

Title 7: Education K-12

Part 84: Trades Industrial, Secondary

MISSISSIPPI
CURRICULUM FRAMEWORK
FOR
BASIC ELECTRONICS

(Program CIP: 47.0101 – Electrical/Electronics Equipment Installation)

SECONDARY

2004

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Published by the:

Office of Vocational and Technical
Education
Mississippi Department of Education
Jackson, Mississippi

Research and Curriculum Unit
for Workforce Development
Vocational and Technical Education
Mississippi State University
Mississippi State, Mississippi

2004

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FOREWORD

The courses in this document reflect the following statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended:

§ 37-3-49. Adoption by school district of instructional program and management system; paperwork reduction.

(1) The State Department of Education shall provide an instructional program and establish guidelines and procedures for managing such program in the public schools as part of the State Program of Educational Accountability and Assessment of Performance as prescribed in Section 37-3-46. Public school districts may (a) elect to adopt the instructional program and management system provided by the State Department of Education, or (b) elect to adopt an instructional program and management system which meets or exceeds criteria established by the State Department of Education for such. This provision shall begin with the courses taught in Grades K-8 which contain skills tested through the Mississippi Basic Skills Assessment Program and shall proceed through all secondary school courses mandated for graduation and all secondary school courses in the Mississippi end-of-course testing program. Other state core objectives must be included in the district's instructional program as they are provided by the State Department of Education along with instructional practices, resources, evaluation items and management procedures. Districts are encouraged to adapt this program and accompanying procedures to all other instructional areas. The department shall provide that such program and guidelines, or a program and guidelines developed by a local school district which incorporates the core objectives from the curriculum structure are enforced through the performance-based accreditation system. It is the intent of the Legislature that every effort be made to protect the instructional time in the classroom and reduce the amount of paperwork which must be completed by teachers. The State Department of Education shall take steps to insure that school districts properly use staff development time to work on the districts' instructional management plans.

(2) The State Department of Education shall provide such instructional program and management guidelines which shall require for every public school district that:

(a) All courses taught in Grades K-8 which contain skills which are tested through the Mississippi Basic Skills Assessment Program, all secondary school courses mandated for graduation, and all courses in the end-of-course testing program shall include the State Department of Education's written list of learning objectives.

(b) The local school board must adopt the objectives that will form the core curriculum which will be systematically delivered throughout the district.

(c) The set of objectives provided by the State Department of Education must be accompanied by suggested instructional practices and resources that would help teachers organize instruction so as to promote student learning of the objectives. Objectives added by the school district must also be accompanied by suggested instructional practices and resources that would help teachers organize instruction. The instructional practices and resources that are identified are to be used as suggestions and not as requirements that teachers must follow. The goal of the program is to have students to achieve the desired objective and not to limit teachers in the way they teach.

(d) Standards for student performance must be established for each core objective in the local program and those standards establish the district's definition of mastery for each objective.

(e) There shall be an annual review of student performance in the instructional program against locally established standards. When weaknesses exist in the local instructional program, the district shall take action to improve student performance.

(3) The State Board of Education and the board of trustees of each school district shall adopt policies to limit and reduce the number and length of written reports that classroom teachers are required to prepare.

(4) This section shall not be construed to limit teachers from using their own professional skills to help students master instructional objectives, nor shall it be construed as a call for more detailed or complex lesson plans or any increase in testing at the local school district level.

(5) In the event any school district meets Level 4 or 5 accreditation requirements, the State Board of Education may, in its discretion, exempt such school district from the provisions of this section.

SOURCES: Laws, 1988, ch.487, §14; Laws, 1991, ch.423, §1; Laws, 1992, ch.519, §4 eff. from and after July 1, 1992.

Each secondary vocational-technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Suggested Objectives
 - A **Competency** represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies.
 - The Suggested Objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.
- Suggested Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each suggested objective. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Suggested Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include classroom discussions, laboratory exercises, and student assignments. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.
- Integrated Academic Topics, Workplace Skills, and Occupational Standards - This section identifies related academic topics in mathematics, science, and communications which are integrated into the content of the unit. It also identifies the general workplace skills as identified in the Secretary's Commission on Achieving Necessary Skills (SCANS) report as being critical for all workers in the 21st Century. Finally where applicable, occupational skills standards associated with the competencies and suggested objectives for the unit are also identified.

- Suggested References - This section indicates some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

The following guidelines were used in developing the curriculum framework in this document and should be considered in developing local instructional management plans and daily lesson plans:

- The content of the courses in this document reflects approximately 75-80 percent of the time allocated to each course. The remaining 20-25 percent of each course should be developed at the local district level and may reflect:
 - Additional units of instruction within the course related to topics not found in the state framework.
 - Activities which develop a higher level of mastery on the existing competencies and suggested objectives.
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed/ revised.
 - Activities which implement components of the Mississippi Tech Prep initiative, including integration of academic and vocational-technical skills and coursework, school-to-work transition activities, and articulation of secondary and postsecondary vocational-technical programs.
 - Individualized learning activities to better prepare individuals in the courses for their chosen occupational area.
- Sequencing of the units of instruction within a course is left to the discretion of the local district. Naturally, foundation units related to topics such as safety, tool and equipment usage, and other basic skills should be taught first. Other units related to specific skill areas in the course, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.

ACKNOWLEDGMENTS

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PROGRAM DESCRIPTION

BASIC ELECTRONICS

(Program CIP: 47.0101 – Electrical/Electronics Equipment Installation)

Basic Electronics is an instructional program which prepares secondary students to enter electronics occupations. Students in Basic Electronics I complete a common core program of study including safety, leadership and personal development, basic alternating and direct current (AC/DC) theory, and introduction to soldering. Students in Basic Electronics II continue study in safety, leadership and personal development, solid state electronics, advanced soldering, digital electronics, advanced alternating circuits and employability skills. Upon completion of study, graduates may elect to continue their education or become employed in the electronics industry.

This curriculum was developed with the use of the competencies and objectives as prepared by the Electronics Technicians Association, International (2003), as recommended by the National Coalition for Electronics Education and ETA's Associate C. E. T. Exam Development Committee.

COURSE OUTLINE

BASIC ELECTRONICS I

<u>Unit #</u>	<u>Unit Title</u>	<u>No. of Hours</u>
Unit 1	Orientation/Leadership and Personal Development	7.5
Unit 2	Safety	15.0
Unit 3	Direct Current (DC) Circuits	90.0
Unit 4	Basic Alternating Current (AC) Circuits	75.0
Unit 5	Introduction to Soldering	15.0

BASIC ELECTRONICS II

<u>Unit #</u>	<u>Unit Title</u>	<u>No. of Hours</u>
Unit 1	Safety/Orientation (Review)	7.5
Unit 2	Advanced Alternating Current (AC) Circuits	30.0
Unit 3	Solid State Electronics	75.0
Unit 4	Advanced Soldering	15.0
Unit 5	Digital Electronics	67.5
Unit 6	Employability Skills	7.5

SECTION I:
CURRICULUM GUIDE
FOR
BASIC ELECTRONICS

BASIC ELECTRONICS I

BASIC ELECTRONICS I

UNIT 1: ORIENTATION/LEADERSHIP AND PERSONAL DEVELOPMENT (7.5 hours)

Competencies and Suggested Objectives:

1. Describe program and vocational center policies and procedures.
 - a. Describe local program policies and procedures.
 - b. Define the vocational center policies and procedures.
2. Describe employment opportunities and responsibilities.
 - a. Describe employment opportunities available in the electronics field.
 - b. Describe basic employee responsibilities.
3. Develop leadership in SkillsUSA.
 - a. State procedures of leadership.
 - b. Describe the leadership purposes of SkillsUSA.
4. Identify personal traits and characteristics.
 - a. Identify desirable personality traits.
 - b. Identify desirable characteristics of the personal work ethic.

Suggested Teaching Strategies:

1. Describe program and vocational center policies and procedures.
 - a. Discuss applicable program rules and regulations.
 - b. Discuss applicable center rules and regulations.
2. Describe employment opportunities and responsibilities.
 - a. Have students survey job opportunities through employer visits, resource person(s), telephone calls, help wanted ads, Career Center visit, Internet research or a field trip; report findings to the class.
 - b. Have resource person speak to students regarding requirements for punctuality, physical requirements, customer relations, following directions, job safety, and entry level skills.
3. Develop leadership in SkillsUSA.
 - a. Allow students to attend a formal meeting to observe "Robert's Rules of Order" in operation. Give a hand-out on procedures for "Robert's Rules of Order." Encourage a classroom discussion concerning "Robert's Rules of Order."
 - b. Discuss leadership opportunities for students.
4. Identify personal traits and characteristics.
 - a. Conduct a class discussion involving desirable personality traits.
 - b. Discuss work ethics.

Suggested Assessment Strategies:

1. Describe program and vocational center policies and procedures
 - a. Test on applicable rules and regulations
 - b. Test on applicable rules and regulations
2. Describe employment opportunities and responsibilities.

- a. Oral/written report or quiz on employment opportunities.
- b. Oral/written report or quiz on employee responsibilities.
3. Develop leadership in SkillsUSA.
 - a. Teacher observation and student participation.
 - b. Teacher observation and student participation.
4. Identify personal traits and characteristics.
 - a. Have students role play desirable personality traits.
 - b. Oral and/or written report.

Standards

Related Academic Standards

- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T2 Social, ethical, and human issues.
- T3 Technology productivity tools.
- T5 Technology research tools.

