

WARREN COUNTY SCHOOL DISTRICT
PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Electronics Technology

Course Number: 00905 AM 00955 PM

Course Prerequisites: Physics, Algebra, Industrial Arts

Course Description: (Include “no final exam” or “final exam required”)

**CIP Code: 15.0303 - ELECTRICAL, ELECTRONIC AND COMMUNICATIONS
ENGINEERING TECHNOLOGY/TECHNICIAN**

An instructional program that prepares individuals to apply basic electronic principles and technical skills to the production, calibration, estimation, testing, assembling, installation and maintenance of electronic equipment. Emphasis is on passive components and solid-state devices; digital circuits; optoelectronic devices; operational amplifiers; audio and RF amplifiers; oscillators; power supplies; and AM, FM and PCM modulators. Knowledge is acquired through theoretical instruction, experimentation and hands-on activities. Instruction will develop basic levels of knowledge, understanding and associated skills essential for entry-level employment in communications, industrial electronics, digital processing, robotics, avionics, biomedical technology and other electronics occupations.

Suggested Grade Level: 10 - 12

Length of Course: One Semester X Two Semesters Other

Three periods per day (120 Min) – Five Days per week – Three years

Units of Credit: 3 / Year (Insert *NONE* if appropriate.)

PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certification(s)

Vocational Instruction – Electronics Technology

Certification verified by WCSD Human Resources Department:

 X Yes No

Board Approved Textbooks, Software, Materials:

Book Title: Electronics Fundamental – Floyd (Year One)
Publisher: Prentice Hall
ISBN #: 0-13-835216-X
Copyright: 1998
Date of Adoption: 1998

Book Title: Electronic Devices – Floyd (Year Two)
Publisher: Prentice Hall
ISBN #: 0-13-649146-4
Copyright: 1999
Date of Adoption: 1999

Book Title: Digital Fundamentals – Floyd (Year Three)
Publisher: Prentice Hall
ISBN #: 0-13-080850-4
Copyright: 2000
Date of Adoption: 2000

Book Title: Essentials of Electronics – 2nd ed.
Publisher: Glencoe McGraw-Hill
ISBN #: 0-07-821048-8
Copyright: 2001
Date of Adoption: 2004

MultiSim – Circuit Simulation Software
National Instruments

UtiliBoard - Printed Circuit Board Layout and Routing (works with MultiSim)
National Instruments

LabView – Circuit Simulation Software (works with MultiSim)
National Instruments

Electronics Technician CBT – Circuit Training Program
Logic Designs Inc.

ETCAI Training Program – Circuit Training Program
ETCAI products

BOARD APPROVAL:

Date Written: _____

Date Approved: _____ April 12, 2010 _____

Implementation Year: _____ 2010-2011 _____

Suggested Supplemental Materials:

Digital Multi-meters and equipment, Oscilloscopes, Computers, Calculators, Televisions, DVD's /players Laser printer, flash drives, Numerous Technical manuals/textbooks, computer management system, Power Supplies, Numerous Electronics/Electrician hand tools, Office and Electronic Simulation software, projector, drill press, Digital storage

scopes, PLC's, Analog VOM's, Signal generators, Radio transmitters/receivers, inverters, numerous test/repair equipment, frequency counters, Microcontrollers w/ software, power generation systems (AC, solar, battery, fuel cell), Proto-board equipment, PCB equipment, solder/desolder equipment.

Course Standards

PA Academic Standards:

Math	Standards
	(BCE103 - 106, 109 - 121), (SSE102,5,6,8), (IE104), (DE101,4), (REE101), (COM101)
2.1.11.A-M	Model and compare values of irrational and complex numbers
2.10.11.A-M	Identify, create, and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.
2.2.11.A-M	Determine and interpret maximum and minimum values of a function over a specified interval.
2.2.11.D-M	Describe and explain the amount of error that may exist in a computation using estimates.
2.2.11.E-M	Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measure.
2.3.11.A-M	Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.
2.3.11.C-M	Demonstrate the ability to produce measures with specified levels of precision.
2.4.11.A-M	Use direct proofs, indirect proofs or proof by contradiction to validate conjectures.
2.4.11.D-M	Use truth tables to reveal the logic of mathematical statements.
2.4.11.E-M	Demonstrate mathematical solutions to problems (e.g., in the physical sciences).
2.5.11.A-M	Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.
2.6.11.A-M	Design and conduct an experiment using random sampling. Describe the data as an example of a distribution using statistical measures of center and spread. Organize and represent the results with graphs. (Use standard deviation, variance and t-tests.)
2.8.11.D-M	Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.
2.8.11.F-M	Identify whether systems of equations and inequalities are consistent or inconsistent.
2.8.11.G-M	Analyze and explain systems of equations, systems of inequalities and matrices.
2.8.11.H-M	Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets and other software.
2.8.11.K-M	Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y-intercepts, graphing by transformations and the use of a graphing calculator.

- 2.8.11.P-M Analyze a relation to determine whether a direct or inverse variation exists and represent it algebraically and graphically.
- 2.8.11.Q-M Represent functional relationships in tables, charts and graphs.
- Use the properties of angles, arcs, chords, tangents and secants to solve problems involving circles.
- 2.9.11.F-M

Math Anchors

- M11.A.1.1.1 Find the square root of an integer to the nearest tenth using either a calculator or estimation.
- M11.A.1.1.2 Express numbers and/or simplify expressions using scientific notation (including numbers less than 1).
- Solve problems using operations with rational numbers including rates and percents (single and multi-step and multiple procedure operations)
- M11.A.2.1.1 Solve problems using direct and inverse proportions.
- M11.A.2.1.3 Identify and/or use proportional relationships in problem solving settings.
- M11.A.3.2.1 Use estimation to solve problems.
- M11.B.2.1.1 Measure and/or compare angles in degrees (up to 360 deg)
- M11.C.1.4.1 Find the measure of a side of a right triangle using the Pythagorean Theorem
- M11.D.2.1.3 Write, solve and/or apply a linear equation (including problem situations).
- Write and/or solve systems of equations using graphing, substitution and/or elimination (limit systems to 2 equations).
- M11.D.2.1.4
- M11.D.3.1.1 Identify, describe and/or use constant or varying rates of change.
- M11.D.3.1.2 Determine how a change in one variable relates to a change in a second variable
- M11.D.3.2.1 Apply the formula for the slope of a line to solve problems
- M11.D.4.1.1 Match the graph of a given function to its table or equation.
- Create and/or use appropriate graphical representations of data, including box-and-whisker plots, stem-and-leaf plots or scatter plots.
- M11.E.1.1.1
- Analyze data and/or answer questions based on displayed data (box-and-whisker plots, stem- and-leaf plots or scatter plots).
- M11.E.1.1.2
- Calculate or select the appropriate measure of central tendency (mean, mode or median) of a set of data given or represented on a table, line plot or stem-and-leaf plot.
- M11.E.2.1.1

RWSL Standards

(BCE101,4,7,9,11,13,22), (SSE101 - 109), (ME101,4), (IE101 - 103), (DE102,3), (REE101 - 106), (MDF101,3,4), (COM101 - 103), (PG101,2), (JS101)

- 1.1.11.A-R Locate various texts, media and traditional resources for assigned and independent projects before reading.
- 1.4.11.D-R Maintain a written record of activities, course work, experience, honors and interests.
- 1.5.11.B-R Write using well-developed content appropriate for the topic.
- 1.6.11.A-R Listen to others.
- 1.8.11.A-R Select and refine a topic for research.

RWSL Anchors

- R11.A.1.1.1 Identify and/or apply meaning of multiple-meaning words used in text.
- R11.A.2.1.1 Identify and/or apply meaning of multiple-meaning words used in text.
- R11.A.2.1.2 Identify and/or apply meaning of content-specific words used in text.

- R11.A.2.2.1 Identify and apply how the meaning of a word is changed when an affix is added; identify the leaning of a word from the text with an affix.
- R11.A.2.2.2 Define and/or apply how the meaning of words or phrases changes when using context clues given in explanatory sentences.
- R11.A.2.3.1 Make inferences and/or draw conclusions based on information from text.
- R11.A.2.3.2 Cite evidence from text to support generalizations.
- R11.A.2.4.1 Identify and/or explain stated or implied main ideas and relevant supporting details from text.
- R11.A.2.5.1 Summarize the major points, processes, and/or events of a non-fictional text as a whole.
- R11.B.1.1.1 Explain, interpret, compare, describe, analyze, and/or evaluate the relationships within fiction and literary nonfiction.
- R11.B.1.2.1 Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.
- R11.B.3.1.1 Explain, interpret, describe, and/or analyze the use of facts and opinions to make a point or construct an argument in non-fictional text.
- R11.B.3.3.3 Explain, interpret, and/or analyze graphics and charts, and/or make connections between text and the content of graphics and charts.
- R11.B.3.3.4 Identify, explain, compare, interpret, describe, and/or analyze the sequence of steps in a list of directions.

Science Standards

(BCE101,2,4,6, 109 - 114, 116 - 121), (SSE101 - 109), (ME101,3), (IE101 - 103), (DE102,3), (REE105,6), (MDF101,4), (COM101 - 103), (PG101,2)

- 3.1.12.A-S Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.
- 3.2.10.D-S Identify and apply the technological design process to solve problems.
- 3.4.10.B-S Analyze energy sources and transfers of heat.
- 3.4.10.C-S Distinguish among the principles of force and motion.
- 3.6.12.A-S Analyze biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.
- 3.7.10.A-S Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.
- 3.7.12.A-S Apply advanced tools, materials and techniques to answer complex questions.
- 3.7.12.B-S Evaluate appropriate instruments and apparatus to accurately measure materials and processes.
- 3.8.12.C-S Evaluate the consequences and impacts of scientific and technological solutions.

Science Anchors

- S11.A.1.3.1 Use appropriate quantitative data to describe or interpret change in systems
- S11.A.2.1.1 Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- S11.A.2.2.1 Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations
- S11.A.2.2.2 Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision.
- S11.A.3.1.1 Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
- S11.A.3.1.2 Analyze and predict the effect of making a change in one part of a system on the system as a whole.
- S11.A.3.1.3 Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).

