Course Outline

Energy, Environment, and Utilities **REVISED: August/2017**

Job Title:
Electronics Technician

Career Pathway:
Telecommunications

Industry Sector:
Energy, Environment, and Utilities

O*NET-SOC CODE:
17-3023.01

CBEDS Title:
Introduction to Electronics Technology

CBEDS No.:
5551

79-35-80

Mobile Electronics Technician / 1

Credits: 15 **Hours:** 180

Course Description:
This competency-based course provides instruction and experience in hands-on installation methods for mobile electronics. Instruction includes information on basic electronics principles, test equipment, and basic automobile mechanics, and the principles, operation, and installation of vehicle audio systems. It also reviews career opportunities and employment skills necessary in the mobile electronics trade. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

Prerequisites:
Enrollment requires a 7.0 reading level as measured by the TABE D 9/10 test and math skills equivalent to Math 1 (53-03-75) course.

NOTE: For Perkins purposes this course has been designated as an **introductory** course.

This course cannot be repeated once a student receives a Certificate of Completion.

Los Angeles Unified School District
Division of Adult and Career Education
Instructional and Couseling Services Unit
Adult Curriculum Office
www.wearedace.org

COURSE OUTLINE COMPETENCY-BASED COMPONENTS

A course outline reflects the essential intent and content of the course described. Acceptable course outlines have six components. (Education Code Section 52506). Course outlines for all apportionment classes, including those in jails, state hospitals, and convalescent hospitals, contain the six required elements:

(EC 52504; 5CCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

COURSE OUTLINE COMPONENTS	**LOCATION**
GOALS AND PURPOSES	Cover

The educational goals or purposes of every course are clearly stated and the class periods are devoted to instruction. The course should be broad enough in scope and should have sufficient educational worth to justify the expenditure of public funds.

The goals and purpose of a course are stated in the COURSE DESCRIPTION. Course descriptions state the major emphasis and content of a course, and are written to be understandable by a prospective student.

PERFORMANCE OBJECTIVES OR COMPETENCIES	pp. 7-11

Objectives should be delineated and described in terms of measurable results for the student and include the possible ways in which the objectives contribute to the student's acquisition of skills and competencies.

Performance Objectives are sequentially listed in the COMPETENCY-BASED COMPONENTS section of the course outline. Competency Areas are units of instruction based on related competencies. Competency Statements are competency area goals that together define the framework and purpose of a course. Competencies fall on a continuum between goals and performance objectives and denote the outcome of instruction.

Competency-based instruction tells a student before instruction what skills or knowledge they will demonstrate after instruction. Competency-based education provides instruction which enables each student to attain individual goals as measured against pre-stated standards.

Competency-based instruction provides immediate and continual repetition and In competency-based education the curriculum, instruction, and assessment share common characteristics based on clearly stated competencies. Curriculum, instruction and assessment in competency-based education are: explicit, known, agreed upon, integrated, performance oriented, and adaptive.

COURSE OUTLINE COMPETENCY-BASED COMPONENTS (continued)

COURSE OUTLINE COMPONENTS	LOCATION
INSTRUCTIONAL STRATEGIES	p. 13
Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom. Instructional strategies for this course are listed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructional strategies and activities for a course should be selected so that the overall teaching approach takes into account the instructional standards of a particular program, i.e., English as a Second Language, Programs for Adults with Disabilities.	
UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT	Cover
The approximate time devoted to each instructional unit within the course, as well as the total hours for the course, is indicated. The time in class is consistent with the needs of the student, and the length of the class should be that it ensures the student will learn at an optimum level. Units of study, with approximate hours allotted for each unit are listed in the COMPETENCY AREA STATEMENT(S) of the course outline. The total hours of the course, including work-based learning hours (community classroom and cooperative vocational education) is listed on the cover of every CBE course outline. Each Competency Area listed within a CBE outline is assigned hours of instruction per unit.	pp. 7-11
EVALUATION PROCEDURES	p. 13
The evaluation describes measurable evaluation criteria clearly within the reach of the student. The evaluation indicates anticipated improvement in performances as well as anticipated skills and competencies to be achieved. Evaluation procedures are detailed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructors monitor students' progress on a continuing basis, assessing students on attainment of objectives identified in the course outline through a variety of formal and informal tests (applied performance procedures, observations, and simulations), paper and pencil exams, and standardized tests.	
REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT	Cover
After a student has completed all the objectives of the course, he or she should not be allowed to reenroll in the course. There is, therefore, a need for a statement about the conditions for possible repetition of a course to prevent perpetuation of students in a particular program for an indefinite period of time.	