Industry Standards

EET8 Safety Precautions

Suggested References

Choices [Computer software]. (2004). Oroville, WA: Bridges.com Co.

Developing safety skills for shop or home. (2002). Winterville, GA: American Association for Vocational Instructional Materials & Tuscaloosa, AL: Resource Center for Technology.

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Grob, B., & Schultz, M. E. (2003). *Basic electronics*. New York: Glencoe/McGraw-Hill.

High School Career Centers.

Local School District Handbook.

SkillsUSA-VICA. (2001). *Student Handbook*. Washington, DC: Vocational Industrial Clubs of America (VICA).

Additional Resources:

Community resource professionals.

What do employers expect from me? (Poster). Available from Tech Prep Office, Mississippi Department of Education.

BASIC ELECTRONICS I
UNIT 2: SAFETY

(15.0 hours)

Competencies and Suggested Objectives:

1. Apply personal and general safety rules.
 - a. Describe personal safety rules for working in a shop/lab and industry.
 - b. Describe general workplace safety rules.
 - c. Describe the proper use of fire extinguishers and classes of fires.
 - d. Identify standard industry Safety Color Codes.
 - e. Describe procedures for safely handling heavy objects.
 - f. Describe safety practices for using climbing devices.
 - g. Describe the Occupational Safety and Health Act (OSHA).
2. Apply electrical safety practices.
 - a. Describe factors to consider in storing and/or disposing of hazardous materials.
 - b. Identify hazardous materials.
 - c. Interpret a Materials Safety Data Sheet (MSDS).
 - d. Describe basic electrical safety practices.
 - e. Describe hazards of electrical shock.
 - f. Describe accident procedures.
 - g. Describe basic electric circuit safety methods.
 - h. Describe the operation of current overload devices.

Suggested Teaching Strategies:

1. Apply personal and general safety rules.
 - a. Have students review safety handout.
 - b. Tour shop and lab and identify potential safety hazards.
 - c. Demonstrate and/or explain uses of fire extinguishers and fire control methods for classes of fires A, B, C, and D.
 - d. Conduct tours of local industry or other local center programs to observe safety color coding procedures.
 - e. Have students perform and/or observe safe lifting techniques.
 - f. Using visual aids, show safety practices for using climbing devices.
 - g. Discuss OSHA and its effect on the workplace.
2. Apply electrical safety practices.
 - a. Discuss factors to consider in storing and disposing of hazardous materials.
 - b. Discuss hazardous materials that may be found on the job site.
 - c. Provide students with Material Safety Data sheets to identify hazardous materials that may be found on the job.
 - d. Discuss basic electrical safety practices, including removal of jewelry and metal objects from the body.
 - e. Utilize media presentations to describe hazards of electrical shock and treatment procedures.

- f. Review procedures to use in case of an accident.
- g. Display examples of proper safety grounding methods.
- h. Discuss the operation of current overload devices.

Suggested Assessment Strategies:

- 1. Apply personal and general safety rules.
 - a. Test.
 - b. Test.
 - c. Test.
 - d. Test.
 - e. Test.
 - f. Test.
 - g. Test.

Note: Safety tests shall be 100 percent.
- 2. Apply electrical safety practices.
 - a. Test.
 - b. Test.
 - c. Test.
 - d. Test.
 - e. Test.
 - f. Test.
 - g. Test.
 - h. Test.

Note: Safety tests shall be 100 percent.

Standards

Related Academic Standards

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

Workplace Skills

- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T2 Social, ethical, and human issues.
- T3 Technology productivity tools.

Industry Standards

EET8 Safety Precautions

Suggested References

Developing safety skills for shop or home. (2002). Winterville, GA: American Association for Vocational Instructional Materials & Tuscaloosa, AL: Resource Center for Technology.

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Grob, B., & Schultz, M. E. (2003). *Basic electronics*. New York: Glencoe/McGraw-Hill.

Local School District Handbook.

Additional Resources:

Community resource professionals.

What do employers expect from me? (Poster). Available from Tech Prep Office, Mississippi Department of Education.

BASIC ELECTRONICS I
UNIT 3: DIRECT CURRENT (DC) CIRCUITS**(90.0 hours)****Competencies and Suggested Objectives:**

1. Describe terms and scientific principles of DC circuits.
 - a. Define terms associated with the nature of matter.
 - b. Describe laws of electrical charges.
 - c. Identify electrical materials.
 - d. Describe methods of generating electricity.
 - e. Describe the principles and operation of batteries.
 - f. Describe basic theories of current flow.
 - g. Describe DC circuit parameters.
 - h. Identify resistor types and values using standard resistor color codes and alphanumeric codes.
 - i. Perform basic engineering notation calculations.
 - j. Identify DC circuit schematic symbols.
2. Create, measure, analyze, evaluate, and troubleshoot circuits and DC electricity.
 - a. Describe and demonstrate use of a multimeter.
 - b. Demonstrate use of Ohm's Law to calculate circuit parameters for a series circuit.
 - c. Draw and construct a series circuit with a minimum of three resistances.
 - d. Calculate and measure all circuit parameters for a series circuit.
 - e. Demonstrate use of Ohm's Law to calculate circuit parameters for a parallel circuit.
 - f. Draw and construct a parallel circuit with a minimum of three resistances.
 - g. Calculate and measure all circuit parameters for a parallel circuit.
 - h. Demonstrate use of Ohm's Law to calculate circuit parameters for a series-parallel circuit.
 - i. Draw and construct a series-parallel circuit with a minimum of three resistances.
 - j. Calculate and measure all circuit parameters for a series-parallel circuit.
 - k. State and apply Kirchhoff's laws in analysis of circuits.
3. Describe the principles of magnetism and electromagnetic properties, and inductors.
 - a. Describe the principles of magnetism.
 - b. Describe the principles of electromagnetic properties.
 - c. Construct a simple electromagnet.
 - d. Define inductance and the terms relating to inductance.
 - e. Sketch the symbols for inductors, and identify the unit of measurements for inductance.
 - f. List the factors that determine the value of an inductor, and state whether the factors have a direct or inverse effect on the value.
 - g. Calculate total inductance in series and parallel.

- h. Explain the Henry in terms of induced voltage and the rate of change of current with respect to time.
 - i. Calculate the time constant for an RL circuit.
 - j. Fabricate and demonstrate the operation of an RL circuit.
4. Apply network theorems to the analysis of complex circuits.
- a. Perform voltage source to current source conversions and current source to voltage source conversions.
 - b. In circuits containing multiple resistors and sources, use the superposition theorem to solve for unknown voltages and currents.
 - c. Through analysis, construction, and testing of an actual circuit, prove the validity of the superposition theorem.
 - d. Reduce series–parallel resistive circuits to their Thevenin’s equivalent.
 - e. Measure the Thevenin’s voltage and resistance of a DC circuit.
 - f. Reduce series–parallel resistive circuits to their Norton equivalent.
 - g. Measure the Norton current and Norton resistance of a series circuit.
 - h. Perform conversions between Thevenin’s and Norton equivalent circuit.
 - i. Explain the conditions under which maximum power occurs.
 - j. Construct a circuit, and prove the maximum power transfer theorem.
5. Explain capacitance, and demonstrate its application in DC and transient circuits.
- a. Explain capacitance and terms related to capacitance.
 - b. Explain the construction of a capacitor and its relationship to capacitance value.
 - c. Draw the symbols for capacitance, and identify the unit of measurement for capacitance.
 - d. Explain how the capacitor is charged and discharged.
 - e. Identify various types of capacitors.
 - f. Explain specifications of connections including values and voltage ratings.
 - g. Calculate the total capacitance of capacitors in series and in parallel.
 - h. Define and compute RC time constant.
 - i. Measure capacitance in series and in parallel.
 - j. Construct a circuit, and using an oscilloscope, display and measure the charge and discharge waveforms in a series RC circuit.
 - k. Explain and demonstrate techniques for troubleshooting capacitors.

Suggested Teaching Strategies:

- 1. Describe terms and scientific principles of DC circuits.
 - a. Give students related handouts; review video on atom; discuss and demonstrate Bohr's Model of the Atom.
 - b. Discuss fundamental laws of electrical charges.
 - c. Give related handouts to students; pass out examples of conductors, insulators, and semiconductors; and introduce the atomic structure of each of the examples.
 - d. Have students research the different methods used to generate electricity.
 - e. Display different battery types and discuss differences.

- f. Discuss basic theories of current flow.
 - g. Discuss current, resistance, and power and explain their relationship to each other. Students will observe actual models of circuits.
 - h. Students will view a selection of resistors and discuss the resistor color code and alphanumeric code.
 - i. Students will complete worksheets on scientific notation and engineering notation.
 - j. Discuss DC circuit schematic symbols and complete worksheet.
2. Create circuits and measure DC electricity.
- a. Pass out operator's manual for related multimeter; discuss and demonstrate procedures; students will participate in related lab activities.
 - b. Using handouts and/or software, have students calculate circuit parameters from example series circuits.
 - c. Observe sample circuit diagrams; given circuit values, students will complete worksheet of assigned drawings; perform lab activity to build a three resistor series circuit.
 - d. Observe sample calculations; complete worksheets/software exercises to calculate parameters; measure series circuit parameters with multimeter.
 - e. Using handouts and/or software, have students calculate circuit parameters from example parallel circuits.
 - f. Observe sample circuit diagrams; given circuit values, students will complete worksheet of assigned drawings; perform lab activity to build a three resistor parallel circuit.
 - g. Observe sample calculations; complete worksheets/software exercises to calculate parameters; measure parallel circuit parameters with multimeter.
 - h. Using handouts and/or software, have students calculate circuit parameters from example series-parallel circuits.
 - i. Observe sample circuit diagrams; given circuit values, students will complete worksheet of assigned drawings; perform lab activity to build a three resistor series-parallel circuit
 - j. Observe sample calculations; complete worksheets/software exercises to calculate parameters; measure series-parallel circuit parameters with multimeter.
3. Describe the principles of magnetism and electromagnetic properties.
- a. Discuss and/or view video series on magnetism and discuss observations.
 - b. Discuss and/or view video series on electromagnetism and discuss observations.
 - c. Pass out materials and allow students to construct an electromagnet.

