Burlington County Institute of Technology

_____ Medford Campus ____X____ Westampton Campus

CAREER MAJOR PROGRAMS

Course Title: Electronics Curriculum

Curriculum Area: CTE

Credits: 5

Board Approved: May, 2019

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The Electronics course Electronics Technology
Curriculum

I. Course of Study (Proposed):

A. Introduction to Electronics	(9th)	S1 B4
B. Circuits 1 DC	(9th)	S2 B4
C. Circuits 2 AC/DC	(10th)	S1 B1
D.Clinical circuits 1	(10th)	S1 B2
E. Semiconductors principals	(10th)	S2 B1
F. Clinical circuits 2	(11th)	S1 B1
G. Digital 1 Circuits	(11th)	S2 B 1
H. Digital 2 Circuits	(11th)	S2 B2
I. Microprocessor applications	(12th)	S1 B3
J. Electronics Independent Projects I/II	(12th)	S1/2 B4

All courses are semester length courses.

II. Program Descriptor:

The Electronics Technology program is designed to teach and enlighten the student with a holistic approach. Students will learn Electronics in a variety of ways utilizing team based concepts with peer inspections, cross functional training, data collection and documentation with an emphasis on total quality management. Students will learn and gain an array of experiences from a complement of various project based projects to give balance and experience for the many different aspects of electronics. In addition students will learn leadership skills as shop forman, public speaking, basic first aid techniques, basic financial planning, conflict management skills, project planning and organizational skills essential in today's industry.

III. Program Outcome: Graduates of the Electronics Technology program will possess an array competitive and desirable skills that include a comprehensive understanding of Electronics and team based concepts. Students will have gained experience and exposure through project based assignments that include Soldering/Rework: single sided, double sided and surface mount boards, project design, tool usage, test equipment, calibration, schematic interpretation,wiring, prototyping, calibration, troubleshooting, programming and mechanical assembly. Students entering the workforce will have the qualifications as an entry level technician. Students during their senior year will take the International Society of certified Electronics technician exam (ISCET) laying the foundation to acquire future certifications. Students progressing onward educationally have the building blocks to move towards field engineering as well.

IV. Course Descriptions:

A. Introduction to Electronics (9th)

This course is explores the field of Electronics and it's many opportunities. This course is designed for the student with little or no experience. The course includes safety, scientific notation, basic electrical units, tools identification and use, component identification, symbols and function, ohm's law, sources of electricity, test equipment. Theory is reinforced with a variety of lab experiments, trainers and kits.

B. Circuits 1 (9th)

This course utilizes lessons learned in introduction to electronics by combining those individual aspects into circuit construction. Theory covers passive devices such as: resistors , capacitors, inductors and there interaction with DC voltage and current . Students will do a variety of basic circuit analysis. Theory is reinforced by use of trainers, kits and project based assignments utilizing test equipment to measure, verify or troubleshoot circuits. Students are expected to present their findings and provide applications used outside the classroom.

C. Circuits 2 AC/DC

This course explores the applications AC/DC theory and applications and introduce integrated circuits exploring non-inverting and inverting signals, integrated, solid state amplifiers, filters, power supplies and oscillators.students will learn theory thru discussions, circuit analysis, kits and project based assignments.

D. Clinical circuits 1

This course utilizes a variety of methods to reinforce electronic AC/DC theory thru project based assignments, trainers, labs and kits to promote project design and schematic interpretation. Students will utilize test equipment and perform circuit analysis, soldering/rework, mechanical assembly and troubleshooting. All project based assignments will be under a structured environment utilizing manufacturing principles requiring the student to get peer inspections on component installation and soldering to maintain cross functional learning and promote total quality management.

E. Semiconductor principals

Students will experience purpose and application of the many types of semiconductors such as diodes, bipolar transistors and field effect transistors. Students will learn testing procedures to determine component integrity, various rectifiers, amplifier circuits. Student will learn troubleshooting techniques utilizing test equipment in solid state electronics.

F. Clinical circuits 2 AC/DC

Students will combine lessons learned with introduction to electronics, circuits 1 & 2 and semiconductor principles learned in previous modules. Students will be responsible to inventory, construct, perform circuit analysis, interpret findings, troubleshoot

complex circuits utilizing test equipment and their experience. Project based assignments may include such projects as Digital multimeters, Analog/digital trainers, logic probes , robotic arm and all terrain robot.