- S11.A.3.1.4 Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating, motor, food production) and identify the resources necessary for operation of the system.
- S11.B.3.3.2 Compare the impact of management practices (e.g., production, processing, research, development, marketing, distribution, consumption, byproducts) in meeting the need for commodities locally and globally.
- S11.B.3.3.3 Explain the environmental benefits and risks associated with human made systems
- S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons).
- S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure.
- S11.C.1.1.3 Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories.
- S11.C.2.1.1 Compare or analyze waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, Xrays, microwaves) as well as their properties, energy levels, and motion.
- S11.C.2.1.2 Describe energy changes in chemical reactions.
- S11.C.2.1.3 Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration, rocket propulsion, heat pump).
- S11.C.2.1.4 Use Ohm's Law to explain relative resistances, currents, and voltage.
- S11.C.3.1.4 Explain how electricity induces magnetism and how magnetism induces electricity as two aspects of a single electromagnetic force.
- S11.D.1.2.2 Explain the impact of obtaining and using natural resources for the production of energy and materials (e.g., resource renewal, amount of pollution, deforestation).

Career Standards

(BCE101,22), (MDF101,3,4), (JS101)

- 13.1.11.A Analyze career options based on student interests, abilities, aptitudes and accomplishments.
- 13.1.11.C Evaluate opportunities for career preparation.
- 13.1.11.D Justify the selection of a career.
- 13.1.11.E Evaluate all opportunities for the transition from secondary to postsecondary education, training or work.
- 13.1.11.F Evaluate individual career plan using decision-making skills.
- 13.1.11.G Analyze the opportunity cost/benefit of continuous learning.
- 13.2.11.A Know and demonstrate industry acceptable job interviewing techniques.
- 13.2.11.B Analyze and evaluate complex technical tasks using sophisticated processes.
- 13.2.11.C Analyze workplace problems and cite technological solutions.
- 13.2.11.D Identify sources of health, safety and regulatory practices and their effect on the work environment.
- 13.2.11.F Analyze performance-based assessments components.
- 13.2.11.G Analyze the need for manipulative/motor skills.
- 13.3.11.A Analyze work habits needed to advance within a career.
- 13.3.11.B Evaluate conflict resolution skills.
- 13.3.11.C Evaluate team member roles to describe and illustrate active listening techniques.
- 13.3.11.G Analyze the availability and societal and economic factors of lifelong participation in career preparation and advancement opportunities.

WCSD Academic Standards: (List or None)

Industry or Other Standards:

ETA – Electronics Technician Association, Student Electronics Technician (SET) Certification, and Associate Electronics Technician Certification (CET).

SPECIAL EDUCATION AND GIFTED REQUIREMENTS

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP) or Gifted Individual Education Plan (GIEP).

**SPECIFIC EDUCATIONAL OBJECTIVES/CORRESPONDING STANDARDS AND
ELIGIBLE CONTENT WHERE APPLICABLE**

(List Objectives, PA Standards #'s, Other Standards (see samples at end))

See “Standards” and “Anchors” above.

ASSESSMENTS

PSSA Assessment Anchors Addressed: The teacher must be knowledgeable of the PDE Assessment Anchors and/or Eligible Content and incorporate them into this planned instruction. Current assessment anchors can be found at pde@state.pa.us.

Formative Assessments: The teacher will develop and use standards-based assessments throughout the course.

Portfolio Assessment: X Yes No

District-wide Final Examination Required: X Yes No

Course Challenge Assessment (Describe):

1. Instructor approved Portfolio
2. Advanced grade on Electronics NOCTI Written Exam
3. Advanced grade on Electronics NOCTI Performance Exam
4. Advanced grade on Electronics ETA (CET or SET) Written Exam

REQUIRED COURSE SEQUENCE AND TIMELINE

(Content must be tied to objectives)

Electronics Technology Lesson Topics

<u>Year</u>	<u>Hours</u>	<u>Code</u>	
1	15	BCE101	Safety and Class Introduction
	10	BCE102	History of Electricity
	10	BCE103	Components, Quantities, and Unit Conversion
	20	BCE104	Atoms, Charge and Color Code
	15	BCE105	Ohm's & Watt's Law, Energy, and Power
	20	BCE106	Measuring Voltage, Current and Resistance
	10	BCE107	Hand Tools and Fasteners
	10	BCE108	Electric Connections
	15	BCE109	Batteries
	15	BCE110	Series Circuits
	15	BCE111	Parallel Circuits
	25	BCE112	Series-Parallel Combination Circuits
	25	MDF101	Soldering and Printed Circuit Board Fabrication
	20	MDF102	Circuit Design Software
	15	MDF103	Electronic Manufacturing Industry
	10	REE101	Circuit Conductor Sizes and Applications
	20	BCE113	Magnetism and Electromagnetism
	20	BCE114	Introduction to Alternating Current and Voltage
	10	BCE115	Oscilloscopes and Electronic Test Lab Equipment
10	BCE116	Capacitors	
20	BCE117	RC Circuits	
10	BCE118	Inductors	
20	BCE119	RL Circuits	

2	20	<i>BCE120</i>	RLC Circuits and Resonance
	20	<i>BCE121</i>	Transformers
	15	<i>IE101</i>	Electric Motors
	15	<i>IE102</i>	Relays
	20	<i>IE103</i>	Industrial Controls, Sensors and Instrumentation
	15	<i>IE104</i>	Mechanical Power Transmission
	40	<i>IE105</i>	Programmable Logic Controllers
	10	<i>REE102</i>	Circuit Protection Devices
	25	<i>REE103</i>	Residential Branch Circuit Wiring
	20	<i>REE104</i>	New Home Electronics
	10	<i>REE105</i>	Lighting Technology
	20	<i>SSE101</i>	Introduction to Semiconductors
	20	<i>SSE102</i>	Diodes and Applications
	10	<i>SSE103</i>	Special-Purpose Diodes & Thyristors
	10	<i>SSE104</i>	Bipolar Junction Transistors (BJTs)
	20	<i>SSE105</i>	BJT Transistor Bias Circuits
	20	<i>SSE106</i>	BJT Amplifiers
	10	<i>SSE107</i>	Field-Effect Transistors (FETs)
	20	<i>SSE108</i>	Amplifiers and Oscillators
20	<i>SSE109</i>	Operational Amplifiers (Op-Amps)	
3	20	<i>DE101</i>	Number Systems, Operations, and Codes
	20	<i>DE102</i>	Introductory Digital Concepts
	20	<i>DE103</i>	Digital Logic Gates
	20	<i>DE104</i>	Boolean Algebra and Logic Simplification
	10	<i>DE105</i>	Combinational Logic
	15	<i>SSE110</i>	Integrated Circuits
	15	<i>ME101</i>	Introduction to Microcomputers
	40	<i>ME102</i>	Programmable Microcontrollers
	20	<i>ME103</i>	Introduction to Robotics
	20	<i>COM101</i>	Wireless Communications
	20	<i>COM102</i>	Cabling
	20	<i>COM103</i>	Wired Communications
	30	<i>ME104</i>	Basic Computer Systems
	10	<i>MDF104</i>	Introduction to Nanotechnology
	15	<i>REE106</i>	Advanced Circuit Systems & Consumer Electronics
20	<i>PG101</i>	Introduction to Electric Power Generation	
20	<i>PG102</i>	Introduction to Alternative Energy	
15	<i>BCE122</i>	Circuit Troubleshooting	
10	<i>JS101</i>	Job Seeking/Keeping & Leadership Skills	

Total
Hours: 1080

Objectives:

Electronics Technology Student Competency List

H - Highly skilled, able to work independently

M - Moderately skilled, requires minimum supervision

L - Limited skills, requires full supervision

N - Not applicable

BCE101 Safety and Class Introduction

H	M	L	N	1	Outline safety rules and safe practices that apply to conditions in the home, outdoors, school lab, and on the job.
H	M	L	N	2	Demonstrate an understanding of State and School safety regulations. Identify and follow the Electronic Technology Program's Rules and Procedures
H	M	L	N	3	Demonstrate an understanding of proper fire drill procedures.
H	M	L	N	4	List the procedures to be followed in the case of an electrical fire.
H	M	L	N	5	Name and give the definition of the four classes of fires and the type of extinguisher used.
H	M	L	N	6	Explain the factors that determine the severity of an electric shock.
H	M	L	N	7	Outline the first-aid procedure for bleeding, burns, and electric shock.
H	M	L	N	8	Describe the mouth-to-mouth method of artificial respiration.
H	M	L	N	9	Interpret Material Safety Data Sheets (MSDS).
H	M	L	N	10	Identify hazardous materials and describe their characteristics.
H	M	L	N	11	Name the three ways in which a toxic substance can enter your body.
H	M	L	N	12	Define the terms chemical hazard, physical hazard, and health hazard.
H	M	L	N	13	Explain the environmentally-safe disposal procedures for electronics equipment.
H	M	L	N	14	Describe lockout and tagging rules for potentially unsafe electrical or mechanical hazards
H	M	L	N	15	Describe how to lift, carry, and put down a load.
H	M	L	N	16	State the purpose of the OSHA Act.
H	M	L	N	17	

BCE102 History of Electricity

H	M	L	N	1	Explain pre-discovery (2750 BC) phenomena by the Egyptian, Greek and Romans
H	M	L	N	2	Describe the Greek studies of static electricity
H	M	L	N	3	Explain the discovery of magnetism (lodestone)
H	M	L	N	4	Describe the Arab understanding of electricity in the 15th century
H	M	L	N	5	Explain the discovery of electricity from 1600 to 1800 by Gilbert, Guericke, Gray, Franklin and Galvani
H	M	L	N	6	Explain how the battery was developed and evolved.
H	M	L	N	7	Describe experiments by Faraday, Henry and Ampere that linked electricity and magnetism
H	M	L	N	8	Describe the evolution of modern power and light with the roles of inventor's Tesla and Edison
H	M	L	N	9	Describe the evolution of modern electronics in radio and TV
H	M	L	N	10	Explain the development evolution and relationship of tube technology and the transistor