Suggested Assessment Strategies:

1. Describe terms and scientific principles of DC circuits.
 - a. Written test.
 - b. Oral/written test.
 - c. Oral/written test.
 - d. Oral/written report.
 - e. Oral/written test.
 - f. Oral/written test.
 - g. Oral/written test.
 - h. Teacher observation and checklist, using a rubric.
 - i. Written test.
 - j. Teacher observation and grade on worksheet.
2. Create circuits and measure DC electricity.
 - a. Observation of proper techniques.
 - b. Completion of student worksheet.
 - c. Observation and completed lab sheet.
 - d. Observation and completed lab sheet.
 - e. Completion of student worksheet with parallel circuit.
 - f. Observation and completed lab sheet with parallel circuit.
 - g. Observation and completed lab sheet with parallel circuit.
 - h. Observation and completed worksheet with series-parallel circuit.
 - i. Observation and completed lab sheet with series-parallel circuit.
 - j. Observation and completed lab sheet with series-parallel circuit.
3. Describe the principles of magnetism and electromagnetic properties.
 - a. Oral/written test.
 - b. Oral/written test.
 - c. Observation and lab sheet.

Standards

Related Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities, and systems in one and two variables.
- A4 Explore and communicate the characteristics and operations of polynomials.
- A5 Utilize various formulas in problem-solving situations.
- A6 Communicate using the language of algebra.
- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T2 Social, ethical, and human issues
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Industry Standards

- EET1 Electrical Theory
- EET2 Electronic Components
- EET4 Block Diagrams-Schematics-Wiring Diagrams
- EET7 Test Equipment & Measurements
- EET9 Mathematics and Formulas

EET11 Electronic Circuits: Series and Parallel

Suggested References

Buban, P., Schmitt, M. L., & Carter, C. G., Jr. (1999). *Electricity and electronics technology*. Peoria, IL: Glencoe/McGraw-Hill.

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

General electronics technician: Semiconductor devices and circuits. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Grob, B., & Schultz, M. E. (2003). *Basic electronics*. New York: Glencoe/McGraw-Hill.

Herman, S. L. (2004). *Delmar's textbook of electricity*. Albany, NY: Delmar Publishers.

Matt, S. R. (1998). *Electricity and basic electronics*. Tinley Park, IL: Goodheart-Willcox.

Meade, R. L. (2003). *Foundations of electronics*. Albany, NY: Delmar Publishers.

Terrell, D. L. (2000). *Fundamentals of electronics: dc/ac circuits*. Albany, NY: Delmar Publishers.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

BASIC ELECTRONICS I

UNIT 4: BASIC ALTERNATING CURRENT (AC) CIRCUITS

(75.0 hours)

Competencies and Suggested Objectives:

1. Describe the terms and scientific principles of AC circuits.
 - a. Describe principles of AC generation.
 - b. Define terms associated with AC voltage.
 - c. Describe sources of AC voltage.
 - d. Describe AC power distribution.
 - e. Describe the properties and characteristics of inductors.
 - f. Describe the properties and characteristics of transformers.
 - g. Describe the properties and characteristics of capacitors.
 - h. Describe differences in phases in electrical power supply.
2. Operate proper equipment to measure AC waveforms.
 - a. Demonstrate the use of an oscilloscope.
 - b. Demonstrate the use of a function generator.
3. Construct and measure basic AC circuits.
 - a. Draw and construct a series resistive circuit, calculating parameters and discussing phase relationship.
 - b. Draw and construct a parallel resistive circuit, calculating parameters and discussing phase relationship.
 - c. Draw and construct a series inductive circuit.
 - d. Draw and construct a parallel inductive circuit.
 - e. Draw and construct a series capacitive circuit.
 - f. Draw and construct a parallel capacitive circuit.
 - g. Measure parameters of basic AC circuits.

Suggested Teaching Strategies:

1. Describe the terms and scientific principles of AC circuits.
 - a. Pass out handouts and view videos on AC generation.
 - b. Pass out handouts and review terms and definitions.
 - c. Have students research AC voltage sources and prepare reports.
 - d. Use student handouts and videos with classroom discussion; observe a power distribution system.
 - e. Use student handouts and videos with classroom discussion.
 - f. Use student handouts and videos with classroom discussion.
 - g. Use student handouts and videos with classroom discussion.
 - h. Use student handouts and visual demonstration.
2. Operate proper equipment to measure AC waveforms.
 - a. Pass out operation manual and block diagram and discuss front panel control and measurement of time, frequency, phase, and amplitude; complete worksheet.

- b. Pass out operation manual and block diagram and discuss front panel controls and output waveform; complete worksheet.
3. Construct and measure basic AC circuits.
 - a. Class discussion, student handouts, student worksheet, and/or computer assignment.
 - b. Class discussion, student handouts, student worksheet, and/or computer assignment.
 - c. Class discussion of series inductive circuits; student worksheet to draw and construct circuit.
 - d. Class discussion of parallel inductive circuits; student worksheet to draw and construct circuit.
 - e. Class discussion of series capacitive circuits and pass out worksheet for student to draw and construct circuit.
 - f. Class discussion of parallel capacitive circuits and pass out worksheet for student to draw and construct circuit.
 - g. Observe use of proper equipment (oscilloscope and function generator) to measure AC circuits; perform lab activities to measure AC circuits.

Suggested Assessment Strategies:

1. Describe the terms and scientific principles of AC circuits.
 - a. Oral/written test.
 - b. Oral/written test.
 - c. Oral/written test.
 - d. Oral/written test.
 - e. Oral/written test.
 - f. Oral/written test.
 - g. Oral/written test.
 - h. Oral/written test.
2. Operate proper equipment to measure AC waveforms.
 - a. Observation and completed lab sheets.
 - b. Observation and completed lab sheets.
3. Construct and measure basic AC circuits.
 - a. Observation and completed lab sheets.
 - b. Observation and completed lab sheets.
 - c. Observation and completed lab sheets.
 - d. Observation and completed lab sheets.
 - e. Observation and completed lab sheets.
 - f. Observation and completed lab sheets.
 - g. Observation and completed lab sheets.

Standards

Related Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A5 Utilize various formulas in problem-solving situations.
- A6 Communicate using the language of algebra.
- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T2 Social, ethical, and human issues
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Industry Standards

- EET1 Electrical Theory
- EET2 Electronic Components
- EET7 Test Equipment & Measurements
- EET9 Mathematics and Formulas
- EET11 Electronic Circuits: Series and Parallel

Suggested References

Buban, P., Schmitt, M. L., & Carter, C. G., Jr. (1999). *Electricity and electronics technology*. Peoria, IL: Glencoe/McGraw-Hill.

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Grob, B., & Schultz, M. E. (2003). *Basic electronics*. New York: Glencoe/McGraw-Hill.

Herman, S. L. (2004). *Delmar's textbook of electricity*. Albany, NY: Delmar Publishers.

Matt, S. R. (1998). *Electricity and basic electronics*. Tinley Park: IL: Goodheart-Willcox.

Meade, R. L. (2003). *Foundations of electronics*. Albany, NY: Delmar Publishers.

Schuler, C. A. (2003). *Electronics-principles and applications*. New York: Glencoe/McGraw-Hill.

Terrell, D. L. (2000). *Fundamentals of electronics: dc/ac circuits*. Albany, NY: Delmar Publishers.

Additional Resources:

Community resource professionals.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

BASIC ELECTRONICS I
UNIT 5: INTRODUCTION TO SOLDERING

(15.0 hours)

Competencies and Suggested Objectives:

1. Identify basic soldering equipment and procedures.
 - a. Match tools and materials with their uses.
 - b. Explain the procedures.
2. Utilize soldering.
 - a. Solder and desolder various components and connectors.
 - b. Protect temperature sensitive components and static sensitive devices (ESD), using protective devices.

Suggested Teaching Strategies:

1. Identify soldering equipment and procedures.
 - a. Video and handout.
 - b. Video, discussion, and demonstration of proper heat sink and static protection devices and technique.
2. Utilize soldering.
 - a. Discussion and demonstration of soldering wires and other objects.
 - b. Discussion and demonstration of how to protect sensitive components.

Suggested Assessment Strategies:

1. Identify soldering equipment and procedures.
 - a. Performance test, using rubric.
 - b. Performance test, using rubric.
2. Utilize soldering.
 - a. Performance test, using rubric.
 - b. Performance test, using rubric.

Standards

Related Academic Standards

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

Industry Standards

- EET3 Soldering-Desoldering and Tools
- EET8 Safety Precautions

Suggested References

Buban, P., Schmitt, M. L., & Carter, C. G., Jr. (1999). *Electricity and electronics technology*. Peoria, IL: Glencoe/McGraw-Hill.