G. Digital 1

This course covers the theory and application of digital logic circuits. Digital systems covered include, a digital introduction, various number systems, logic gates, gate and logic circuit operation, symbols and truth tables. Operation of combinational and sequential logic gates. A discussion about the basic operating principles of multiplexers, demultiplexers, flip flops, wiring and testing thru use with a logic probe.

H. Digital circuits 2

This course covers theory and design logic circuits, integrating logic operations thru the use of Boolean logic and karnaugh mapping. Students will construct a variety of challenging digital lab circuits from digital lab kits designed to compliment theory with hands on applications to reforce and explain logic circuits such as clock circuits multiplexing, demultiplexing, flip flops, counters and shift registers. Students will troubleshoot utilizing test equipment and give an oral presentation on circuit operation and applications outside the class.

I. Microprocessor applications

This course deals as an extension of Digital circuits 2 learning concepts in programming and the interfacing of microprocessors/microcontrollers demonstrated by a variety of application examples. It covers the architecture of modern processors and the many I/O peripherals now commonly found on-board the device. Studies of computer I/O and interrupt techniques as applied to analog-to-digital, digital-to-analog, timers, parallel and serial interfaces are included. Laboratory activities provide the student with experience in developing the hardware and software required to incorporate microprocessors into systems that solve real-world interfacing problem such as Arduino construction, programming and modifications .

J. Electronics independant projects

This experience allows students the ability to prepare them to enter the workforce and college by allowing the student more independent study. Students will demonstrate their skills and proficiencies utilizing lessons learned through a series of project based assignments. Students will also have an opportunity to further diversify from a variety of trainers such as: fire control system, residential electricity and motor controls.

Students have the opportunity to earn credit and income during school to work in their field of study. Students must provide their own transportation, coordinated by school to work staff and require the recommendation of the electronics instructor.

Course: A) Introduction to Electronics S1 Grade 9 Unit: Character Education Length: 2-3 Weeks

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP8. 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What is engineering and scientific notation? How is scientific notation used in Electronics?	Engineering notation Converting metric prefixes Division and multiplication involving powers of ten. Reciprocals with powers of ten. Square roots of numbers involving powers of ten notation. Scientific notation and component unit merging. Scientific calculator	Students will be involved in discussions regarding engineering and scientific notation. Students will participate interactively with with visual examples. Students will demonstrate critical thinking and problem solving skills when participating in scientific notation exercises in the form of worksheets, component mathematics and circuit analysis.	Written/Performance test and quizzes. Labs Various project based kits such as the 50/1 includes All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

			Students will learn use and operation utilizing the scientific calculator involving the use of component and circuit analysis.	
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8. 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are tools and their uses in electronics? How do we identify and state the use for common tools used in the electrical and electronic industry? What are the procedures for proper care and use of tools? How do we identify common fastening devices associated with	Visual tool representations and descriptions. Test equipment overview and use. Various fasteners associated with tools. Tool handling and safety.	Students will participate in discussion of tools and their uses. Tool safety. Students will learn about tools thru visual and physical interaction. Students will learn proper handling and execution of tool use. Students will be taught strategies when	Written/Performance test and quizzes. Labs Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

	tool selection?		determining tool selection. Students will learn about test equipment through the following methods utilizing all or a combination of the following: Discussion, equipment interaction, overview and function, Labs, test equipment workouts utilizing written and oral student operation and use.	
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8. 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7	What is safety in the classroom? How do we outline safety rules and safe practices that apply to fit the environment and on the job? What are the determining factors that	BCIT policy and procedure outlined in crises manual. Identification of possible safety hazards in the classroom. Classroom conduct and expectations while performing labs and	Discussion of BCIT policy and procedures of students outlined in handbook and crises manual. Discussion and identification of exits with scenario situations for accommodating a situation.	Written/Performance test and quizzes. Various Labs Text book: Essentials of Electronics Various project based kits includes All or some elements of the