BCE103 Components, Quantities, and Unit Conversion

H	M	L	N	1	Recognize some common electrical components and measuring instruments
H	M	L	N	2	State basic electrical and magnetic quantities and their units
H	M	L	N	3	Use scientific notation (powers of ten) to express quantities
H	M	L	N	4	Use engineering notation and metric prefixes to express large and small values
H	M	L	N	5	Define metric prefixes and convert metric units of measurements

H	M	L	N	6	Identify the basic schematic symbols for: resistors, capacitors, switches, batteries, potentiometer, etc...
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BCE104 Atoms, Charge and Color Code

H	M	L	N	1	Describe the basic structure of an atom Explain the relationship between atomic structure and the conductor / insulator property of materials.
H	M	L	N	2	
H	M	L	N	3	Explain the concept of electrical charge Explain the difference between electron and conventional current theory
H	M	L	N	4	
H	M	L	N	5	Define voltage and discuss its characteristics
H	M	L	N	6	Define current and discuss its characteristics
H	M	L	N	7	Discuss resistance and its characteristics Identify resistors by their color code, or given the color code for a given resistor value
H	M	L	N	8	
H	M	L	N	9	Describe a basic electrical circuit : Source, Conductor, Load
H	M	L	N	10	Design Basic circuit structure

BCE105 Ohm's & Watt's Law, Energy, and Power

H	M	L	N	1	Explain Ohm's Law
H	M	L	N	2	Use Ohm's Law to determine voltage, current, or resistance
H	M	L	N	3	Explain Watt's Law
H	M	L	N	4	Use Watt's Law to determine voltage, current, or wattage
H	M	L	N	5	Properly select resistors based on power consideration Describe a basic approach to troubleshooting using Ohms and Watts Law
H	M	L	N	6	
H	M	L	N	7	Define Energy and Power
H	M	L	N	8	Identify and use KWH
H	M	L	N	9	Properly read a residential electric meter
H	M	L	N	10	Calculate power usage and total electric costs per KWH

BCE106 Measuring Voltage, Current and Resistance

H	M	L	N	1	Compare the operation of analog and digital meters.
H	M	L	N	2	Correctly read an analog meter scale with varying ranges.
H	M	L	N	3	Correctly set and read a digital multi-meter.
H	M	L	N	4	Use a multimeter to measure voltage, current, and resistance.
H	M	L	N	5	List the safety precautions to be observed when using multimeters.
H	M	L	N	6	Explain the multimeter specifications and special features

BCE107 Hand Tools and Fasteners

H	M	L	N	1	Identify and state the use for common electrical/electronic measuring devices.
H	M	L	N	2	Identify and state the use for common tools used in the electrical/electronic industry. List tool hazards that are associated with technician activities in the workplace and in the field.
H	M	L	N	3	Explain the proper usage of numerous basic hand tools
H	M	L	N	4	List proper equipment care routines
H	M	L	N	5	Identify and state the features of common fastening devices.

BCE108 Electric Connections

H	M	L	N	1	Describe the negative effects of a poorly formed electric connection.
H	M	L	N	2	Properly remove insulation from a wire.
H	M	L	N	3	Correctly install terminal-screw, crimp-on, and mechanical connectors.
H	M	L	N	4	Explain the principles of soldering.
H	M	L	N	5	Describe insulating wiring with heat shrink and electrical tape.

H	M	L	N	6	Properly insulate wire repairs.
H	M	L	N	7	Assemble, test, and install cables used as part of electronic interconnection systems.

BCE109 Batteries

					Compare the characteristics, applications and design of different types of cells.
H	M	L	N	1	
H	M	L	N	2	Explain the ways in which cells and batteries are rated. Design a suitable connection of cells to obtain a desired voltage and current capacity.
H	M	L	N	3	
H	M	L	N	4	Explain how cells and batteries are tested.
H	M	L	N	5	Properly charge a rechargeable battery.

BCE110 Series Circuits

H	M	L	N	1	Identify a series circuit
H	M	L	N	2	Determine the current and voltage in a series circuit
H	M	L	N	3	Determine the total resistance in a series circuit
H	M	L	N	4	Apply Ohm's Law in a series circuit Determine the total effect of voltage sources in series (aiding and opposing)
H	M	L	N	5	
H	M	L	N	6	Apply Kirchhoff's voltage law
H	M	L	N	7	Determine power in a series circuit
H	M	L	N	8	Use a series circuit as a voltage divider
H	M	L	N	9	Determine and identify ground and reference points in a series circuit Construct a series resistive circuit and compare calculations to measurements.
H	M	L	N	10	
H	M	L	N	11	Troubleshoot series circuits

BCE111 Parallel Circuits

H	M	L	N	1	Identify a parallel circuit
H	M	L	N	2	Determine the voltage across a parallel circuit
H	M	L	N	3	Apply Kirchhoff's Current Law
H	M	L	N	4	Determine total parallel resistance
H	M	L	N	5	Apply Ohm's Law in a parallel circuit
H	M	L	N	6	Use a parallel circuit as a current divider
H	M	L	N	7	Determine power in a parallel circuit Construct a parallel resistive circuit and compare calculations to measurements.
H	M	L	N	8	
H	M	L	N	9	Troubleshoot parallel circuits
H	M	L	N	10	Describe some basic applications of parallel circuits

BCE112 Series-Parallel Combination Circuits

H	M	L	N	1	Identify series-parallel relationships
H	M	L	N	2	Analyze a series-parallel circuit
H	M	L	N	3	Analyze loaded voltage dividers
H	M	L	N	4	Determine the loading effect of a voltmeter on a circuit
H	M	L	N	5	Analyze a Wheatstone bridge
H	M	L	N	6	Analyze a circuit with more than one source Apply Thevenin's theorem to simplify a circuit to create equivalent circuits.
H	M	L	N	7	
H	M	L	N	8	Calculate total resistance of a series-parallel circuit with multiple resistors Calculate voltage, current, resistance and power in a series/parallel combination circuits
H	M	L	N	9	
H	M	L	N	10	Construct series/parallel combination circuits and compare calculations to measurements.
H	M	L	N	11	Measure voltage and current and resistance in a series/parallel circuit

H M L N 12 Troubleshoot series-parallel circuits

MDF101 Soldering and Printed Circuit Board Fabrication

H M L N 1 Explain the cause of solder fumes and the effects of lead poisoning

H M L N 2 List causes and precautions to prevent or reduce solder splatter

H M L N 3 Describe the proper usage of soldering irons and aids

H M L N 4 List types of solder and reasons for choosing each

H M L N 5 Describe flux and explain its purposes

H M L N 6 Describe cold – defective solder joints and list reasons they occur

H M L N 7 Explain heat shunts, why and how they are used

H M L N 8 Make a neat, clean, strong, and electrically solid solder connection

H M L N 9 Properly mount and solder thru-hole components to a PCB.

H M L N 10 Properly desolder and replace thru-hole components on a PCB.

H M L N 11 Explain how desoldering equipment and aids are used
Remove components from electronic circuits without damaging the circuit or leaving excess solder behind

H M L N 12

H M L N 13 Demonstrate the use of braid-wick solder removers

H M L N 14 Describe methods of replacing surface mount components

H M L N 15 Properly mount and solder surface mount components to a PCB.

H M L N 16 Properly desolder and replace surface mount components on a PCB.

H M L N 17 Explain how hot air bonding equipment is used
Define RoHS (Restriction of Hazardous Substances) and explain its purpose

H M L N 18

H M L N 19 Describe the different ways in which a PCB is constructed.

H M L N 20 Explain the photographic and print-and-etch processes.
Properly use industry approved circuit design software to develop a printed circuit board

H M L N 21 Print PCB layout design and use Press & Peel to apply traces to PCB board.

H M L N 22

H M L N 23 Develop a printed circuit board using the print etch method

MDF102 Circuit Design Software

H M L N 1 Develop a working circuit using a circuit design software package
Convert a schematic to a PCB layout using industry approved software.

H M L N 2

H M L N 3 Simulate breadboard construction using the virtual breadboard.
Properly connect and run simulated voltmeters, ammeters and ohmmeters.

H M L N 4

H M L N 5 Properly add description boxes to circuits

H M L N 6 Run and analyze circuit simulations.

H M L N 7 Properly connect and run simulated oscilloscopes to circuits

H M L N 8 Properly connect and run simulated frequency counters

H M L N 9 Properly connect and run simulated bode plotter to amplifier circuits

H M L N 10 Make adjustments to a simulated spectrum analyzer.

H M L N 11 Perform simulation circuit troubleshooting to find circuit faults.

H M L N 12 Export a functioning simulated circuit to a PCB layout program
Develop a PCB layout making adjustments to trace routing and parts placement.

H M L N 13

MDF103 Electronic Manufacturing Industry

H M L N 1 Student can explain the idea of engineering a product.

H M L N 2 Student can explain contracted manufacturing.
Student can explain what is meant by after market servicing and product updating / calibration.

H M L N 3

H M L N 4 Explain what a "flying probe" does.

H M L N 5 Describe a "pick and place" machine.

H	M	L	N	6	Describe a "semi-automated pick and place" machine
H	M	L	N	7	Explain how a wave solder machine works
H	M	L	N	8	Describe what is meant by a "box build"
H	M	L	N	9	Explain common steps in "parts preparation"
H	M	L	N	10	Describe why ESD protection is important and common practices.