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

May 21, 2004

BASIC ELECTRONICS II

May 21, 2004

BASIC ELECTRONICS II
UNIT 1: SAFETY/ORIENTATION (REVIEW)

(7.5 hours)

Competencies and Suggested Objectives:

1. Review personal and general safety rules.
 - a. Describe personal safety rules for working in a shop/lab and industry.
 - b. Describe general workplace safety rules.
 - c. Describe the proper use of fire extinguishers and classes of fires.
 - d. Identify standard industry Safety Color Codes.
 - e. Describe procedures for safely handling heavy objects.
 - f. Describe safety practices for using climbing devices.
 - g. Describe the Occupational Safety and Health Act (OSHA).
2. Review electrical safety practices.
 - a. Describe factors to consider in storing and/or disposing of hazardous materials.
 - b. Identify hazardous materials.
 - c. Interpret a Materials Safety Data Sheet (MSDS).
 - d. Describe basic electrical safety practices.
 - e. Describe hazards of electrical shock.
 - f. Describe accident procedures.
 - g. Describe basic electric circuit safety methods.
 - h. Describe the operation of current overload devices.
3. Review program and vocational center policies and procedures.
 - a. Describe local program policies and procedures.
 - b. Define the vocational center policies and procedures.
4. Review employment opportunities and responsibilities.
 - a. Describe employment opportunities available in the electronics field.
 - b. Describe basic employee responsibilities.
5. Develop advanced leadership in SkillsUSA.
 - a. State procedures of leadership.
 - b. Describe the leadership purposes of SkillsUSA.
6. Review personal traits and characteristics.
 - a. Identify desirable personality traits.
 - b. Identify desirable characteristics of the personal work ethic.

Suggested Teaching Strategies:

1. Review personal and general safety rules.
 - a. Have students review safety handout.
 - b. Tour shop and lab and identify potential safety hazards.
 - c. Demonstrate and/or explain uses of fire extinguishers and fire control methods for classes of fires A, B, C, and D.
 - d. Conduct industry tour to observe safety color coding procedures.
 - e. Have students perform and/or observe safe lifting techniques.
 - f. Demonstrate safety practices for using climbing devices.
 - g. Discuss OSHA and its effect on the workplace.

2. Review electrical safety practices.
 - a. Discuss factors to consider in storing and disposing of hazardous materials.
 - b. Identify hazardous materials that may be found on the job site.
 - c. Provide students with Material Safety Data to identify hazardous materials that may be found on the job.
 - d. Describe basic electrical safety practices, including removal of jewelry and metal objects from the body.
 - e. Utilize media presentations to describe hazards of electrical shock and treatment procedures.
 - f. Review procedures to use in case of an accident.
 - g. Display examples of proper safety grounding methods.
 - h. Demonstrate the operation of current overload devices.
3. Review program and vocational center policies and procedures.
 - a. Review and discuss applicable program rules and regulations.
 - b. Review and discuss applicable center rules and regulations.
4. Review employment opportunities and responsibilities.
 - a. Have students survey job opportunities through employer visits, resource person(s), telephone calls, help wanted ads, Career Center visit, Internet research or a field trip; report findings to the class.
 - b. Have resource person speak to students regarding requirements for punctuality, physical requirements, customer relations, following directions, job safety, and entry level skills.
5. Develop advanced leadership in SkillsUSA.
 - a. Allow students to attend a formal meeting to observe "Robert's Rules of Order" in operation. Give a hand-out on procedures for "Robert's Rules of Order." Encourage a classroom discussion concerning "Robert's Rules of Order."
 - b. Discuss leadership opportunities for students.
6. Review personal traits and characteristics.
 - a. Conduct a class discussion involving desirable personality traits.
 - b. Discuss work ethics.

Suggested Assessment Strategies:

1. Review personal and general safety rules.
 - a. Oral and/or written exercise.
 - b. Oral and/or written exercise.
 - c. Oral and/or written exercise.
 - d. Oral and/or written exercise.
 - e. Oral and/or written exercise and performance exercise.
 - f. Oral and/or written exercise.
 - g. Oral and/or written exercise.

Note: Safety tests shall be 100 percent.
2. Review electrical safety practices.
 - a. Oral and/or written exercise.
 - b. Oral and/or written exercise.
 - c. Student identification of hazardous materials using the MSDS sheet.
 - d. Observe and monitor safe practices performed by students.

- e. Oral and/or written evaluation.
- f. Oral and/or written evaluation.
- g. Oral and/or written evaluation.
- h. Oral and/or written evaluation.

Note: Safety tests shall be 100 percent

- 3. Review program and vocational center policies and procedures.
 - a. Test on applicable rules and regulations.
 - b. Test on applicable rules and regulations.
- 4. Review employment opportunities and responsibilities.
 - a. Oral/written report or quiz on employment opportunities.
 - b. Oral/written report or quiz on employee responsibilities.
- 5. Develop advanced leadership in SkillsUSA.
 - a. Teacher observation and student participation.
 - b. Teacher observation and student participation.
- 6. Review personal traits and characteristics.
 - a. Have students role play desirable personality traits.
 - b. Oral and/or written report.

Standards

Related Academic Standards

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5 Selects, applies, and maintains/troubleshoots technology.

- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T2 Social, ethical, and human issues
- T3 Technology productivity tools
- T5 Technology research tools

Industry Standards

- EET8 Safety Precautions

Suggested References

Choices [Computer software]. (2004). Oroville, WA: Bridges.com Co.

Developing safety skills for shop or home. (2002). Winterville, GA: American Association for Vocational Instructional Materials & Tuscaloosa, AL: Resource Center for Technology.

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Grob, B., & Schultz, M. E. (2003). *Basic electronics*. New York: Glencoe/McGraw-Hill.

High School Career Centers.

Local School District Handbook.

SkillsUSA-VICA. (2001). *Student Handbook*. Washington, DC: Vocational Industrial Clubs of America (VICA).

Additional Resources:

Community resource professionals.

What do employers expect from me? (Poster). Available from Tech Prep Office, Mississippi Department of Education.

BASIC ELECTRONICS II**UNIT 2: ADVANCED ALTERNATING CURRENT (AC) CIRCUITS****(30.0 hours)****Competencies and Suggested Objectives:**

1. Construct and measure RC circuits.
 - a. Draw and construct a series RC circuit.
 - b. Draw and construct a parallel RC circuit.
 - c. Draw RC time constants.
 - d. Measure parameters of RC circuits.
2. Construct and measure RL circuits.
 - a. Draw and construct a series RL circuit.
 - b. Draw and construct a parallel RL circuit.
 - c. Draw RL time constants.
 - d. Measure parameters of RL circuits.
3. Construct and measure RLC circuits.
 - a. Draw and construct a series RLC circuit.
 - b. Draw and construct a parallel RLC circuit.
 - c. Describe series and parallel resonance.
 - d. Measure parameters of RLC circuits.

Suggested Teaching Strategies:

1. Construct and measure RC circuits.
 - a. Discuss series RC circuits; pass out worksheet for students to complete.
 - b. Discuss parallel RC circuits; pass out worksheet for students to complete.
 - c. Discuss RC time constants; pass out worksheet for students to complete.
 - d. Students will perform lab activity to measure time/voltage of RC circuits.
2. Construct and measure RL circuits.
 - a. Discuss series RL circuits; pass out worksheet for students to complete.
 - b. Discuss parallel RL circuits; pass out worksheet for students to complete.
 - c. Discuss RL time constants; pass out worksheet for students to complete.
 - d. Students will perform lab activity to measure time/voltage of RL circuits.
3. Construct and measure RLC circuits.
 - a. Discuss series RLC circuits; pass out worksheet for students to complete.
 - b. Discuss parallel RLC circuits; pass out worksheet for students to complete.
 - c. Discuss RLC time constants; pass out worksheet for students to complete.
 - d. Students will perform lab activity to measure time/voltage of RLC circuits.

Suggested Assessment Strategies:

1. Construct and measure RC circuits.
 - a. Observation and completed lab sheet; test.
 - b. Observation and completed lab sheet; test.
 - c. Observation and completed lab sheet; test.
 - d. Observation and completed lab sheet; test.

2. Construct and measure RL circuits.
 - a. Observation and completed lab sheet; test.
 - b. Observation and completed lab sheet; test.
 - c. Observation and completed lab sheet; test.
 - d. Observation and completed lab sheet; test.
3. Construct and measure RLC circuits.
 - a. Observation and completed lab sheet; test.
 - b. Observation and completed lab sheet; test.
 - c. Observation and completed lab sheet; test.
 - d. Observation and completed lab sheet; test.

Standards

Related Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A5 Utilize various formulas in problem-solving situations.
- A6 Communicate using the language of algebra.
- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.

- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T2 Social, ethical, and human issues
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Industry Standards

- EET1 Electrical Theory
- EET2 Electronic Components
- EET7 Test Equipment & Measurements
- EET9 Mathematics and Formulas
- EET11 Electronic Circuits: Series and Parallel

Suggested References

- Buban, P., Schmitt, M. L., & Carter, C. G., Jr. (1999). *Electricity and electronics technology*. Peoria, IL: Glencoe/McGraw-Hill.
- ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com
- General electronics technician: Basic electronics*. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.
- Grob, B., & Schultz, M. E. (2003). *Basic electronics*. New York: Glencoe/McGraw-Hill.
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- Matt, S. R. (1998). *Electricity and basic electronics*. Tinley Park: IL: Goodheart-Willcox.
- Meade, R. L. (2003). *Foundations of electronics*. Albany, NY: Delmar Publishers.
- Terrell, D. L. (2000). *Fundamentals of electronics: dc/ac circuits*. Albany, NY: Delmar Publishers.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

ELECTRONICS II
UNIT 3: SOLID STATE ELECTRONICS

(75.0 hours)

Competencies and Suggested Objectives:

1. Define and describe solid state electronic characteristics.
 - a. Define the characteristics of semiconductor materials.
 - b. Describe characteristics of a P.N. junction diode.
2. Describe and construct solid state circuits and components.
 - a. Describe and construct diode rectifier circuits.
 - b. Identify special purpose diodes.
 - c. Describe transistor characteristics.
 - d. Describe and construct basic transistor circuit configurations.
 - e. Describe, draw, and construct a single stage transistor amplifier.
 - f. Describe the use of integrated circuits in solid state electronics.

Suggested Teaching Strategies:

1. Define and describe solid state electronic characteristics.
 - a. Handouts, overhead transparencies, and video.
 - b. Video, handouts, and overhead transparencies.
2. Describe and construct solid state circuits and components.
 - a. Handouts, video, overhead transparencies, and computer applications. Lab exercise.
 - b. Video, handouts, and manufacturer's data sheet.
 - c. Handouts, video, overhead transparencies, and computer applications. Lab exercise.
 - d. Handouts, video, overhead transparencies, and computer applications. Lab exercise.
 - e. Handouts, video, overhead transparencies, and computer applications. Lab exercise.
 - f. Handouts, video, and overhead transparencies.

Suggested Assessment Strategies:

1. Define and describe solid state electronic characteristics.
 - a. Written test.
 - b. Observation and student report/test.
2. Describe and construct solid state circuits and components.
 - a. Observation and completed lab sheet.
 - b. Oral/written test.
 - c. Oral/written test.
 - d. Observation and completed lab sheet.
 - e. Observation and completed lab sheets.
 - f. Oral/written report.

Standards

Related Academic Standards

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H2 Describe the impact of science and technology on the historical development of the United States in the global community.
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T2 Social, ethical, and human issues
- T3 Technology productivity tools
- T5 Technology research tools

T6 Technology problem-solving and decision-making tools

Industry Standards

EET 1 Electrical Theory
EET 2 Electronic Components
EET 6 Power Supplies
EET 11 Electronic Circuits: Series and Parallel

Suggested References

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Semiconductor devices and circuits. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Grob, B., & Schultz, M. E. (2003). *Basic electronics.* New York: Glencoe/McGraw-Hill.

Schuler, C. A. (2003). *Electronics-principles and applications.* New York: Glencoe/McGraw-Hill.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

ELECTRONICS II
UNIT 4: ADVANCED SOLDERING

(15.0 hours)

Competencies and Suggested Objectives:

1. Identify advanced soldering equipment and procedures.
 - a. Match tools and materials with their uses.
 - b. Explain the procedures.
2. Utilize advanced soldering techniques.
 - a. Solder and desolder various components and connectors.
 - b. Protect temperature sensitive components and static sensitive devices (ESD), using protective devices.

Suggested Teaching Strategies:

1. Identify advanced soldering equipment and procedures.
 - a. Student observation of various advanced equipment; video and handout.
 - b. Video, discussion, and demonstration of proper heat sink and static protection devices and techniques.
2. Utilize advanced soldering techniques.
 - a. Demonstration of advanced soldering.
 - b. Demonstration of how to protect sensitive components.

Suggested Assessment Strategies:

1. Identify advanced soldering equipment and procedures.
 - a. Lab performance, using rubric.
 - b. Lab performance, using rubric.
2. Utilize advanced soldering techniques.
 - a. Lab performance, using rubric.
 - b. Lab performance, using rubric.

Standards

Related Academic Standards

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

Industry Standards

- EET 3 Soldering-Desoldering and Tools
- EET 8 Safety Precautions

Suggested References

Buban, P., Schmitt, M. L., & Carter, C. G., Jr. (1999). *Electricity and electronics technology*. Peoria, IL: Glencoe/McGraw-Hill.

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Basic electronics. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

ELECTRONICS II
UNIT 5: DIGITAL ELECTRONICS

(67.5 hours)

Competencies and Suggested Objectives:

1. Convert between number systems and perform mathematical operations.
 - a. Convert between number systems.
 - b. Perform mathematical operations in number systems.
2. Describe digital components and construct digital circuits.
 - a. Describe basic logic gates.
 - b. Describe and construct combinational logic circuits.
 - c. Describe logic gate families.

Suggested Teaching Strategies:

1. Convert between number systems and perform mathematical operations.
 - a. Handouts, video, overhead, computer assignment, and discussion.
 - b. Complete worksheet and computer assignment.
2. Describe digital components and construct digital circuits.
 - a. Handout, video, overhead, computer assignment, and lab assignment.
 - b. Handout, video, overhead, computer assignment, and lab assignment.
 - c. Handout, video, overhead transparencies, and discussion.

Suggested Assessment Strategies:

1. Convert between number systems and perform mathematical operations.
 - a. Written test or grade on computer exercise.
 - b. Written test or grade on computer exercise.
2. Describe digital components and construct digital circuits.
 - a. Observation and completed lab sheet on basic logic gates.
 - b. Observation and completed lab sheet on combinational logic gates.
 - c. Oral/written test.

Standards

Related Academic Standards

- | | |
|----|--|
| A1 | Recognize, classify, and use real numbers and their properties. |
| A2 | Recognize, create, extend, and apply patterns, relations, and functions and their applications. |
| E1 | Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose. |
| E2 | Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud. |
| E3 | Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects. |

- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T2 Social, ethical, and human issues
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Industry Standards

- EET 9 Mathematics and Formulas
- EET 14 Digital Concepts of Circuitry

Suggested References

ETCAI [Computer software]. (2003). ETCAI Products. Gautier, MS: etcai.com

General electronics technician: Digital electronics and introduction to microprocessors. (1997). Stillwater, OK: Curriculum and Instructional Materials Center.

Rabiee, M. (2002). *Programmable logic controllers*. Tinley Park, IL: Goodheart-Willcox.

Streib, W. J. (1997). *Digital circuits*. Tinley Park, IL: Goodheart-Willcox.

Tokheim, R. L. (2003). *Digital electronics*. New York: Glencoe/McGraw-Hill.

Videos:

Nida series. (1996). Basic electricity/electronics. Available from Learning Labs, Inc., P. O. Box 1419, Calhoun, GA 30703, Phone 1-800-334-4943, Fax 1-706-629-6761, email sales.dept@lli.com, website http://www.lli.com/products/electronics/nida_elec_train.htm

UCANDO series. (1992). Available from VCR Educational Products Corporation, P. O. Box 928, Greenville, OH 45331, email UCANDO-CORP@WESNET.COM, website <http://www.ucando-corp.com/index.html>

ELECTRONICS II
UNIT 6: EMPLOYABILITY SKILLS

(7.5 hours)

Competencies and Suggested Objectives:

1. Prepare written documents for a position.
 - a. Prepare a resumé containing essential information.
 - b. Complete a job application form.
2. Conduct a position interview.
 - a. Explain procedures for interviews using correct etiquette.
 - b. Demonstrate the role of an applicant in an interview.

Suggested Teaching Strategies:

1. Prepare written documents for a position.
 - a. Assist guidance counselor in presenting resumé writing.
 - b. Assist guidance counselor or industry personnel manager in completing an application form.
2. Conduct a position interview.
 - a. Role play with guidance counselor, teachers, and others.
 - b. Role play with guidance counselor, teachers, and others.

Suggested Assessment Strategies:

1. Prepare written documents for a position.
 - a. Evaluate student resumé.
 - b. Evaluate student application.
2. Conduct a position interview.
 - a. Oral or written report.
 - b. Observation of role play.

Standards

Related Academic Standards

- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.

E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

T1 Basic operations and concepts

T2 Social, ethical, and human issues

T3 Technology productivity tools

T4 Technology communications tools

T5 Technology research tools

T6 Technology problem-solving and decision-making tools

Industry Standards

EET 20 Technician Work Procedures

Suggested References

Choices [Computer software]. (2004). Oroville, WA: Bridges.com Co.

High School Career Centers.

Additional Resources:

Community resource professionals.

What do employers expect from me? (Poster). Available from Tech Prep Office, Mississippi Department of Education.