RST.11-12.4. RST.11-12.3. RST.11-12.8.	determine the severity of electrical shock ? How do we determine hazardous materials and their characteristics? What is OSHA's role in shop safety? What are the outlining procedures for identifying and administering first aid?	utilizing tools and test equipment. Proper tool use when testing live equipment. Occupational safety includes:Tool and equipment safety, safety attire, typical warning and caution signs, MSDS, lockout and tag outs. General safety rules that in the lab. Electrical safety when working outside. Electrical shock: causes and procedures. First aid defined and procedures. CPR and Heimlich maneuvers basics. Classes of various fires Basic of OSHA's color code	Interactive student demonstrations when utilizing test equipment and testing live circuits. Discussion on OSHA and what are MSDS where are they located and what information is necessary to know to student or employee. Discussions on when and where to perform lock outs and tag outs. General discussion on work area safety to include: work area cleanliness, organization, equipment checks and visual overviews. Safety rules when working in the lab: safety glasses, jewelry, conduct and clothing. Discussion on the	following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessments Vocabulary definitions Written/Performance Test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic electronics

			various classes of fires and proper methods of extinguishing Class A,B.&C fires. Discuss and describe first aid basics and procedures utilizing a variety of audio and visual aids Discussion on electrical shock observations, signs and procedures. Discuss what is CPR and Heimlich maneuvers utilizing a variety of audio and visual aids.	
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8 CRP7.	What are basic electrical units?	Define symbols and units associated with	Discussion combining scientific notation,	Written/Performance test and quizzes.

CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3 . RST.11-12.8.	How do we define electrical current, voltage, resistance, power, and energy? What are the essential parts and purpose of a circuit? What are the relationships among current, voltage and resistance? What are the differences between electron flow and conventional current? What are the components use and function? How are the component units associated with scientific notation? How are electronic symbols associated with components? How are symbols used	components as it applies with schematics. Vocabulary definitions of units as they apply to circuit analysis. Circuit analysis breakdown relating to component interaction. Circuit analysis among the relationship between voltage, also known as ohm's law current,resistance. Power and wattage as it relates to the circuit. Component integrity analysis utilizing test equipment. Lab documentation Using proper vernacular both oral and written as it applies to Electronics circuits. Schematic interpretation	components and associated symbols. Utilizing a variety of educational methods. Labs using the 50/1 basic electronics kit. Students transition through a variety of basic circuits gaining an understanding of components, circuit construction, meter use, prototyping, project design, circuit analysis and troubleshooting. Discussion and demonstration of project based concepts. Student will gain on understanding on team based concepts utilizing industry standards such as (TQM) total quality management, cross functional learning, time management skills,mechanical assembly,tool usage, schematic, and technical interpretation. Accomplished through project breakdowns,	Various Labs Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Essentials of Electronics Text book: Grob's basic electronics Vocabulary definitions Labs Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing,

	in schematics? What is prototyping? What is a schematic?	Electronic circuit prototyping.	student required inspections as well as instructor sign off, documentation of defects. Lab reports requiring objectives, applications outside the classroom oral and written account of specific work. Students will perform a variety of electronic projects topic relevant to reinforce theory and concepts. Project requirements are delineated by instructor requiring the following:Inventory, prototyping, component inserting, soldering and final operation.	soldering,testing, operation and verbal assessment.

CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8 CRP7. CRP4 CRP2 9.3.MN-PRO.1	What is static and current electricity? How do we define the differences Alternating and Direct voltage and current ?	Terminology used with sources and characteristics of electricity. Identifying the various forms energy:	Discussion on electricity followed with terminology. Students will perform a variety of electronic projects topic relevant	Written/Performance test and quizzes. Vocabulary definitions Labs

9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are the basic sources of electricity and electrical devices used to convert the various energy forms? What is the terminology used when discussing electricity?	Chemical,photo, mechanical, piezoelectric and heat. Electro Static Discharge (ESD): Cause and effect on component integrity when subjected to static electricity. ESD protection	to reinforce theory and concepts. Project requirements are delineated by instructor requiring the following:Inventory, prototyping, component inserting, soldering and final operation. Discussion on the various sources of electricity and how they apply in electronics	Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Essentials of Electronics Text book: Grob's basic electronics
Course: B) Circuits 1	**S1 Grade 9**	**Unit Character Education**	**Length: 6-8 weeks**	
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8 CRP7 CRP4 CRP2	What is ohm's law? What are the three	Define; what ohms law is. List multiples and	Discussion on ohm's law and its linear effect on circuit analysis.	Use ohm's law to to perform circuit analysis by calculating voltage, current and resistance.