REE101 Circuit Conductor Sizes and Applications

H	M	L	N	1	Identify uses for different conductor forms.
H	M	L	N	2	Properly select wire-insulating materials.
H	M	L	N	3	Compare the AWG size and diameter of conductors.
H	M	L	N	4	List the factors that determine a conductor's ampacity rating. Identify the factors that contribute to the resistance value of a conductor.
H	M	L	N	5	
H	M	L	N	6	Calculate a conductors Resistivity
H	M	L	N	7	Calculate line-voltage drop and line power loss.
H	M	L	N	8	Identify and select the proper cord for common applications.
H	M	L	N	9	Properly connect a two-prong plug cap.
H	M	L	N	10	Properly connect a three-prong plug cap.
H	M	L	N	11	Explain the purpose and method of grounding appliances. Distinguish between the live, neutral, and grounding conductors of an appliance circuit.
H	M	L	N	12	
H	M	L	N	13	Explain the operation of ground-fault circuit interrupter (GFCI).

BCE113 Magnetism and Electromagnetism

H	M	L	N	1	Explain the principles of magnetic fields
H	M	L	N	2	Discuss Lenz's and Faraday's Laws
H	M	L	N	3	Explain the four factors that directly effect an electromagnets strength.
H	M	L	N	4	Calculate an Electromagnet strength in Ampere/Turns
H	M	L	N	5	Calculate a materials permeability.
H	M	L	N	6	Calculate a materials retentivity. Describe the principle of operation for several types of electromagnetic devices
H	M	L	N	7	
H	M	L	N	8	Describe magnetic shielding.
H	M	L	N	9	Explain magnetic hysteresis
H	M	L	N	10	Discuss the principle of electromagnetic induction
H	M	L	N	11	Describe some applications of electromagnetic induction

BCE114 Introduction to Alternating Current and Voltage

H	M	L	N	1	Identify a sinusoidal waveform and measure its characteristics
H	M	L	N	2	Describe how sine waves are generated
H	M	L	N	3	Find the radian / degree relationship of an AC sine-wave
H	M	L	N	4	Determine the voltage and current values of sine waves
H	M	L	N	5	Describe angular relationships of sine waves
H	M	L	N	6	Mathematically analyze a sinusoidal waveform
H	M	L	N	7	Find: A.C. instantaneous values
H	M	L	N	8	Measure Duty cycle of a sine-wave, square-wave and triangle-wave.
H	M	L	N	9	Apply the basic circuit laws to ac resistive circuits
H	M	L	N	10	Determine total voltages which have both ac and dc components
H	M	L	N	11	Identify the characteristics of basic nonsinusoidal waveforms

BCE115 Oscilloscopes and Electronic Test Lab Equipment

H	M	L	N	1	Operate an oscilloscope to observe and measure signals. State the various functions of the basic front-panel controls of an oscilloscope.
H	M	L	N	2	
H	M	L	N	3	Obtain a sweep on an oscilloscope
H	M	L	N	4	Measure A.C. (Frequency, Time and Period) w/ a 'scope

H	M	L	N	5	List the purposes and types of signal generators
H	M	L	N	6	Set frequency and voltage with a signal generator
H	M	L	N	7	Compare the output signals of audio, function, pulse, and radio frequency signal generators.
H	M	L	N	8	Define specifications related to lab power supplies.
H	M	L	N	9	Design and build a simple Wheatstone-bridge resistance measurement circuit.
H	M	L	N	10	Explain the use and proper operation of a Logic probe.
H	M	L	N	11	Discuss power supplies and their characteristics

BCE116 Capacitors

H	M	L	N	1	Describe the basic structure and characteristics of a capacitor
H	M	L	N	2	Construct a capacitor
H	M	L	N	3	Discuss various types of capacitors and their dielectric constants.
H	M	L	N	4	Discuss the capacitor charge and discharge curve and calculate the RC time constant
H	M	L	N	5	Describe the effects of wiring capacitors in series.
H	M	L	N	6	Describe the effects of wiring capacitors in parallel.
H	M	L	N	7	Describe how a capacitor operates in a dc switching circuit
H	M	L	N	8	Discuss some capacitor applications
H	M	L	N	9	Test a capacitor

BCE117 RC Circuits

H	M	L	N	1	Describe the relationship between current and voltage in an RC circuit
H	M	L	N	2	Determine impedance and phase angle in a series RC circuit
H	M	L	N	3	Construct an R.C. circuit
H	M	L	N	4	Calculate all characteristics of an AC series RC circuit
H	M	L	N	5	Measure A.C. phase shift of an R.C. circuit with a 'scope
H	M	L	N	6	Determine impedance and phase angle in a parallel RC circuit
H	M	L	N	7	Calculate all characteristics of an AC parallel RC circuit
H	M	L	N	8	Analyze series-parallel circuits
H	M	L	N	9	Determine power in RC circuits
H	M	L	N	10	Discuss some basic RC applications
H	M	L	N	11	Troubleshoot RC circuits
H	M	L	N	12	Explain the operation of RC low-pass filters
H	M	L	N	13	Explain the operation of RC high-pass filters
H	M	L	N	14	Explain the operation of RC band pass filters

BCE118 Inductors

H	M	L	N	1	Describe the basic structure and characteristics of an inductor
H	M	L	N	2	Construct an inductor
H	M	L	N	3	Discuss various types of inductors
H	M	L	N	4	Explain how inductance relates to magnetism and describe coil construction, cores and usages
H	M	L	N	5	Calculate RL time constants
H	M	L	N	6	Analyze series inductors
H	M	L	N	7	Analyze parallel inductors
H	M	L	N	8	Analyze inductive dc switching circuits
H	M	L	N	9	Discuss some inductor applications
H	M	L	N	10	Test an inductor

BCE119 RL Circuits

H	M	L	N	1	Describe the relationship between current and voltage in an RL circuit
H	M	L	N	2	Determine impedance and phase angle in a series RL circuit
H	M	L	N	3	Calculate all characteristics of an AC series RL circuit
H	M	L	N	4	Measure A.C. phase shift of an R.L. circuit with a 'scope

H	M	L	N	5	Determine impedance and phase angle in a parallel RL circuit
H	M	L	N	6	Calculate all characteristics of an AC parallel RL circuit
H	M	L	N	7	Analyze series-parallel RL circuits
H	M	L	N	8	Determine power in RL circuits
H	M	L	N	9	Discuss some basic RL applications
H	M	L	N	10	Construct an R.L. circuit
H	M	L	N	11	Troubleshoot RL circuits
H	M	L	N	12	Explain the operation of RL low-pass filters
H	M	L	N	13	Explain the operation of RL high-pass filters
H	M	L	N	14	Explain the operation of RL band pass filters

BCE120 RLC Circuits and Resonance

H	M	L	N	1	Determine the impedance and phase angle of a series RLC circuit
H	M	L	N	2	Analyze series RLC circuits design
H	M	L	N	3	Analyze a circuit for series resonance
H	M	L	N	4	Determine resonant frequency in a series circuit
H	M	L	N	5	Construct a vector diagram of an RLC circuit
H	M	L	N	6	Construct a series R.L.C. circuit
H	M	L	N	7	Perform R.L.C. circuit calculations
H	M	L	N	8	Calculate Bandwidth of an R.L.C. circuit
H	M	L	N	9	Measure Bandwidth of an R.L.C. circuit
H	M	L	N	10	Measure A.C. phase shift of an R.L.C. circuit with a 'scope
H	M	L	N	11	Calculate parallel RLC circuits
H	M	L	N	12	Analyze a circuit for parallel resonance
H	M	L	N	13	Discuss some system applications of resonant circuits

BCE121 Transformers

H	M	L	N	1	Explain mutual inductance
H	M	L	N	2	Describe how a transformer is constructed and how it works
H	M	L	N	3	Explain the operation of a center-tap transformer.
H	M	L	N	4	Describe the Construction of a Tesla Coil
H	M	L	N	5	Explain how a step-up transformer works
H	M	L	N	6	Explain how a step-down transformer works
H	M	L	N	7	Perform Transformer (ratio and voltage) calculations
H	M	L	N	8	Discuss the effect of a resistive load across the secondary winding
H	M	L	N	9	Discuss the concept of a reflective load in a transformer
H	M	L	N	10	Discuss impedance matching with transformers
H	M	L	N	11	Explain how the transformer acts as an isolation device
H	M	L	N	12	Explain why laminations are used
H	M	L	N	13	Explain the operation of a auto-transformer.
H	M	L	N	14	Residential uses for transformers
H	M	L	N	15	Describe several types of transformers
H	M	L	N	16	Describe the similarities of transformer operation to the theory of radio.
H	M	L	N	17	Troubleshoot transformers

IE101 Electric Motors

H	M	L	N	1	Explain the basic motor operating principle. Describe the construction, connection, and operating characteristics of dc motors.
H	M	L	N	2	Describe the construction, connection, and operating characteristics of the universal motor.
H	M	L	N	3	Describe the construction, connection, and operating characteristics of ac single-phase and polyphase motors.
H	M	L	N	4	Explain the relationship between motor power, speed, and torque.
H	M	L	N	5	Diagnose common motor problems.
H	M	L	N	6	

IE102 Relays

H	M	L	N	1	Compare electromagnetic and solid-state relays.
H	M	L	N	2	Identify relay symbols used on schematic diagrams.
H	M	L	N	3	Describe the different ways in which relays are used.
H	M	L	N	4	Explain how relays are rated.
H	M	L	N	5	Describe the operation of ON-delay and OFF-delay timer relays.
H	M	L	N	6	Setup and operate a time delay Relay circuit.
H	M	L	N	7	Setup and operate a computer controlled relay circuit.