ACKNOWLEDGMENTS

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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 Energy, Environment, and Utilities academic alignment matrix for identification of standards.

2.0 Communications
Acquire, and accurately use Energy, Environment, and Utilities sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

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.

4.0 Technology
Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Energy, Environment, and Utilities sector workplace environment.

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 Energy, Environment, and Utilities sector using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques.

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 Energy, Environment, and Utilities sector workplace environment.

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 Energy, Environment, and Utilities sector workplace environment and community settings.

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.

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 as practiced in the SkillsUSA career technical student organization.

10.0 Technical Knowledge and Skills
Apply essential technical knowledge and skills common to all pathways in the Energy, Environment, and Utilities sector.

11.0 Demonstration and Application
Demonstrate and apply the knowledge and skills contained in the Energy, Environment, and Utilities anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization.

C. Telecommunications Pathway

The Telecommunications pathway prepares students for employment and postsecondary education and training in the wireless and fixed-line communications industries. The sharing of information is essential for personal, commercial, educational, government, and military functions. Information is stored, sent, and accessed primarily via the telecommunications industries.

Sample occupations associated with this pathway:

- Cable/Telecommunications Installation and Maintenance Technicians
- Line Workers
- Network Operators, Technicians, Designers, and Managers
- Network Security Administrator
- Satellite Systems Installation/Engineers

C1.0 Understand the basic principles and concepts that impact the telecommunications industry, including systems, concepts, and regulations.

C2.0 Demonstrate understanding and use of the basic and emerging technologies that impact the telecommunications industry.

C3.0 Examine the role and functions of satellites in telecommunications.

C4.0 Research the components, interaction, and operations of wireless telecommunications systems.

C5.0 Research the components, interaction, and operations of fixed-wire telecommunications systems.

C6.0 Consider privacy and security issues of the telecommunications systems.

CBE
Competency-Based Education

COMPETENCY-BASED COMPONENTS
for the Mobile Electronics Technician/1 Course

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
A. ORIENTATION Understand the philosophy and purpose of the class. (2 hours)	1. Describe class procedures. 2. Describe class policies.	**Career Ready Practice:** 1 **CTE Anchor:** Communications: 2.1, 2.2, 2.3 Career Planning and Management: 3.1, 3.2, 3.4, 3.6 **CTE Pathway:** C1.1
B. SAFETY Comprehend safety test and procedures. (10 hours)	1. Describe safety and first aid procedures. 2. Pass designated safety test with 100% accuracy. 3. Demonstrate proper safety techniques for power tools. 4. Demonstrate proper safety techniques for hand tools. 5. Demonstrate proper safety techniques for equipment. 6. Demonstrate care in handling of vehicles. 7. Explain the danger of wet cell batteries. 8. Demonstrate procedures for working in an engine compartment.	**Career Ready Practice:** 1, 3, 6, 12 **CTE Anchor:** Communications: 2.1, 2.2, 2.3 Health and Safety: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16 Ethics and Legal Responsibilities: 8.2 Technical Knowledge and Skills: 10.1, 10.2 **CTE Pathway:** C1.1