9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	forms of used in ohm's law? How is ohm's law utilized in circuit analysis?	submultiples units of voltage, current and resistance. Interaction of voltage, current and resistance in a circuit.	Explain the difference between linear and non-linear resistance. Explain the difference between work and power and list the units of each. Circuit analysis to include: Calculating the power in a circuit when the voltage, current, resistance and voltage are know. Determine the required resistance and appropriate wattage rating for a resistor. Explain the difference between open and short circuits.	Vocabulary definitions Written/Performance test and quizzes. Labs: 50 in 1 training labs: 32BCITPK2 fundamental kit or equivalent. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8	What is a series circuit?	Elements of a series circuit.	Explain the various elements that make up	Vocabulary definitions

.CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3 . RST.11-12.8.	Why is current the same in all parts of series circuit? What are the rules for series circuits when circuit analyzing? How is ohm's law utilized in series circuits? How is ohm's law utilized in series circuits? What is Kirchhoff's law? What is series adding and series opposing voltages? How is circuit analysis performed when troubleshooting series circuits when utilizing test equipment.	Rules of series circuits. Calculation of series circuit utilizing series rules and ohm's law. Kirchhoff's law Polarity of I/R drops Total power in a series circuit. Series adding and series opposing voltages. Analyzing series circuits with random unknowns. Ground connections in electrical and electronic systems. Troubleshooting opens and shorts in a series circuits.	a series circuit. Through circuit analysis explain how the rules of series circuits and ohm's law are use. Explain and perform power calculation used in series circuits. Labs: 50 in 1 training labs: 32BCITPK2 fundamental kit or equivalent. to compare and contrast when calculating and constructing series circuit. Students will gain knowledge in component identification, prototyping, project design, tools, power supplies, ohm's law, meter use and troubleshooting. CES trainers will be utilized to construct and analyze series circuits. Circuit analysis with	Written/Performance test and quizzes. Labs: 50 in 1 training labs: 32BCITPK2 fundamental kit or equivalent. Text book: Grob's basic electronics Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

			reference to ground in series circuits.	
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4.	What is soldering? What are the tools and equipment used in soldering? How are the tools and equipment used in soldering? How is soldering performed? What is Solder rework? How is Solder rework performed? What are the various solder situations?	Solder stations Solder/desolder tools Solder/desolder methods and techniques. Identifying good and bad solder joints. Defect documentation Dwell time Solder applications: single sided, double sided boards, connectors, tinning and surface mount. Solder rework and board repair.	Define what soldering is. Explain and demonstrate Soldering/Desoldering methods and techniques. Explain and demonstrate tools and accessories used for Soldering/Desoldering. Explain and show examples of good solder joints and bad solder joints. Explain and demonstrate how to perform solder	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Benchmark Solder Kits**:** Blinker bot 3200LRK Elenco K28 pocket dice

WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are the various desoldering methods? What is a solder defect? What is difference between soldering and crimping?		inspections. Explain how to document solder defects. Student will learn how to solder/desolder on the following disciplines: Single sided boards, double sided boards, solder connectors , tinning, wiring and surface mount technology. Student will learn how to strip and tin wires. Student will learn Various crimping techniques used on wiring. Solder rework and board repair.	Elenco LP525K Logic probe kit Elenco XK550 analog/digital trainer kit Elenco AM550CK AM radio kit Elenco Digital multimeter kit M2666K Introduction to surface technology. Electronix express: Desolder/Solder training kit #32REWORK
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**

CRP8 CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are the characteristics of a parallel circuit? What are the rules used for calculating a parallel circuit? How is ohm's law used in parallel circuits? How is total power calculated in a parallel circuit? What are conductances in a parallel circuit? What are the comparisons between series circuits and parallel circuits? How is circuit analysis performed when troubleshooting series circuits when utilizing test equipment.	Elements of a parallel circuit. Rules of parallel circuits. Calculation of parallel circuit utilizing parallel rules and ohm's law. Explain why the equivalent resistance of a parallel circuit is less than the smallest branch resistance. Kirchhoff's law as it applies in parallel circuits. Total power in a parallel circuit. Analyzing parallel circuits with random unknowns. Troubleshooting opens and shorts in a parallel circuits.	Explain the various elements that make up a parallel circuit. Through circuit analysis explain how the rules of parallel circuits and ohm's law are use. Explain and perform power calculation used in parallel circuits. Labs: 50 in 1 training labs: 32BCITPK2 fundamental kit or equivalent.t to compare and contrast when calculating and constructing parallel circuit. Students will gain knowledge in component identification, prototyping, project design, tools, power supplies, ohm's law, meter use and troubleshooting.	Vocabulary definitions Written/Performance test and quizzes. 50 in 1 training labs: 32BCITPK2 fundamental kit or equivalent. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