IE103 Industrial Controls, Sensors and Instrumentation

H	M	L	N	1	Explain the principles and connections of motor protection circuits. List and describe the methods and equipment by which a motor may be started.
H	M	L	N	2	Describe the operation of reversing and jogging motor-control circuits.
H	M	L	N	3	List the methods of stopping a motor.
H	M	L	N	4	Explain the operating principles of variable-speed motor drives.
H	M	L	N	5	Describe the uses of operation of thermocouples
H	M	L	N	6	Describe a thermopile. Demonstrate ability to install and troubleshoot interconnecting wiring of industrial electronics equipment
H	M	L	N	7	List the signal types, frequencies and levels required for interconnecting industrial equipment
H	M	L	N	8	Describe the operation of a inductive proximity sensor.
H	M	L	N	9	Setup and operate an inductive proximity sensor
H	M	L	N	10	Describe the operation of a photoelectric sensor.
H	M	L	N	11	Setup and operate an photoelectric sensor
H	M	L	N	12	Describe the operation of a fiber optic sensor.
H	M	L	N	13	Setup and operate an fiber optic sensor
H	M	L	N	14	Describe the operation of a capacitive proximity sensor.
H	M	L	N	15	Setup and operate an capacitive proximity sensor
H	M	L	N	16	Describe the operation of a ultrasonic sensor.
H	M	L	N	17	Setup and operate an ultrasonic sensor
H	M	L	N	18	Describe the operation of a pressure sensor.
H	M	L	N	19	Setup and operate an pressure sensor
H	M	L	N	20	Describe the operation of a current sensing transducer.
H	M	L	N	21	Setup and operate a current sensing transducer.
H	M	L	N	22	Explain the concepts of process controllers.
H	M	L	N	23	
H	M	L	N	24	

IE104 Mechanical Power Transmission

H	M	L	N	1	Using two pulleys of different size calculate ratio's and R.P.M.
H	M	L	N	2	Using two pulleys of different size calculate Belt sizes
H	M	L	N	3	Using two gears of different sizes calculate ratio's and R.P.M.
H	M	L	N	4	Calculating Horsepower and Wattages in electric motors

IE105 Programmable Logic Controllers

H	M	L	N	1	Convert a basic line diagram into a PLC line diagram using the proper PLC symbols. Convert a PLC line diagram into a basic line diagram using standard electrical symbols.
H	M	L	N	2	Identify each input in a standard line diagram and state its proper address as applied when programming the PLC diagram.
H	M	L	N	3	Call up the PLC software program, enter the edit mode, and program a basic PLC circuit.
H	M	L	N	4	Download a programmed circuit from the computer to the PLC and test the circuit's operation.
H	M	L	N	5	

H	M	L	N	6	Monitor a programmed circuit operation on the computer and using the PLC input/output status indicator LEDs.
H	M	L	N	7	Add Documentation to any programmed circuit.
H	M	L	N	8	Program, download, wire, and test a circuit that demonstrates AND switching logic.
H	M	L	N	9	Program, download, wire, and test a circuit that demonstrates OR switching logic.
H	M	L	N	10	Program, download, wire, and test a circuit that demonstrates NOT switching logic.
H	M	L	N	11	Program, download, wire, and test a circuit that demonstrates NOT-NOT switching logic.
H	M	L	N	12	Program, download, wire, and test a circuit that demonstrates NAND switching logic.
H	M	L	N	13	Program, download, wire, and test a circuit that demonstrates NOR switching logic.
H	M	L	N	14	Program, download, wire, and test a circuit that demonstrates programming circuit memory logic.
H	M	L	N	15	Program, download, wire, and test a circuit that demonstrates set/reset circuit.
H	M	L	N	16	Program, download, wire, and test a circuit that demonstrates a standard start/stop motor control circuit.
H	M	L	N	17	Program, download, wire, and test a circuit that demonstrates how a single-input ON-delay timer operates.
H	M	L	N	18	Program, download, wire, and test a circuit that demonstrates how a dual-input ON-delay timer operates.
H	M	L	N	19	Program, download, wire, and test a circuit that demonstrates how a spotlight timing sequence circuit operates.
H	M	L	N	20	Write a program for the required order in which pushbuttons and limit switches must be activated to produce a predetermined circuit sequence.
H	M	L	N	21	Program, download, wire, and test a circuit that demonstrates programming an up counter.
H	M	L	N	22	Program, download, wire, and test a circuit that combines up counters and timers.
H	M	L	N	23	Program, download, wire, and test a circuit that demonstrates programming an up/down counter.
H	M	L	N	24	Program, download, wire, and test a circuit that demonstrates programming a stage counter.
H	M	L	N	25	Program, download, wire, and test a circuit that demonstrates how Equal-To comparative contacts are used.
H	M	L	N	26	Program, download, wire, and test a circuit that demonstrates how Not-Equal-To comparative contacts are used.
H	M	L	N	27	Program, download, wire, and test a circuit that demonstrates how Greater-Than comparative contacts are used.
H	M	L	N	28	Program, download, wire, and test a circuit that demonstrates how Less-Than comparative contacts are used.
H	M	L	N	29	Add additional END instructions into a circuit to aid in system start-ups and circuit troubleshooting.
H	M	L	N	30	Program a STOP instruction into a circuit to automatically move a circuit from a run mode to a stop mode and turn off all outputs.

REE102 Circuit Protection Devices

H	M	L	N	1	Define the terms overload and short circuit.
H	M	L	N	2	Compare the basic principle of operation of a fuse and a circuit breaker.
H	M	L	N	3	State how fuses and circuit breakers are rated.
H	M	L	N	4	Identify basic fuse types and typical applications.
H	M	L	N	5	Test fuses and circuit breakers in and out of circuits.
H	M	L	N	6	Explain how lightning rods and arresters protect electrical equipment.

REE103 Residential Branch Circuit Wiring

H	M	L	N	1	Outline the purpose of the National Electrical Code (NEC) and the method of code enforcement.
H	M	L	N	2	Identify the components of an incoming service.
H	M	L	N	3	Draw the schematic for a three-wire distribution system.
H	M	L	N	4	State common NEC requirements that pertain to residential wiring. Explain the purpose and process involved in grounding and overcurrent protection.
H	M	L	N	5	Define the term branch circuit as it applies to the NEC.
H	M	L	N	6	Outline NEC branch circuit requirements for different areas of a home.
H	M	L	N	7	Describe the physical features of a split receptacle.
H	M	L	N	8	Complete typical branch circuit schematic and wiring diagrams.
H	M	L	N	9	Wire typical branch circuits in accordance with the guidelines of the NEC.
H	M	L	N	10	Explain the purpose and method of grounding appliances.
H	M	L	N	11	Distinguish between the live, neutral, and grounding conductors of an appliance circuit.
H	M	L	N	12	Explain the operation of ground-fault circuit interrupter (GFCI).
H	M	L	N	13	

REE104 New Home Electronics

H	M	L	N	1	Identify and explore HVAC systems
H	M	L	N	2	Discuss programmable controls in the home Explain major components of the most common home entertainment products
H	M	L	N	3	Identify and Discuss Home Audio systems
H	M	L	N	4	Identify SMART home concepts
H	M	L	N	5	Describe low voltage lighting, its usage and precautions
H	M	L	N	6	Describe current audio signal and speaker cabling and wiring Describe control and sensor wiring used for home automation and manual operation
H	M	L	N	7	Diagram a basic telephone circuit
H	M	L	N	8	Explain basic concepts of DTV/HDTV reception (Digital TV and High Definition TV)
H	M	L	N	9	Explain how alarm-security systems may be interfaced with entertainment/information products
H	M	L	N	10	Explain speaker construction and precautions
H	M	L	N	11	Explain when, why and how to use in-line amplifiers
H	M	L	N	12	
H	M	L	N	13	

REE105 Lighting Technology

H	M	L	N	1	Describe the operating principle of an incandescent lamp.
H	M	L	N	2	Repair a table lamp.
H	M	L	N	3	Install a light fixture.
H	M	L	N	4	Describe the operating principle of a fluorescent light fixture.
H	M	L	N	5	Describe the operating principles of high-intensity discharge lamps.
H	M	L	N	6	Describe new lighting technologies like LED.
H	M	L	N	7	Install security lighting devices.

SSE101 Introduction to Semiconductors

H	M	L	N	1	Identify and define what is meant by majority and minority carrier in P and N type semiconductors
H	M	L	N	2	Discuss the basic structure of semiconductors
H	M	L	N	3	Discuss covalent bonding in silicon Explain basic atomic theory as it relates to the behavior of electrons in conductors, semiconductors and insulators
H	M	L	N	4	Explain how the depletion region of a PN junction is produced and how bias changes the width of the depletion region
H	M	L	N	5	Explain how current occurs in a semiconductor
H	M	L	N	6	

H	M	L	N	7	Discuss the characteristics of doped semiconductors
H	M	L	N	8	Describe the characteristics of a pn junction
H	M	L	N	9	Explain how to bias a pn junction Explain the effects of forward and reverse bias on a PN junction
H	M	L	N	10	relating the voltage versus current characteristics Graphically illustrate & label the forward and reverse bias
H	M	L	N	11	characteristics for si and ge PN junctions Give typical values of barrier potential for silicon and germanium PN
H	M	L	N	12	junctions
H	M	L	N	13	Test semiconductor diodes
H	M	L	N	14	Describe the basic diode characteristics

SSE102 Diodes and Applications

					Explain shock hazards when servicing power supplies in electronic equipment
H	M	L	N	1	
H	M	L	N	2	Analyze the operation of a half-wave rectifier
H	M	L	N	3	Analyze the operation of a full-wave rectifier
H	M	L	N	4	Describe the operation of power supply filters Calculate the average DC volt. & current of three common rectifier
H	M	L	N	5	circuits given RMS input voltage and load resist. Explain the reasons for filtering; describe hum; identify common filter
H	M	L	N	6	types Given the AC RMS source voltage, predict the peak DC output voltage
H	M	L	N	7	of a rectifier circuit with a capacitor filter Calculate the required size of a filter capacitor needed to reduce ripple
H	M	L	N	8	from a rectifier circuit
H	M	L	N	9	Analyze the operation of diode limiters and clampers
H	M	L	N	10	Interpret a typical data sheet and ECG Data Manual
H	M	L	N	11	Construct and operate a half-wave rectifier circuit
H	M	L	N	12	Construct and operate a full-wave bridge rectifier circuit
H	M	L	N	13	Construct and operate a, full-wave, CT transformer, rectifier circuit
H	M	L	N	14	Apply LC filtration to half-wave and full-wave rectifier circuits
H	M	L	N	15	Troubleshoot rectifier circuits
H	M	L	N	16	Explain the operation of a voltage multiplier.