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
C. TOOLS Demonstrate the proper use of tools. (10 hours)	1. Identify various hand tools. 2. Identify various power tools. 3. Describe use of hand tools. 4. Describe use of power tools. 5. Describe student's responsibility for tools.	**Career Ready Practice:** 1 **CTE Anchor:** Communications; 2.1, 2.2, 2.3 Health and Safety: 6.3, 6.15, 6.16 Technical Knowledge and Skills: 10.1 **CTE Pathway:** C5.7
D. ELECTRONICS PRINCIPLES Understand the principles of basic electronics. (55 hours)	1. Define Ohm's Law. 2. Calculate Ohm's Law equations. 3. Describe series circuit. 4. Describe parallel circuit. 5. Describe series/parallel circuit. 6. Identify electronic components and symbols. 7. Describe the use function of resistors, capacitors, and inductors. 8. Demonstrate the use of schematics. 9. Describe direct current (DC). 10. Describe alternating current (AC). 11. Describe various applications for alternating current. 12. Describe various applications for direct current. 13. Identify power supplies. 14. Analyze problems in basic electronics.	**Career Ready Practice:** 1, 3 **CTE Anchor:** Communication: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.1 Technical Knowledge and Skills: 10.1 **CTE Pathway:** C1.1, C5.6
E. TEST EQUIPMENT Demonstrate the ability to use test equipment.	1. Determine the proper test equipment for specific jobs. 2. Identify a multimeter's function and range of use. 3. Measure unknown voltages with a multimeter. 4. Measure resistance with a multimeter. 5. Measure current with a multimeter. 6. Demonstrate proper data recording. 7. Demonstrate the ability to use an oscilloscope appropriately. 8. Demonstrate the ability to use a signal generator appropriately. 9. Demonstrate proper use of battery load tester. 10. Diagnose and solve problems, such as open circuit, short circuit, resistance in circuit, ground loops, and improper voltages.	**Career Ready Practice:** 1, 3, 5 **CTE Anchor:** Communications: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.1, 5.2, 5.4 Health and Safety: 6.6, 6.8, 6.14, 6.15, 6.16

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(20 hours)		Technical Knowledge and Skills: 10.5 **CTE Pathway:** C1.1, C5.5, C5.6, C5.7, C6.3
F. BASIC AUTO MECHANICS Comprehend basic auto mechanics as it relates to installation and repair. (30 hours)	1. Describe basic auto mechanics as it relates to installation and repair. 2. Modify mechanical components for audio and security applications. 3. Design special plans for installation. 4. Describe safety procedures. 5. Complete check-out sheet when checking in an automobile. 6. Locate proper installation locations for equipment. 7. Demonstrate use of various types of equipment. 8. Perform correct procedures for re-installation. 9. Install a component. 10. Check for proper installation of component. 11. Use check-out sheet for review and identify damage.	**Career Ready Practice:** 1, 3 **CTE Anchor:** Communications: 2.1, 2.2, 2.3, 2.4 Health and Safety: 6.6, 6.8, 6.14, 6.15, 6.16 Technical Knowledge and Skills: 10.1 **CTE Pathway:** C1.1, C5.6
G. CAR AUDIO AND VIDEO Understand the principles of car audio use and installation.	1. Describe the theory of car audio and video systems. 2. Describe the terminology of car audio and video systems. 3. Describe the principles of amplitude modulation (AM). 4. Describe the principles of frequency modulation (FM). 5. Know how to design audio and video systems. 6. Describe vehicle tear-down and reassembly. 7. Determine location of equipment. 8. Determine the dimensions of components. 9. Determine the proper application of components. 10. Install various audio and video components. 11. Describe engine interference. 12. Describe correct use of noise suppression devices. 13. Describe audio amplifiers and equalizers. 14. Evaluate different types of audio amplifiers and equalizers. 15. Determine proper car audio components for installation. 16. Describe car audio specifications.	**Career Ready Practice:** 1, 3, 10 **CTE Anchor:** Communications: 2.1, 2.2, 2.3, 2.4 Technology: 4.1 Problem Solving and Critical Thinking: 5.1 Health and Safety: 6.6, 6.11, 6.16 Ethics and Legal Responsibilities: 8.1

