speed of robotic systems.
• 065	Describe the functioning of stepper motors in robotic systems.
• 066	Match DC brushless, hall-effect, brushed, and stepper motors to specific applications of designing a robot.
Exploring Microcontroller Technology	
• 067	Describe the architecture of the basic microcontroller.
• 068	Apply diagnostics to the understanding of microcontroller operation.
• 069	Apply binary systems, binary arithmetic, and logic operations.
• 070	Identify how Boolean operations are used to make decisions.
• 071	Employ logic operations and logic circuitry to control robotic systems.
• 072	Understand the basic architecture and operation of a microcontroller.
Programming Microcontrollers	
• 073	Demonstrate how computer programs can be used to move robotic systems.
• 074	Assemble a system whereby computer programs can be used to sense characteristics of

2011/2012 Student Competency Record
CTE502 -- Robotics Engineering
36 weeks

	an environment.
• 075	Simulate a situation where computer programs can be used to make decisions based on environmental characteristics.
Using Data Acquisition (Sensors)	
• 076	Explain how mechanical switches are employed as touch sensors.
• 077	Describe how optoelectronic sensors are used to collect visual data.
• 078	Design a robotic system controlled by temperature sensors.
• 079	Determine the range of a robot using ultrasonic sensors.
• 080	Explain how voice recognition hardware and software can be used to control robotic systems.
• 081	Identify how robots employ speech synthesis to communicate with their human counterparts.
• 082	Describe how vision systems allow robots to see.
Handling and Converting Data	
• 083	Describe how synchro and servo mechanisms are used in robotic systems.
• 084	Explain how robot synchro systems operate.
• 085	Differentiate between digital and analog signals.
• 086	Summarize how electronic circuits convert digital information to analog signals and analog information to digital signals.
Interfacing to the Microcontroller	
• 087	Connect basic interfacing circuits to a microcontroller.
• 088	Interface support circuits for sensors with microcontroller.
• 089	Interface indicator devices with a microcontroller.
• 090	Interface drive circuits with a microcontroller.
• 091	Program microcontrollers to use interface circuits.
Designing and Developing Intelligent Machines	
• 092	Identify and describe engineering problems and their solutions.
• 093	Summarize how the designing process incorporates data input to solve problems when designing a robot.
• 094	Summarize how the designing process incorporates sensory input to solve problems when designing a robot.
• 095	Describe the application of mathematics used in robotic engineering.
• 096	Describe the application of scientific principles in the solution of engineering problems.
• 097	Describe the application of technology in the solution of engineering problems.
• 098	Prepare a model demonstrating an engineering problem and its solution.
• 099	Incorporate the engineering process with machine output to solve problems when designing a robot.
• 100	Design a robot using the engineering/design process.
• 101	Troubleshoot robotic engineering systems.