SSE103 Special-Purpose Diodes & Thyristors

H	M	L	N	1	Describe the characteristics of a zener diode and analyze its operation Explain how a zener is used in voltage regulation and limiting and
H	M	L	N	2	analyze zener circuits Explain the avalanche and zener reverse breakdown modes of a PN
H	M	L	N	3	junction
H	M	L	N	4	Troubleshoot zener diode regulators
H	M	L	N	5	Describe the operation of basic series and shunt voltage regulators
H	M	L	N	6	Describe the basic operation of a varactor diode
H	M	L	N	7	Discuss the operation and application of LEDs and photodiodes
H	M	L	N	8	Discuss the operation and application of RGB LEDs. Describe the variable-capacitance characteristics of a varactor diode
H	M	L	N	9	and analyze its operation in a typical circuit
H	M	L	N	10	Discuss the operation and application of the UJT Explain the basic structure and operation of the SCR, the triac, and the
H	M	L	N	11	diac Construct a power control circuit using a Silicon Controlled Rectifier
H	M	L	N	12	(SCR)
H	M	L	N	13	Construct a power control circuit using a Triac
H	M	L	N	14	Construct a power control circuit using a Diac

SSE104 Bipolar Junction Transistors (BJTs)

H	M	L	N	1	Describe the basic operation of the Diode and Triode Tube and there relationship to the transistor.
H	M	L	N	2	Describe the basic structure and operation of bipolar junction transistors and NPN / PNP transistors
H	M	L	N	3	Explain with a schematic symbol for an NPN and a PNP transistor how the device is normally biased
H	M	L	N	4	Explain how a transistor is biased and discuss the transistor currents and their relationships
H	M	L	N	5	Relate the emitter, base and collector currents of a bipolar transistor. Define beta (HFE)
H	M	L	N	6	Discuss transistor parameters and characteristics and use these to analyze a transistor circuit
H	M	L	N	7	Explain the operation of a bipolar transistor as an amplifier
H	M	L	N	8	Analyze a transistor switching circuit
H	M	L	N	9	Discuss important transistor parameters and maximum ratings
H	M	L	N	10	Recognize transistor packages and identify the terminals

SSE105 BJT Transistor Bias Circuits

H	M	L	N	1	Calculate all parameters of a dual power supply transistor bias circuits
H	M	L	N	2	Perform voltage-divider bias transistor calculations
H	M	L	N	3	Perform Alpha and Beta Calculations
H	M	L	N	4	Troubleshoot various faults in transistor bias circuits

SSE106 BJT Amplifiers

H	M	L	N	1	Understand the amplifier concept
H	M	L	N	2	Identify and apply internal transistor parameters
H	M	L	N	3	Calculate the Q-point for a voltage -divider transistor circuit
H	M	L	N	4	Construct a Bipolar transistor amp
H	M	L	N	5	Calculate Gain/loss for the bipolar transistor amp
H	M	L	N	6	Calculate Gain/loss for the bipolar transistor amp using decibels (dB)
H	M	L	N	7	Understand and analyze the operation of common-emitter amplifiers
H	M	L	N	8	Understand and analyze the operation of common-collector amplifiers
H	M	L	N	9	Understand and analyze the operation of common-base amplifiers
H	M	L	N	10	Construct a CB amp (common base)
H	M	L	N	11	Construct a CC amp (common collector)
H	M	L	N	12	Construct a CE amp (common emitter)
H	M	L	N	13	Explain the modes of operation - Class A, B, C etc... Show causes of distortion in amplifiers and list ways to reduce or eliminate it
H	M	L	N	14	
H	M	L	N	15	Discuss multistage amplifiers and analyze their operation
H	M	L	N	16	Explain the uses and operation of a Darlington pair.
H	M	L	N	17	Troubleshoot amplifier circuits

SSE107 Field-Effect Transistors (FETs)

H	M	L	N	1	Explain the operation of JFETs
H	M	L	N	2	Describe the basic structure and operation of a JFET
H	M	L	N	3	Explain the operation of a JFET in terms of its characteristics
H	M	L	N	4	Explain the basic structure and operation of MOSFET
H	M	L	N	5	Analyze several biasing arrangements for JFETs and MOSFETs
H	M	L	N	6	Construct and operate a D-MOSFET transistor circuit
H	M	L	N	7	Construct and operate a E-MOSFET transistor circuit
H	M	L	N	8	Troubleshoot FET circuits

SSE108 Amplifiers and Oscillators

H	M	L	N	1	Construct an operate and Tank circuit as an oscillator
H	M	L	N	2	Discuss the theory and analyze the operation of several types of

					oscillators
H	M	L	N	3	Explain the purpose of oscillators
H	M	L	N	4	Discuss the operation of a 555 Timer and its applications.
H	M	L	N	5	Construct a 555 timer circuit
H	M	L	N	6	Vary the frequency and duty cycle on a 555 timer circuit
H	M	L	N	7	Calculate Gain for the 741 OP-amp
H	M	L	N	8	Construct a 741 opamp circuit
H	M	L	N	9	Construct a closed loop 741 opamp circuit
H	M	L	N	10	Troubleshoot amplifier circuits

SSE109 Operational Amplifiers (Op-Amps)

H	M	L	N	1	Discuss the basic op-amp
H	M	L	N	2	Explain the basic operation of a differential amplifier
H	M	L	N	3	Interpret op-amp data sheets
H	M	L	N	4	Analyze the noninverting, voltage-follower, and inverting op-amp configurations
H	M	L	N	5	Analyze the effects of negative feedback on the three basic op-amp configurations
H	M	L	N	6	Explain the basic operation of a comparator circuit
H	M	L	N	7	Analyze summing amplifiers, averaging amplifiers, and scaling amplifiers
H	M	L	N	8	Troubleshoot op-amp circuits

DE101 Number Systems, Operations, and Codes

H	M	L	N	1	Review the decimal number system
H	M	L	N	2	Count in the binary number system
H	M	L	N	3	Convert from decimal to binary and from binary to decimal
H	M	L	N	4	Apply arithmetic operations to binary numbers
H	M	L	N	5	Determine the 1's and 2's complements of a binary number
H	M	L	N	6	Express signed binary numbers in sign-magnitude, 1's complement, 2's complement, and floating-point format
H	M	L	N	7	Carry out arithmetic operations with signed binary numbers
H	M	L	N	8	Convert between the binary and hexadecimal number systems
H	M	L	N	9	Add numbers in hexadecimal form
H	M	L	N	10	Convert between the binary and octal number systems
H	M	L	N	11	Express decimal numbers in binary coded decimal (BCD) form
H	M	L	N	12	Convert between the binary system and the Gray code
H	M	L	N	13	Interpret the American Standard Code for Information Interchange (ASCII)
H	M	L	N	14	Use binary numbers and codes in a system application

DE102 Introductory Digital Concepts

H	M	L	N	1	Explain the basic differences between digital and analog quantities
H	M	L	N	2	Show how voltage levels are used to represent digital quantities
H	M	L	N	3	Describe various parameters of a pulse waveform such as rise time, fall time, pulse width, frequency, period, and duty cycle
H	M	L	N	4	Explain the basic logic operations of NOT, AND, and OR
H	M	L	N	5	Describe the logic functions of the comparator, adder, code converter, encoder, decoder, multiplexer, demultiplexer, counter, and register
H	M	L	N	6	Identify fixed-function digital integrated circuits according to their complexity and the type of circuit packaging
H	M	L	N	7	Identify pin numbers on integrated circuit packages
H	M	L	N	9	Recognize digital instruments and understand how they are used in troubleshooting digital circuits and systems

DE103 Digital Logic Gates

H	M	L	N	1	Describe the operation of the inverter, the AND gate, and the OR gate
H	M	L	N	2	Describe the operation of the NAND gate and the NOR gate
H	M	L	N	3	Express the operation of the NOT, AND, OR, NAND, and NOR gates with Boolean algebra
H	M	L	N	4	Describe the operation of the exclusive-OR and exclusive-NOR gates
H	M	L	N	5	Demonstrate ability to extract and analyze pertinent data from technical manuals
H	M	L	N	6	Make basic comparisons between the major IC technologies - CMOS and TTL
H	M	L	N	7	Define propagation, delay time, power dissipation, speed-power product, and fan-out in relation to logic gates
H	M	L	N	8	Use each logic gate in simple application circuits
H	M	L	N	9	Troubleshoot logic gates for opens and shorts by using the logic pulser and probe or the oscilloscope
H	M	L	N	10	Explain how counters operate
H	M	L	N	11	Explain the purpose of flip flops and list common types
H	M	L	N	12	Describe the basic concepts of programmable logic

DE104 Boolean Algebra and Logic Simplification

H	M	L	N	1	Apply the basic laws and rules of Boolean algebra
H	M	L	N	2	Apply DeMorgan's theorems to Boolean expressions
H	M	L	N	3	Describe gate networks with Boolean expressions
H	M	L	N	4	Evaluate Boolean expressions
H	M	L	N	5	Simplify expressions by using the laws and rules of Boolean algebra
H	M	L	N	6	Convert any Boolean expression into a sum-of-products (SOP) form
H	M	L	N	7	Convert any Boolean expression into a product-of-sums (POS) form
H	M	L	N	8	Use a Karnaugh map to simplify Boolean expressions
H	M	L	N	9	Use a Karnaugh map to simplify truth table functions
H	M	L	N	10	Apply Boolean algebra and the Karnaugh map method to a system application
H	M	L	N	11	Write the Boolean output expressions for any combinational logic circuit
H	M	L	N	12	Develop a truth table from the output expression for a combinational logic circuit
H	M	L	N	13	Design a combinational logic circuit for a given Boolean output expression

DE105 Combinational Logic

					Analyze basic combinational logic circuits, such as AND-OR, AND-OR-Invert, exclusive-OR, exclusive-NOR, and other general combinational networks
H	M	L	N	1	
H	M	L	N	2	Design a combinational logic circuit for a given truth table
H	M	L	N	3	Simplify a combinational logic circuit to its minimum form
H	M	L	N	4	Use NAND gates to implement any combinational logic function
H	M	L	N	5	Use NOR gates to implement any combinational logic function
H	M	L	N	6	Troubleshoot logic circuits by using signal tracing and waveform analysis

SSE110 Integrated Circuits

					Describe the basic construction and features of integrated circuits (ICs).
H	M	L	N	1	
H	M	L	N	2	Compare the operation of digital and analog ICs and their applications.
H	M	L	N	3	Assemble, test, and troubleshoot IC experimental circuits.