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(40 hours)		Technical Knowledge and Skills: 10.1 **CTE Pathway:** C5.6
H. ANTENNAS Understand the principle and application of antennas. (10 hours)	1. Describe various types of mobile antennas. 2. Differentiate among various types of mobile antennas. 3. Describe the application of citizen band (CB), cellular, short-wave, and car audio antennas. 4. Describe antennas installations. 5. Determine proper antenna locations. 6. Install an antenna. 7. Describe how to calibrate special application antennas.	**Career Ready Practice:** 1, 3, 10 **CTE Anchor:** Communications: 2.1, 2.2, 2.3 Technology: 4.1 Problem Solving and Critical Thinking: 5.1, 5.4 Health and Safety: 6.6, 6.13, 6.16 Responsibility and Flexibility: 7.4, 7.5 Ethics and Legal Responsibilities: 8.1 Technical Knowledge and Skills: 10.1, 10.2 **CTE Pathway:** C1.1, C3.9, C4.5, C5.6, C7.2, C7.3
I. EMPLOYABILITY SKILLS Understand, apply, and evaluate the employability skills required in mobile electronics work.	1. Describe employment requirements. 2. Apply learned skills when seeking employment. 3. Design a résumé. 4. Explain job specifics. 5. Describe qualifications. 6. Formulate a plan for seeking employment. 7. Identify potential employers. 8. Describe customer service as a method of building permanent relationships between the organization and the customer.	**Career Ready Practice:** 1, 2, 3, 7, 8 **CTE Anchor:** Communications: 2.1, 2.2, 2.3, 2.4, 2.5 Career Planning and Management: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(3 hours)		Technology: 4.4 Responsibility and Flexibility: 7.2, 7.4, 7.5, 7.6, 7.7 Ethics and Legal Responsibilities: 8.4 Leadership and Teamwork: 9.2, 9.4, 9.6 Technical Knowledge and Skills: 10.1 Demonstration and Application: 11.1, 11.2, 11.5 **CTE Pathway:** C1.1, C7.1, C7.2, C7.3, C7.4

SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES

TEXTS AND SUPPLEMENTAL BOOKS

Agrawal Dharma P. and Qing-An Zeng. Introduction to Wireless and Mobile Systems. CL Engineering, 2010.

Fujimoto, Kyohei and J.R. James. Mobile Antenna Systems Handbook. Artech House, 2008.

Goldsmith, Andrea. Wireless Communications. Cambridge University Press, 2005.

Grob, Bernard and Mitchell E. Schultz. Basic Electronics, 5th Edition. McGraw-Hill Companies, 2002.

Herrick, Clyde. Basic Electronics Math. Elsevier Science, 2007.

Nicopolitidis, P. A.S. Pomportsis and M.S. Obaidat. Wireless Networks. Wiley, John and Sons, Incorporated, 2002.

Schuler, Charles A. Electronics: Principles and Applications, 6th Edition. McGraw-Hill and Companies, 2002.

Schwartz, Mischa. Mobile Wireless Communications. Cambridge University press, 2004.

Slone, G. Randy. Understanding Electricity and Electronics, 2nd Edition. McGraw-Hill and Companies, 2002.

RESOURCES

Employer Advisory Board members

CTE Model Curriculum Standards
http://www.cde.ca.gov/ci/ct/sf/documents/energyutilities.pdf

Mobile Electronics Certified Professional (MECP) Program, 1919 S. Eads St., Arlington, VA 22202
866-858-1555
www.mecp.com

International Society of Certified Electronics Technicians, 3608 Pershing Ave., Forth Worth, TX, 76107-4527, 800-946-0201
www.iscet.org

Electronics Technicians Association International, 5 Depot Street, Greencastle, IN 46135, 800-288-3824
www.eta-i.org

COMPETENCY CHECKLIST

TEACHING STRATEGIES and EVALUATION

METHODS AND PROCEDURES

A. Lecture and discussion

B. Multimedia presentations

C. Demonstrations and participation

D. Individualized instruction

E. Peer teaching

F. Role-playing

G. Guest speakers

H. Field trips and field study experiences

I. Projects

EVALUATION

SECTION A – Orientation – Pass all assignments and exams on orientation with a minimum score of 80% or higher.

SECTION B – Safety –Pass the safety test with 100% accuracy.

SECTION C – Tools – Pass all assignments and exams on tools with a minimum score of 80% or higher.

SECTION D – Electronics Principles – Pass all assignments and exams on electronics principles with a minimum score of 80% or higher.

SECTION E – Test Equipment – Pass all assignments and exams on test equipment with a minimum score of 80% or higher.

SECTION F – Basic Auto Mechanics – Pass all assignments and exams on basic auto mechanics with a minimum score of 80% or higher.

SECTION G – Car Audio – Pass all assignments and exams on car audio with a minimum score of 80% or higher.

SECTION H – Antennas – Pass all assignments and exams on antennas with a minimum score of 80% or higher.

SECTION I – Employability Skills – Pass all assignments and exams on employability skills with a minimum score of 80% or higher.

Statement for Civil Rights

All educational and vocational opportunities are offered without regard to race, color, national origin, gender, or physical disability.