SECTION II:
CURRICULUM FRAMEWORKS
FOR
BASIC ELECTRONICS

May 21, 2004

CURRICULUM FRAMEWORK

Course Name: Basic Electronics I

Course CIP Code: 47.0199

Course Description: Basic Electronics I is the entry level course of the secondary Basic Electronics program. Students in this course will gain foundation competencies related to safety, leadership and personal development, direct current circuits, basic alternating current circuits, and introduction to soldering. (2-2½ Carnegie units, depending upon time spent in the course)

Competencies and Suggested Objectives:

1. Describe program and vocational center policies and procedures.
 - a. Describe local program policies and procedures.
 - b. Define the vocational center policies and procedures.
2. Describe employment opportunities and responsibilities.
 - a. Describe employment opportunities available in the electronics field.
 - b. Describe basic employee responsibilities.
3. Develop leadership in SkillsUSA.
 - a. State procedures of leadership.
 - b. Describe the leadership purposes of SkillsUSA.
4. Identify personal traits and characteristics.
 - a. Identify desirable personality traits.
 - b. Identify desirable characteristics of the personal work ethic.
5. Apply personal and general safety rules.
 - a. Describe personal safety rules for working in a shop/lab and industry.
 - b. Describe general workplace safety rules.
 - c. Describe the proper use of fire extinguishers and classes of fires.
 - d. Identify standard industry Safety Color Codes.
 - e. Describe procedures for safely handling heavy objects.
 - f. Describe safety practices for using climbing devices.
 - g. Describe the Occupational Safety and Health Act (OSHA).
6. Apply electrical safety practices.
 - a. Describe factors to consider in storing and/or disposing of hazardous materials.
 - b. Identify hazardous materials.
 - c. Interpret a Materials Safety Data Sheet (MSDS).
 - d. Describe basic electrical safety practices.
 - e. Describe hazards of electrical shock.
 - f. Describe accident procedures.
 - g. Describe basic electric circuit safety methods.
 - h. Describe the operation of current overload devices.

7. Describe terms and scientific principles of DC circuits.
 - a. Define terms associated with the nature of matter.
 - b. Describe laws of electrical charges.
 - c. Identify electrical materials.
 - d. Describe methods of generating electricity.
 - e. Describe the principles and operation of batteries.
 - f. Describe basic theories of current flow.
 - g. Describe DC circuit parameters.
 - h. Identify resistor types and values using standard resistor color codes and alphanumeric codes.
 - i. Perform basic engineering notation calculations.
 - j. Identify DC circuit schematic symbols.
8. Create circuits and measure DC electricity.
 - a. Describe and demonstrate use of a multimeter.
 - b. Demonstrate use of Ohm's Law to calculate circuit parameters for a series circuit.
 - c. Draw and construct a series circuit with a minimum of three resistances.
 - d. Calculate and measure circuit parameters for a series circuit.
 - e. Demonstrate use of Ohm's Law to calculate circuit parameters for a parallel circuit.
 - f. Draw and construct a parallel circuit with a minimum of three resistances.
 - g. Calculate and measure circuit parameters for a parallel circuit.
 - h. Demonstrate use of Ohm's Law to calculate circuit parameters for a series-parallel circuit.
 - i. Draw and construct a series-parallel circuit with a minimum of three resistances.
 - j. Calculate and measure circuit parameters for a series-parallel circuit.
9. Describe the principles of magnetism and electromagnetic properties.
 - a. Describe the principles of magnetism.
 - b. Describe the principles of electromagnetic properties.
 - c. Construct a simple electromagnet.
10. Describe the terms and scientific principles of AC circuits.
 - a. Describe principles of AC generation.
 - b. Define terms associated with AC voltage.
 - c. Describe sources of AC voltage.
 - d. Describe AC power distribution.
 - e. Describe the properties and characteristics of inductors.
 - f. Describe the properties and characteristics of transformers.
 - g. Describe properties and characteristics of capacitors.
 - h. Describe differences in phases in electrical power supply.
11. Operate proper equipment to measure AC waveforms.
 - a. Demonstrate the use of an oscilloscope.
 - b. Demonstrate the use of a function generator.

12. Construct and measure basic AC circuits.
 - a. Draw and construct a series resistive circuit, calculating parameters and discussing phase relationship.
 - b. Draw and construct a parallel resistive circuit, calculating parameters and discussing phase relationship.
 - c. Draw and construct a series inductive circuit.
 - d. Draw and construct a parallel inductive circuit.
 - e. Draw and construct a series capacitive circuit.
 - f. Draw and construct a parallel capacitive circuit.
 - h. Measure parameters of basic AC circuits.
13. Identify basic soldering equipment and procedures.
 - a. Match tools and materials with their uses.
 - b. Explain the procedures.
14. Utilize soldering.
 - a. Solder and desolder various components and connectors.
 - b. Protect temperature sensitive components and static sensitive devices (ESD), using protective devices.

CURRICULUM FRAMEWORK

Course Name: Basic Electronics II

Course CIP Code: 47.0200

Course Description: Basic Electronics II is the continuing course of the secondary Basic Electronics program. Students in this course will gain additional competencies related to safety, leadership, solid state electronics, soldering, digital electronics, and employment skills. (2-2½ Carnegie units, depending upon time spent in the course)

Competencies and Suggested Objectives:

1. Review personal and general safety rules.
 - a. Describe personal safety rules for working in a shop/lab and industry.
 - b. Describe general workplace safety rules.
 - c. Describe the proper use of fire extinguishers and classes of fires.
 - d. Identify standard industry Safety Color Codes.
 - e. Describe procedures for safely handling heavy objects.
 - f. Describe safety practices for using climbing devices.
 - g. Describe the Occupational Safety and Health Act (OSHA).
2. Review electrical safety practices.
 - a. Describe factors to consider in storing and/or disposing of hazardous materials.
 - b. Identify hazardous materials.
 - c. Interpret a Materials Safety Data Sheet (MSDS).
 - d. Describe basic electrical safety practices.
 - e. Describe hazards of electrical shock.
 - f. Describe accident procedures.
 - g. Describe basic electric circuit safety methods.
 - h. Describe the operation of current overload devices.
3. Review program and vocational center policies and procedures.
 - a. Describe local program policies and procedures.
 - b. Define the vocational center policies and procedures.
4. Review employment opportunities and responsibilities.
 - a. Describe employment opportunities available in the electronics field.
 - b. Describe basic employee responsibilities.
5. Develop advanced leadership in SkillsUSA.
 - a. State procedures of leadership.
 - b. Describe the leadership purposes of SkillsUSA.
6. Review personal traits and characteristics.
 - a. Identify desirable personality traits.
 - b. Identify desirable characteristics of the personal work ethic.
7. Construct and measure RC circuits.
 - a. Draw and construct a series RC circuit.
 - b. Draw and construct a parallel RC circuit.
 - c. Draw RC time constants.

- d. Measure parameters of RC circuits.
8. Construct and measure RL circuits.
 - a. Draw and construct a series RL circuit.
 - b. Draw and construct a parallel RL circuit.
 - c. Draw RL time constants.
 - d. Measure parameters of RL circuits.
9. Construct and measure RLC circuits.
 - a. Draw and construct a series RLC circuit.
 - b. Draw and construct a parallel RLC circuit.
 - c. Describe series and parallel resonance.
 - d. Measure parameters of RLC circuits.
10. Define and describe solid state electronic characteristics.
 - a. Define the characteristics of semiconductor materials.
 - b. Describe characteristics of a P.N. junction diode.
11. Describe and construct solid state circuits and components.
 - a. Describe and construct diode rectifier circuits.
 - b. Identify special purpose diodes.
 - c. Describe transistor characteristics.
 - d. Describe and construct basic transistor circuit configurations.
 - e. Describe, draw, and construct a single stage transistor amplifier.
 - f. Describe the use of integrated circuits in solid state electronics.
12. Identify advanced soldering equipment and procedures.
 - a. Match tools and materials with their uses.
 - b. Explain the procedures.
13. Utilize advanced soldering techniques.
 - a. Solder and desolder various components and connectors.
 - b. Protect temperature sensitive components and static sensitive devices (ESD), using protective devices.
14. Convert between number systems and perform mathematical operations.
 - a. Convert between number systems.
 - b. Perform mathematical operations in number systems.
15. Describe digital components and construct digital circuits.
 - a. Describe basic logic gates.
 - b. Describe and construct combinational logic circuits.
 - c. Describe logic gate families.
16. Prepare written documents for a position.
 - a. Prepare a resumé containing essential information.
 - b. Complete a job application form.
17. Conduct a position interview.
 - a. Explain procedures for interviews using correct etiquette.
 - b. Demonstrate the role of an applicant in an interview.

SECTION III:
RECOMMENDED TOOLS AND EQUIPMENT

May 21, 2004

RECOMMENDED TOOLS AND EQUIPMENT
FOR
BASIC ELECTRONICS

1. Student tool kit (1 per station) to include:
 - Metal tool box with locking device
 - Wrench set, box & open end (5/32 - 1") (optional)
 - Long nose pliers, 3"
 - Diagonal cutting pliers, 3"
 - Combination slip or groove joint pliers
 - Flat nose cutting pliers, 3" (nippers)
 - Miniature jeweler screwdrivers (flat blade and Phillips)
 - TORX[®] Drivers
 - Posidriv[®] Drivers
 - Screwdrivers, flat blade, 4" (1/8, 3/16, 1/4, and 5/16)
 - Screwdrivers, Phillips head 4" (#1, #2, and #3)
 - Adjustable wire strippers
 - Needle nose pliers, 3"
 - Nut driver set (1/8 - 3/4)
 - Hemostats, curved
 - Hemostats, straight
 - Files, precision/miniature
 - Wire strippers
 - Heat sink
 - Solder/desolder vacuum sucker
 - Component removal/insertion tool
 - IC Insertion/removal tool
 - IC Extender device (14, 16, 18)
 - Flashlight
 - Digital multimeter
 - LCR meter (optional)
 - Telescoping magnet
2. Logic kit (1 per station) to include:
 - analyzer
 - probe
 - pulser
3. AC power supply (1 per station)
4. Breadboards, 1500 connectors (minimum) (15)
5. Compressor, 2 H.P. w/3 gal tank (1)
6. Computers, with printers, for computer assisted instruction; electronics software with practical applications in DC, AC, solid state (transistors), and digital devices; word processing software; and mathematical software (1 per station)
7. Crimping tool w/crimp set (2)
8. DC power supply, variable 0-30 V (1 per station)
9. Digital storage oscilloscope, 100 MHz (1)