ME101 Introduction to Microcomputers

					Identify and explain the purpose of each of the major parts of a microcomputer system.
H	M	L	N	1	
H	M	L	N	2	Identify types of computer input and output devices.

H	M	L	N	3	Explain how data is processed in a computer.
H	M	L	N	4	Discuss the role of computer software programs.
H	M	L	N	5	Discuss the operation of microprocessor-based control systems.
H	M	L	N	6	Explain the operating principles of a personal computer.

ME102 Programmable Microcontrollers

H	M	L	N	1	Explain the applications of a microcontroller.
H	M	L	N	2	Properly install and run Parallax microcontroller software.
H	M	L	N	3	Set up your BASIC Stamp hardware
H	M	L	N	4	Set up and test your software and hardware
H	M	L	N	5	Identify the BS2 pin numbers associated with each I/O.
H	M	L	N	6	Write PBASIC2 code to read and write to simple I/O.
H	M	L	N	7	Write a program using the DEBUG and END commands
H	M	L	N	8	Write a program using the CR control character and DEC formatter Properly use the BASIC Stamp Editor's Help and the BASIC Stamp Manual
H	M	L	N	9	
H	M	L	N	10	Write a program using using ASCII code. Switch an LED circuit on and off by internally connecting an I/O pin to either Vdd or Vss.
H	M	L	N	11	Use the PAUSE command to cause the BASIC Stamp to not execute commands for an amount of time.
H	M	L	N	12	
H	M	L	N	13	Use the DO...LOOP command to create an infinite program loop. Build and test a pushbutton circuit and use the BASIC Stamp to read the state of one or more pushbuttons.
H	M	L	N	14	
H	M	L	N	15	Program the BS2 to read a potentiometer. Program the STAMP to make decisions based on the state(s) of the pushbutton(s), and then control LED(s).
H	M	L	N	16	Write a program to make decisions based on values using IF...THEN...ELSE commands.
H	M	L	N	17	
H	M	L	N	18	Add a condition to a DO...LOOP command using the UNTIL command
H	M	L	N	19	Use a microcontroller to control the motion of a servo motor. Use the PULSOUT command to make the BASIC Stamp send these signals to the servo.
H	M	L	N	20	
H	M	L	N	21	Use the PULSOUT and PAUSE commands in a loop to deliver pulses every 20 ms so the servo will hold its position. Use the Debug Terminal and DEBUGIN command to control servo position.
H	M	L	N	22	Use the FOR...NEXT loop command to cause the servo to make sweeping motions
H	M	L	N	23	Use a resistor and a capacitor to vary discharge time changes in a circuit.
H	M	L	N	24	Use the RCTIME command to control the STAMP I/O pins High and Low conditions.
H	M	L	N	25	
H	M	L	N	26	Use the PIN directive as a way to name I/O pins and let the BASIC Stamp Editor determine whether to read an input or write to an output.

ME103 Introduction to Robotics

H	M	L	N	1	Assemble robot platform including circuitry, motors and sensors.
H	M	L	N	2	Setup an optical eye board using CDS cells and LED's.
H	M	L	N	3	Construct a relay control board.
H	M	L	N	4	Build a timing circuit using a 555 timer to produce repetitive motion. Use an optical eye board using LED's, Infrared LED's and CDS cells to control the directional motion of a robot.
H	M	L	N	5	
H	M	L	N	6	Using a Parallax BS2 platform: program a robot to control servo speed. Using a Parallax BS2 platform: program a robot to control wheel rotation and direction.
H	M	L	N	7	
H	M	L	N	8	Build IR Object detection circuits for the BS2 Robot.

H	M	L	N	9	Write IR Object detection programs to run the IR detection circuit for the BS2 Robot.
H	M	L	N	10	Build a set of 3 IR Object detection circuits for the BS2 Robot. Write programs to respond to multiple detection circumstances and respond for obstacle avoidance.
H	M	L	N	11	

COM101 Wireless Communications

H	M	L	N	1	Describe electromagnetic transmission and reception theory Discuss the generation of a sine wave by describing its three characteristics: amplitude, phase, and frequency.
H	M	L	N	2	List common radio frequency bands
H	M	L	N	3	Describe the difference between Amplitude and Frequency Modulation.
H	M	L	N	4	Convert frequency to wavelength and vice-versa
H	M	L	N	5	Describe antenna construction, types, wavelength and frequency characteristics
H	M	L	N	6	Describe the major radio receiver circuitry sections
H	M	L	N	7	Define a carrier wave.
H	M	L	N	8	Explain how tuning is accomplished in radio receivers and transmitters
H	M	L	N	9	Discuss the radio frequency (rf) spectrum usage.
H	M	L	N	10	Explain basic FCC (Federal Communications Commission) rules and regulations
H	M	L	N	11	Describe transmitter RF (Radio Frequency) exposure hazards
H	M	L	N	12	Describe major types of two-way radio communications (avionics, land mobile, maritime, etc.)
H	M	L	N	13	Explain the differences between point-to-point and point-to-multipoint transmissions
H	M	L	N	14	Describe the function of a repeater
H	M	L	N	15	Describe satellite communications principles
H	M	L	N	16	Describe the basic principle and operation of GPS.
H	M	L	N	17	Describe the basic principle and operation of cellular phones
H	M	L	N	18	Describe the features of Wireless local area network standards 802.11x.
H	M	L	N	19	

COM102 Cabling

H	M	L	N	1	Explain the differences between electrical power wiring, twisted-pair telephone wiring; coaxial, fiber cables, STP, and UTP cables Demonstrate the proper methods of using cable crimpers (TP and Coaxial)
H	M	L	N	2	
H	M	L	N	3	Describe a 'punch-down' tool, show where it is used and how it is used Explain how 66 or 110 block panels are used as distribution and interface center for telecom services
H	M	L	N	4	
H	M	L	N	5	Explain the purpose and proper use of 'fish tape' and 'pull' devices
H	M	L	N	6	Explain how Cable TV wiring is used for data and voice services
H	M	L	N	7	Explain the differences between coax types RG 58, RG 59 and RG 6
H	M	L	N	8	List the types of signal losses in cables, the purpose of matching correct impedances and convert dB levels to microvolt levels Explain multiplexing and its importance to today's communications systems
H	M	L	N	9	
H	M	L	N	10	Explain the term 'Bandwidth'
H	M	L	N	11	Describe the T568A / T568B standards Describe the differences between CAT 1, 2, 3, 4, 5, 5e and 6
H	M	L	N	12	telephone-data cables
H	M	L	N	13	Explain the effects of proper and improper termination

COM103 Wired Communications

H	M	L	N	1	Describe the various network topologies:
H	M	L	N	2	Explain the difference between a LAN and a WAN

H	M	L	N	3	Define the purpose and use of communications protocols. Explain the seven OSI layers and what functions are performed at each layer
H	M	L	N	4	
H	M	L	N	5	Constructs a UTP patch cable.
H	M	L	N	6	Tests a UTP patch cable. Explain the characteristics and features of peer-to-peer and client/server networks.
H	M	L	N	7	Explain how to setup file and print sharing utilities on a network using Windows server based platforms.
H	M	L	N	8	
H	M	L	N	9	Explain the various Fiber Optics terminologies.
H	M	L	N	10	Describe the basics of how laser and infrared communications work.
H	M	L	N	11	List the parts of a fiber optic data link. Safety-demonstrate the rules for disposal and eye safety when working with fiber optics equipment
H	M	L	N	12	
H	M	L	N	13	State the difference between multimode and single mode optical fibers.
H	M	L	N	14	Describe the conversion process from copper to fiber signals

ME104 Basic Computer Systems

H	M	L	N	1	Examines the structure of the Windows filing system.
H	M	L	N	3	Identifies common faults in computer hardware.
H	M	L	N	5	Identifies the hardware and software requirements of applications.
H	M	L	N	6	Explores procedures for backing up data. Identifies software, cleaning and technical tools used in computer troubleshooting and maintenance.
H	M	L	N	7	
H	M	L	N	9	Explores the tools a support technician may use.
H	M	L	N	10	Explores preventive maintenance systems and procedures. Identify proper procedures for installing and configuring IDE/EIDE devices.
H	M	L	N	12	
H	M	L	N	13	Identify the categories of RAM (Random Access Memory) terminology, their locations, and physical characteristics.
H	M	L	N	14	Identifies different types of network cable media and their features.
H	M	L	N	15	Installs and tests a hub-based network.
H	M	L	N	16	Creates a local user account. Shares a local user account folder on different computers and between different users.
H	M	L	N	17	
H	M	L	N	18	Resolves the name or IP address of a networked computer using the ping command. Recognizes the problems caused by having duplicated IP addresses and computer names on the same network.
H	M	L	N	19	
H	M	L	N	20	Assemble and operate a computer on a network

MDF104 Introduction to Nanotechnology

H	M	L	N	1	Explain the physical size of a nanometer. Describe the differences between; nano-scale, micro-scale and macro-scale.
H	M	L	N	2	
H	M	L	N	3	Describe nanotechnologies use 1700 years ago.
H	M	L	N	4	Describe controllability and repeatability in terms of nanotechnology.
H	M	L	N	5	Explain the Quantum Corral.
H	M	L	N	6	List material we use everyday utilizing nanotechnology.
H	M	L	N	7	Explain fluorescent nanoparticles and how we use them.
H	M	L	N	8	Describe the Stylus Profilometer.
H	M	L	N	9	Describe the Scanning Probe Microscope.
H	M	L	N	10	Describe the Scanning Electron Microscope.
H	M	L	N	11	Describe the term Nanofabrication.
H	M	L	N	12	Explain Bottom Up Nanofabrication.
H	M	L	N	13	Explain Top Down Nanofabrication.
H	M	L	N	14	Explain the differences between the Dry and Wet Etch process.

H	M	L	N	15	Explain the basics of lithography its tools and materials.
H	M	L	N	16	Describe how photoresist and UV light effect a substrate.
H	M	L	N	17	Describe magnetron sputtering.
H	M	L	N	18	Identify jobs in Nanotechnology.

REE106 Advanced Circuit Systems & Consumer Electronics

H	M	L	N	1	Setup up an automotive audio system with amplifier
H	M	L	N	2	Describe the operation of an RGB.
H	M	L	N	3	Build a control circuit to produce multiple colors from an RGB. Describe the differences and characteristics of; CRT, LCD, LED, Plasma television sets.
H	M	L	N	4	Describe the differences and advantages of digital TV transmission versus analog transmission.
H	M	L	N	5	Analyze Digital media recording equipment and standards for video and audio.
H	M	L	N	6	Analyze Digital media equipment and standards for digital photography.
H	M	L	N	7	Analyze and compare various brands of personal audio systems.
H	M	L	N	8	

PG101 Introduction to Electric Power Generation

H	M	L	N	1	List several different types of electric power plants in the U.S. List two environmental problems caused by burning coal to make electricity.
H	M	L	N	2	Describe how engineers are involved in getting electricity to our homes.
H	M	L	N	3	Describe how a Hydro power plant produces electricity.
H	M	L	N	4	The student will discuss the operational theory of hydro power, including its advantages and limitations.
H	M	L	N	5	The student will discuss the operational theory of wind power, including its advantages and limitations.
H	M	L	N	6	Differentiate between renewable and non-renewable energy.
H	M	L	N	7	Describe the basic steps required to produce electricity
H	M	L	N	8	Students will operate a portable home generator.
H	M	L	N	9	Describe the basic steps required to get electricity from the plant to your home.
H	M	L	N	10	Students will be able to describe important discoveries leading to power distribution.
H	M	L	N	11	Students will be able to name the different sources of power generation and how they work.
H	M	L	N	12	Students will be able to list the pro's and con's of each method of power generation.
H	M	L	N	13	

PG102 Introduction to Alternative Energy

H	M	L	N	1	Describe the advantages and limitations of renewable energy systems.
H	M	L	N	2	Explain the basic concept and operation of a power inverter.
H	M	L	N	3	Explain the basic operation of an electric generator.
H	M	L	N	4	Describe energy storage and backup supply systems Calculate energy use and analyze how changing their behaviors and appliances will affect the energy their use
H	M	L	N	5	Identify how solar cells are used.
H	M	L	N	6	Explain how a solar cell produces electricity.
H	M	L	N	7	Describe the basic electrical characteristics of a solar cell.
H	M	L	N	8	Determine how much electricity can a solar cell produce under different lighting conditions?
H	M	L	N	9	Measure the current and voltage produced by the solar cell.
H	M	L	N	10	Demonstrate how current and voltage vary when solar cells are connected in series and parallel.
H	M	L	N	11	The student will review specific safety hazards in dealing with fuel cell
H	M	L	N	12	

					systems.
H	M	L	N	13	The student will list the component parts of a PEM fuel cell stack. The student will discuss the basic structure of the fuel cell and the operating temperatures of the various types of commonly used fuel cells and systems.
H	M	L	N	14	
H	M	L	N	15	The student will discuss the applications of fuel cells and systems.
H	M	L	N	16	The student will run test's on fuel cells measuring current and voltage.
H	M	L	N	17	Explain how a wind turbine works.
H	M	L	N	18	Explain the design and control of wind turbines Evaluate and explain wind and solar energy maps from the N.R.E. Laboratories.
H	M	L	N	19	
H	M	L	N	20	Build a basic wind turbine using a pinwheel and electric DC motor.
H	M	L	N	21	Describe the transformations of energy that occur in a wind turbine.

BCE122 Circuit Troubleshooting

H	M	L	N	1	Explain the Divide & Conquer troubleshooting method Explain how schematics are used to locate component and wiring failures in electronics products
H	M	L	N	2	
H	M	L	N	3	Identify symptoms in malfunctioning equipment and systems
H	M	L	N	4	Perform preliminary checks and eliminate obvious problems.
H	M	L	N	5	Localize circuit defects by using signal injection and signal tracing.
H	M	L	N	6	Find component level defects by using voltage analysis.
H	M	L	N	7	Explain how automated testing works.

JS101 Job Seeking/Keeping & Leadership Skills

H	M	L	N	1	Participate as an effective team/group member
H	M	L	N	2	Conduct a business meeting
H	M	L	N	3	Establish a long range career goal plan
H	M	L	N	4	Participate in a Vocational Organization like Skills USA or VICA
H	M	L	N	5	Complete an employment application
H	M	L	N	6	Prepare a working resume
H	M	L	N	7	Write a letter expressing interest in employment
H	M	L	N	8	Interview for employment
H	M	L	N	9	Display job-keeping skills
H	M	L	N	10	Identify the careers available in electronics technology. Describe the entry-level requirements for various electronics technology careers.
H	M	L	N	11	
H	M	L	N	12	Enumerate the electronics shop environment safety and security aspects needed by technicians List concerns field techs should be aware of in the In-home environment
H	M	L	N	13	
H	M	L	N	14	Explain the purposes and requirements for proper record keeping Outline work bench—work area safety & efficiency 'good' and 'bad' technician practices
H	M	L	N	15	Demonstrate obtaining a parts by using supplier reference and data books or catalogs
H	M	L	N	16	Produce an example of good practices 'testing & cleaning' of repaired units after service
H	M	L	N	17	

H - Highly skilled, able to work independently
M - Moderately skilled, requires minimum supervision
L - Limited skills, requires full supervision
N – Not applicable

WRITING TEAM:

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WCSD STUDENT DATA SYSTEM INFORMATION

1. Is there a required final examination? X Yes No
2. Does this course issue a mark/grade for the report card? X Yes No
3. Does this course issue a Pass/Fail mark? Yes X No
4. Is the course mark/grade part of the GPA calculation? X Yes No
5. Is the course eligible for Honor Roll calculation? X Yes No
6. What is the academic weight of the course?
 No weight/Non credit X Standard weight
 Enhanced weight (Describe)



Electronics Technology

WCCC Quarterly Course Sequence

Year	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
1	BCE101 Safety and Orientation	15	BCE107 Hand Tools and Fasteners	10	MDF101 Solder. & PCB Fabrication	25	BCE114 Intro. to Alter. Current and Voltage	20
	BCE102 History of Electricity	10	BCE108 Electric Connections	10	MDF102 Circuit Design Software	20	BCE115 O'scopes & Elec. Test Lab Equip.	10
	BCE103 Compon., Quan., and Unit Conv.	10	BCE109 Batteries	15	MDF103 Electronic Manufacturing Industry	15	BCE116 Capacitors	10
	BCE104 Atoms, Charge and Color Code	20	BCE110 Series Circuits	15	REE101 Circuit Conductor Sizes and Appl.	10	BCE117 RC Circuits	20
	BCE105 Ohm's/Watt's Law, Eng. & Pow.	15	BCE111 Parallel Circuits	15	BCE113 Magnetism and Electromagnetism	20	BCE118 Inductors	10
	BCE106 Meas. Volt., Current and Resist.	20	BCE112 Series-Parallel Combination Circuits	25			BCE119 RL Circuits	20
	Total hours: 90		Total hours: 90		Total hours: 90		Total hours: 90	
2	BCE120 RLC Circuits and Resonance	20	IE104 Mechanical Power Transmission	15	REE104 New Home Electronics	20	SSE105 BJT Transistor Bias Circuits	20
	BCE121 Transformers	20	IE105 Programmable Logic Controllers	40	REE105 Lighting Technology	10	SSE106 BJT Amplifiers	20
	IE101 Electric Motors	15	REE102 Circuit Protection Devices	10	SSE101 Introduction to Semiconductors	20	SSE107 Field-Effect Transistors (FETs)	10
	IE102 Relays	15	REE103 Residential Branch Circuit Wiring	25	SSE102 Diodes and Applications	20	SSE108 Amplifiers and Oscillators	20
	IE103 Industrial Cont., Sens. & Instrument.	20			SSE103 Special-Purpose Diodes & Thyristors	10	SSE109 Operational Amplifiers (Op-Amps)	20
					SSE104 Bipolar Junction Transistors (BJTs)	10		
Total hours: 90		Total hours: 90		Total hours: 90		Total hours: 90		
3	DE101 Number Systems, Oper., and Codes	20	SSE110 Integrated Circuits	15	COM101 Wireless Communications	20	MDF104 Introduction to Nanotechnology	10
	DE102 Introductory Digital Concepts	20	ME101 Introduction to Microcomputers	15	COM102 Cabling	20	REE106 Adv. Circuit Systems & Cons. Elect.	15
	DE103 Digital Logic Gates	20	ME102 Programmable Microcontrollers	40	COM103 Wired Communications	20	PG101 Intro. to Electric Power Generation	20
	DE104 Boolean Algebra and Logic Simpl.	20	ME103 Introduction to Robotics	20	ME104 Basic Computer Systems	30	PG102 Intro. to Alternative Energy	20
	DE105 Combinational Logic	10					BCE122 Circuit Troubleshooting	15
Total hours: 90		Total hours: 90		Total hours: 90		Total hours: 90		
						JS101 Job Seeking/Keeping & Leader. Skills	10	