10. Frequency counter, 10 MHz (1 per station)
11. Function generators, 0-10 MHz (1 per station)
12. GFCI tester (1 per station)
13. Isolation transformer (variable) (1)
14. LCR meter (1 per station)
15. Multimeter, analog (1 per station)
16. Multimeter, digital (1 per station)
17. Oscilloscope, minimum 50 MHz Dual trace (1 per station)
18. Power drill, 3/8", cordless (2)
19. Power drill, 1/2" cordless (2)
20. Semiconductor tester (1 per station)
21. Soldering vise (10)
22. Soldering/Desoldering kit (1 per station)
23. Vacuum cleaner (1)

RECOMMENDED INSTRUCTIONAL AIDS

Recommend that teachers have access to:

1. Scientific calculator (1)
2. Cart, AV (for overhead projector) (1)
3. Cart, AV (for TV-VCR) (1)
4. Computer with operating software with multimedia kit (1)
5. Projector, overhead (1)
6. TV-VCR (1)
7. Video out (Microcomputer to TV monitor) (1)
8. Video/audio data projector (1)
9. Lap Top Computer (1)
10. Computer file server with network software
11. Digital camera
12. Digital scanner with Optical Character Recognition (OCR)
13. Interactive display board system

APPENDIX A:
RELATED ACADEMIC TOPICS

May 21, 2004

ALGEBRA I

Competencies and Suggested Objective(s)

A1. Recognize, classify, and use real numbers and their properties.

- a. Describe the real number system using a diagram to show the relationships of component sets of numbers that compose the set of real numbers.
- b. Model properties and equivalence relationships of real numbers.
- c. Demonstrate and apply properties of real numbers to algebraic expressions.
- d. Perform basic operations on square roots excluding rationalizing denominators.

A2. Recognize, create, extend, and apply patterns, relations, and functions and their applications.

- a. Analyze relationships between two variables, identify domain and range, and determine whether a relation is a function.
- b. Explain and illustrate how change in one variable may result in a change in another variable.
- c. Determine the rule that describes a pattern and determine the pattern given the rule.
- d. Apply patterns to graphs and use appropriate technology.

A3. Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.

- a. Solve, check, and graph linear equations and inequalities in one variable, including rational coefficients.
- b. Graph and check linear equations and inequalities in two variables.
- c. Solve and graph absolute value equations and inequalities in one variable.
- d. Use algebraic and graphical methods to solve systems of linear equations and inequalities.
- e. Translate problem-solving situations into algebraic sentences and determine solutions.

A4. Explore and communicate the characteristics and operations of polynomials.

- a. Classify polynomials and determine the degree.
- b. Add, subtract, multiply, and divide polynomial expressions.
- c. Factor polynomials using algebraic methods and geometric models
- d. Investigate and apply real-number solutions to quadratic equations algebraically and graphically.

- e. Use convincing arguments to justify unfactorable polynomials.
- f. Apply polynomial operations to problems involving perimeter and area.

A5. Utilize various formulas in problem-solving situations.

- a. Evaluate and apply formulas (e.g., circumference, perimeter, area, volume, Pythagorean Theorem, interest, distance, rate, and time).
- b. Reinforce formulas experimentally to verify solutions.
- c. Given a literal equation, solve for any variable of degree one.
- d. Using the appropriate formula, determine the length, midpoint, and slope of a segment in a coordinate plane.
- e. Use formulas (e.g., point-slope and slope-intercept) to write equations of lines.

A6. Communicate using the language of algebra.

- a. Recognize and demonstrate the appropriate use of terms, symbols, and notations.
- b. Distinguish between linear and non-linear equations.
- c. Translate between verbal expressions and algebraic expressions.
- d. Apply the operations of addition, subtraction, and scalar multiplication to matrices.
- e. Use scientific notation to solve problems.
- f. Use appropriate algebraic language to justify solutions and processes used in solving problems.

A7. Interpret and apply slope as a rate of change.

- a. Define slope as a rate of change using algebraic and geometric representations.
- b. Interpret and apply slope as a rate of change in problem-solving situations.
- c. Use ratio and proportion to solve problems including direct variation ($y=kx$).
- d. Apply the concept of slope to parallel and perpendicular lines.

A8. Analyze data and apply concepts of probability.

- a. Collect, organize, graph, and interpret data sets, draw conclusions, and make predictions from the analysis of data.
- b. Define event and sample spaces and apply to simple probability problems.
- c. Use counting techniques, permutations, and combinations to solve probability problems.

BIOLOGY I

Competencies and Suggested Objective(s)

B1. Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.

- a. Demonstrate the proper use and care for scientific equipment used in biology.
- b. Observe and practice safe procedures in the classroom and laboratory.
- c. Apply the components of scientific processes and methods in the classroom and laboratory investigations.
- d. Communicate results of scientific investigations in oral, written, and graphic form.

B2. Investigate the biochemical basis of life.

- a. Identify the characteristics of living things.
- b. Describe and differentiate between covalent and ionic bonds using examples of each.
- c. Describe the unique bonding and characteristics of water that makes it an essential component of living systems.
- d. Classify solutions using the pH scale and relate the importance of pH to organism survival.
- e. Compare the structure, properties and functions of carbohydrates, lipids, proteins and nucleic acids in living organisms.
- f. Explain how enzymes work and identify factors that can affect enzyme action.

B3. Investigate cell structures, functions, and methods of reproduction.

- a. Differentiate between prokaryotic and eukaryotic cells.
- b. Distinguish between plant and animal (eukaryotic) cell structures.
- c. Identify and describe the structure and basic functions of the major eukaryotic organelles.
- d. Describe the way in which cells are organized in multicellular organisms.
- e. Relate cell membrane structure to its function in passive and active transport.
- f. Describe the main events in the cell cycle and cell mitosis including differences in plant and animal cell divisions.
- g. Relate the importance of meiosis to sexual reproduction and the maintenance of chromosome number.
- h. Identify and distinguish among forms of asexual and sexual reproduction.

B4. Investigate the transfer of energy from the sun to living systems.

- a. Describe the structure of ATP and its importance in life processes.
- b. Examine, compare, and contrast the basic processes of photosynthesis and cellular respiration.
- c. Compare and contrast aerobic and anaerobic respiration.

B5. Investigate the principles, mechanisms, and methodology of classical and molecular genetics.

- a. Compare and contrast the molecular structures of DNA and RNA as they relate to replication, transcription, and translation.
- b. Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.
- c. Analyze the applications of DNA technology (forensics, medicine, agriculture).
- d. Discuss the significant contributions of well-known scientists to the historical progression of classical and molecular genetics.
- e. Apply genetic principles to solve simple inheritance problems including monohybrid crosses, sex linkage, multiple alleles, incomplete dominance, and codominance.
- f. Examine inheritance patterns using current technology (gel electrophoresis, pedigrees, karyotypes).

B6. Investigate concepts of natural selection as they relate to diversity of life.

- a. Analyze how organisms are classified into a hierarchy of groups and subgroups based on similarities and differences.
- b. Identify characteristics of kingdoms including monerans, protists, fungi, plants and animals.
- c. Differentiate among major divisions of the plant and animal kingdoms (vascular/non-vascular; vertebrate/invertebrate).
- d. Compare the structures and functions of viruses and bacteria relating their impact on other living organisms.
- e. Identify evidence of change in species using fossils, DNA sequences, anatomical and physiological similarities, and embryology.
- f. Analyze the results of natural selection in speciation, diversity, adaptation, behavior and extinction.

B7. Investigate the interdependence and interactions that occur within an ecosystem.

- a. Analyze the flow of energy and matter through various cycles including carbon, oxygen, nitrogen and water cycles.
- b. Interpret interactions among organisms in an ecosystem (producer/consumer/decomposer, predator/prey, symbiotic relationships and competitive relationships).
- c. Compare variations, tolerances, and adaptations of plants and animals in major biomes.
- d. Investigate and explain the transfer of energy in an ecosystem including food chains, food webs, and food pyramids.
- e. Examine long and short-term changes to the environment as a result of natural events and human actions.

ENGLISH II

Competencies and Suggested Objective(s)

E1. Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

- a. Produce individual and/or group compositions and/or projects to persuade, tell a story, describe, create an effect, explain or justify an action or event, inform, entertain, etc.
- b. Produce writing typically used in the workplace such as social, business, and technical correspondence; explanation of procedures; status reports; research findings; narratives for graphs; justification of decisions, actions, or expenses; etc.
- c. Write a response, reaction, interpretation, analysis, summary, etc., of literature, other reading matter, or orally presented material.
- d. Revise to ensure effective introductions, details, wording, topic sentences, and conclusions.

E2. Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

- a. Listen to determine the main idea and supporting details, to distinguish fact from opinion, and to determine a speaker's purpose or bias.
- b. Speak with appropriate intonation, articulation, gestures, and facial expression.
- c. Speak effectively to explain and justify ideas to peers, to inform, to summarize, to persuade, to entertain, to describe, etc.

E3. Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

- a. Read, view, and listen to distinguish fact from opinions and to recognize persuasive and manipulative techniques.
- b. Access both print and non-print sources to produce an I-Search paper, research paper, or project.
- c. Use computers and audio-visual technology to access and organize information for purposes such as resumes, career search projects, and analytical writings, etc.
- d. Use reference sources, indices, electronic card catalog, and appropriate research procedures to gather and synthesize information.

- E4. Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.**
- a. Interact with peers to examine real world and literary issues and ideas.
 - b. Show growth in critical thinking, leadership skills, consensus building, and self-confidence by assuming a role in a group, negotiating compromise, and reflecting on individual or group work.
- E5. Complete oral and written presentations which exhibit interaction and consensus within a group.**
- a. Share, critique, and evaluate works in progress and completed works through a process approach.
 - b. Communicate effectively in a group to present completed projects and/or compositions.
 - c. Edit oral and written presentations to reflect correct grammar, usage, and mechanics.
- E6. Explore cultural contributions to the history of the English language and its literature.**
- a. Explore a variety of works from various historical periods, geographical locations, and cultures, recognizing their influence on language and literature.
 - b. Identify instances of dialectal differences which create stereotypes, perceptions, and identities.
 - c. Recognize root words, prefixes, suffixes, and cognates.
 - d. Relate how vocabulary and spelling have changed over time.
- E7. Discover the power and effect of language by reading and listening to selections from various literary genres.**
- a. Listen to and read aloud selected works to recognize and respond to the rhythm and power of language to convey a message.
 - b. Read aloud with fluency and expression.
 - c. Analyze the stylistic devices, such as alliteration, assonance, word order, rhyme, onomatopoeia, etc., that make a passage achieve a certain effect.
 - d. Demonstrate how the use of language can confuse or inform, repel or persuade, or inspire or enrage.
 - e. Analyze how grammatical structure or style helps to create a certain effect.

E8. Read, discuss, analyze, and evaluate literature from various genres and other written material.

- a. Read and explore increasingly complete works, both classic and contemporary, for oral discussion and written analysis.
- b. Read, discuss, and interpret literature to make connections to life.
- c. Read from a variety of genres to understand how the literary elements contribute to the overall quality of the work.
- d. Identify qualities in increasingly complex literature that have produced a lasting impact on society.
- e. Read for enjoyment, appreciation, and comprehension of plot, style, vocabulary, etc.

E9. Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.

- a. Infuse the study of grammar and vocabulary into written and oral communication.
- b. Demonstrate, in the context of their own writing, proficient use of the conventions of standard English, including, but not limited to, the following: complete sentences, subject-verb agreement, plurals, spellings, homophones, possessives, verb forms, punctuation, capitalization, pronouns, pronoun-antecedent agreement, parallel structure, and dangling and misplaced modifiers.
- c. Give oral presentations to reinforce the use of standard English.
- d. Employ increasingly proficient editing skills to identify and solve problems in grammar, usage, and structure.

E10. Use language and critical thinking strategies to serve as tools for learning.

- a. Use language to facilitate continuous learning, to record observations, to clarify thought, to synthesize information, and to analyze and evaluate language.
- b. Interpret visual material orally and in writing.

U. S. HISTORY FROM 1877

Competencies and Suggested Objective(s)

H1. Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.

- a. Apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues (e.g., gold standard, free coinage of silver, tariff issue, laissez faire, deficit spending, etc.).
- b. Explain the emergence of modern America from a domestic perspective (e.g., frontier experience, Industrial Revolution and organized labor, reform movements of Populism and Progressivism, Women's Movement, Civil Rights Movement, the New Deal, etc.).
- c. Explain the changing role of the United States in world affairs since 1877 through wars, conflicts, and foreign policy (e.g., Spanish-American War, Korean conflict, containment policy, etc.).
- d. Trace the expansion of the United States and its acquisition of territory from 1877 (e.g., expansionism and imperialism).

H2. Describe the impact of science and technology on the historical development of the United States in the global community.

- a. Analyze the impact of inventions on the United States (e.g., telephone, light bulb, etc.).
- b. Examine the continuing impact of the Industrial Revolution on the development of our nation (e.g., mass production, computer operations, etc.).
- c. Describe the effects of transportation and communication advances since 1877.

H3. Describe the relationship of people, places, and environments through time.

- a. Analyze human migration patterns since 1877 (e.g., rural to urban, the Great Migration, etc.).
- b. Analyze how changing human, physical, geographic characteristics can alter a regional landscape (e.g., urbanization, Dust Bowl, etc.).

H4. Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

- a. Interpret special purpose maps, primary/secondary sources, and political cartoons.
- b. Analyze technological information on graphs, charts, and timelines.

- c. Locate areas of international conflict (e.g., Caribbean, Southeast Asia, Europe, etc.).

H5. Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.

- a. Examine various reform movements (e.g., Civil Rights, Women's Movement, etc.).
- b. Examine the government's role in various movements (e.g., arbitration, 26th Amendment, etc.).
- c. Examine the role of government in the preservation of citizens' rights (e.g., 19th Amendment, Civil Rights Act of 1964).
- d. Examine individuals' duties and responsibilities in a democratic society (e.g., voting, volunteerism, etc.).

APPENDIX B:
WORKPLACE SKILLS

WORKPLACE SKILLS FOR THE 21ST CENTURY

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

May 21, 2004

APPENDIX C

NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR STUDENTS

May 21, 2004

APPENDIX C
NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR STUDENTS

- T1 Basic operations and concepts
- Students demonstrate a sound understanding of the nature and operation of technology systems.
 - Students are proficient in the use of technology.
- T2 Social, ethical, and human issues
- Students understand the ethical, cultural, and societal issues related to technology.
 - Students practice responsible use of technology systems, information, and software.
 - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- T3 Technology productivity tools
- Students use technology tools to enhance learning, increase productivity, and promote creativity.
 - Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.
- T4 Technology communications tools
- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
 - Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
- T5 Technology research tools
- Students use technology to locate, evaluate, and collect information from a variety of sources.
 - Students use technology tools to process data and report results.
 - Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
- T6 Technology problem-solving and decision-making tools
- Students use technology resources for solving problems and making informed decisions.
 - Students employ technology in the development of strategies for solving problems in the real world.

May 21, 2004

APPENDIX D:
INDUSTRY STANDARDS

May 21, 2004

APPENDIX D

INDUSTRY STANDARDS
TAKEN FROM
ELECTRONICS TECHNICIANS ASSOCIATION, INTERNATIONAL
(As recommended by the National Coalition for Electronics Education and ETA's
Associate C.E.T. Exam Development Committee)

EET1	Electrical Theory
EET2	Electronic Components
EET3	Soldering-Desoldering and Tools
EET4	Block Diagrams-Schematics-Wiring Diagrams
EET5	Cabling
EET6	Power Supplies
EET7	Test Equipment & Measurements
EET8	Safety Precautions
EET9	Mathematics and Formulas
EET10	Radio Communications Technology
EET11	Electronic Circuits: Series and Parallel
EET12	Amplifiers
EET13	Interfacing of Electronics Products
EET14	Digital Concepts of Circuitry
EET15	Computer Electronics
EET16	Computer Applications
EET17	Audio & Video Systems
EET18	Optical Electronics
EET19	Telecommunications Basics
EET20	Technician Work Procedures

May 21, 2004

APPENDIX E:
STUDENT COMPETENCY PROFILE

May 21, 2004

STUDENT COMPETENCY PROFILE
FOR
BASIC ELECTRONICS I

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation/Leadership and Personal Development

- ____ 1. Describe program and vocational center policies and procedures.
- ____ 2. Describe employment opportunities and responsibilities.
- ____ 3. Develop leadership in SkillsUSA.
- ____ 4. Identify personal traits and characteristics.

Unit 2: Safety

- ____ 1. Apply personal and general safety rules.
- ____ 2. Apply electrical safety practices.

Unit 3: Direct Current (DC) Circuits

- ____ 1. Describe terms and scientific principles of DC circuits.
- ____ 2. Create circuits and measure DC electricity.
- ____ 3. Describe the principles of magnetism and electromagnetic properties.

Unit 4: Basic Alternating Current (AC) Circuits

- ____ 1. Describe the terms and scientific principles of AC circuits.
- ____ 2. Operate proper equipment to measure AC waveforms.
- ____ 3. Construct and measure basic AC circuits.

Unit 5: Introduction to Soldering

- ____ 1. Identify basic soldering equipment and procedures.
- ____ 2. Utilize soldering.

STUDENT COMPETENCY PROFILE
FOR
BASIC ELECTRONICS II

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Safety/Orientation (Review)

- _____ 1. Review personal and general safety rules.
- _____ 2. Review electrical safety practices.
- _____ 3. Review program and vocational center policies and procedures.
- _____ 4. Review employment opportunities and responsibilities.
- _____ 5. Develop advanced leadership in SkillsUSA.
- _____ 6. Review personal traits and characteristics.

Unit 2: Advanced Alternating Current (AC) Circuits

- _____ 1. Construct and measure RC circuits.
- _____ 2. Construct and measure RL circuits.
- _____ 3. Construct and measure RLC circuits.

Unit 3: Solid State Electronics

- _____ 1. Define and describe solid state electronic characteristics.
- _____ 2. Describe and construct solid state circuits and components.

Unit 4: Advanced Soldering

- _____ 1. Identify advanced soldering equipment and procedures.
- _____ 2. Utilize advanced soldering techniques.

Unit 5: Digital Electronics

- _____ 1. Convert between number systems and perform mathematical operations.
- _____ 2. Describe digital components and construct digital circuits.

Unit 6: Employability Skills

- _____1. Prepare written documents for a position.
- _____2. Conduct a position interview.