Course: C) Circuits 2 AC/DC **S1** **Grade 10** **Unit: Character Education** **Length: 8-10 Weeks**				
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5	Why is review essential? What are the characteristics of a series & parallel circuit?	Review introduction to electronics. Review circuits 1 Series & parallel circuit breakdown?	Covers safety, scientific notation and components. Covers ohm's law, series circuits, parallel circuits and DC theory. Explain the various elements that make up a parallel circuit.	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	How is ohm's law used in series & parallel circuits? How is total power calculated in a series & parallel circuit? How do the the rules and ohm's law apply between series & parallel circuits? How is circuit analysis performed when troubleshooting series & parallel circuits when utilizing test equipment. What is AC? What is AC impedance?	Calculation of series & parallel circuits utilizing series, parallel rules and ohm's law. Analyzing series & parallel circuits with random unknowns. Troubleshooting opens and shorts in series & parallel circuits. Define AC voltage and current? Compare AC vs DC. Define impedance?	Through circuit analysis explain how the rules of parallel circuits and ohm's law are use. Explain and perform power calculation used in parallel circuits. Explain the various elements that make up a series & parallel circuit. Schematic and technical interpretation. Prototyping and CES trainers will be used to construct and analyze circuits utilizing digital multimeter, audio generators and oscilloscopes.	OWI-KIT Robotic arm edge, wired control robotic arm kit Vocabulary definitions Labs Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing,

		Compare resistance vs impedance?		operation and verbal assessment.
	What is RMS voltage? How is RMS voltage calculated?	Explain how is RMS used in circuit analysis. Explain calculation procedures of converting peak to peak to RMS voltage.		Elenco AM-550CK radio kit (combo transistor and IC)
	What is AC Voltage and current in a series circuit? What is AC voltage in a parallel circuit? What is AC voltage in series and parallel circuit? What is the purpose of an oscilloscope? How does an oscilloscope operate?	Test equipment workouts will be given to focus on individual operation and use. Circuit analysis will be used to utilizing both DC and AC comparisons to demonstrate RMS as its DC equivalent. Students will learn calibration and setup procedures when utilizing various pieces of test equipment. Students will be introduced to	Circuit analysis with reference to ground in parallel circuits. Explain the various elements that make up a series & parallel circuit. Through circuit analysis students will learn how the rules apply to series & parallel circuits and ohm's law is used. Explain and perform power calculation used in series & parallel circuits.	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal

		electronics used in communications. Sophomore project will include the construction of an AM radio utilizing a variety of test equipment working in conjunction to perform the following functions: measure, test, calibrate and troubleshoot to completion.	CES trainers will be utilized to construct and analyze series & parallel circuits.	assessment. Text book: Grob's basic electronics
CRP8 .CRP7. CRP4 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2	What are the characteristics of Voltage and current divider circuits? How are voltage and current divider circuits used? How do voltage and current divider circuits differ under loaded conditions? How are voltage and current divider circuits analyzed?	Series and voltage dividers. Current dividers with parallel resistances. Series voltage dividers with parallel load current. Explain the design of a loaded voltage divider.	Student will learn what makes up a Voltage or a current divider. Through circuit analysis calculate a voltage/current divider loaded and unloaded. Knowledge of the the various theorems: Thevenin, Norton's and superposition.	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic

WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.				electronics

Course: D) Clinical Circuits 1 S2 Grade 10 Unit Character Education unit length: 6-8 weeks

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1	What is a network theorem? What are the various network theorems used? How is a network theorem used in circuits?	Applying Superposition theorem to find voltages across two points. Requirements for a Superposition theorem. Determine Thevenin and Norton's for determining unknown voltage and current. MIllman's theorem to find common voltage across any number of parallel branches.	Students will understand the various elements that make up a network theorem circuit. Students will learn how perform circuit analysis to a network theorem circuit.	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Vocabulary definitions

WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What is Magnetism? What is Electromagnetism? What is Capacitance? What is capacitive reactance?	Explain magnetic fields. Induction by a magnetic field. Types of magnets. Explain magnetomotive force. Hysteresis effect. Explain how a charge is stored. Student will learn about Charging and discharging in a capacitor. Student will learn about Capacitor varieties. Student will learn about Series and parallel capacitances. Student will learn about Capacitor coding Student will learn about	Student will have a variety discussions, worksheets and projects available to learn the material. Student will have a variety discussions, worksheets and projects available to learn the material. Student will have a variety discussions, worksheets and projects available to learn the material.	Written/Performance Test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic electronics

	What is inductance? What is inductive reactance? What are RC/LR time constants?	AC in a capacitive circuit. Student will learn about XC analysis. Student will learn about Series and parallel capacitive reactances. Student will learn about Applications of capacitive reactance. Student will learn about Induction by AC. Student will learn about Self and Mutual inductance. Student will learn about Transformers. Student will learn about inductances in series and parallel, circuit analysis.	Student will have a variety discussions, worksheets and projects available to learn the material. Student will have a variety discussions, worksheets and projects available to learn the material. Student will have a variety discussions, worksheets and projects available to learn the material.	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic electronics

	What are filter circuits?	Student will learn about circuit analysis of XL. Student will learn about series and parallel inductive reactances. Student will learn about applications of inductive circuits. Student will learn about analysis of RC and LR time constants. Student will learn about series and parallel resonance. Student will learn about examples of filtering. Student will learn about applications of filtering. Student will learn about types of filtering.		Vocabulary definitions Written/Performance Test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic electronics

Course: E) Semiconductor Principles S2 Grade 10		**Unit Education length: 4- 6 weeks**		
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2	What is the purpose of a semiconductor? What are bipolar transistors What is the purpose and function of transistor amplifiers. How is calculating amplifier gain accomplished.	Student will learn about semiconductor overview Student will learn about Transistor biasing. Student will learn about signal amplifier operation.	Student will be proficient in stating operation of purpose diodes and transistors Checking and testing transistors with an ohmmeter Prototyping amplifier circuits through a variety of kits.	Vocabulary definitions Written/Performance test and quizzes. Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic electronics Elenco XP-15K variable

WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are the different types of amplifiers? What are field effect transistors? What are thyristors?	Explain the following: common base amplifier, common collector and emitter follower. Explain purpose and function of the following FET's: JFETS and MOSFETS. Explain the following types of Thyristors: Diacs,SCR's and Triacs		power supply kit.

Course: F) Clinical circuits 2 S1 Grade 11 Unit Character length: 10-16 weeks

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1	Why is review an important aspect of learning?	Review circuits 1 & 2 to include the following:DC circuits, AC circuits.	Student will have a variety discussions, worksheets and projects available to learn the material.	Vocabulary definitions Written/Performance Text book: Essentials of Electronics(Petruzella)

9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	Why are student projects an important aspect of learning and applying lessons learned. What are low voltage signal systems? What are printed circuits? Transistor amplification, switching and oscillation circuits What are Integrated Circuits?	Student will learn about alarm systems,and communication circuits Student will learn about printed circuit boards. Student will learn about transistor switching circuits, amplifier circuits and oscillator circuit analysis. Student will learn about Advantages and limitations of IC's. Student will learn about IC symbol packages. Student will understand about op-amps.	OWI All terrain robot Projects are to be determined by instructor. Student will have a variety discussions, worksheets and projects available to learn the material.	Test and quizzes. OWI All terrain robot. Elenco XK-550K analog/digital trainer kit. Elenco Digital multimeter kit M2666K Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Grob's basic electronics Telecommunications trainer lab

	What is the purpose and function of the 555 timer?	Student will learn about the uses and operation of the 555 timer.	Student will have a variety discussions, worksheets and projects available to learn the material.	
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
Course: G) Digital circuits 1	**S2 Grade 11**		**Unit character length:**	**4-6 weeks**
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2	What is a digital circuit? Why use digital circuits? Why is the difference between analog and digital ?	Explain the characteristics of a digital circuit. Explain the use and applications of digital circuits in real world situations . Describe the differences and comparisons of analog	Student will have a variety discussions, worksheets and projects available to learn the material. Student will construct ad test analog and digital compatible circuits utilizing oscopes, DMM and logic probes.	Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are the base numbers used in digital electronics? What are the various Logic gates?	vs digital. Counting in decimal and binary. Binary and decimal conversions. Hexadecimal number system. Octal number system. Explain each logic gate its function and corresponding truth table.	Worksheets, conversion between the number systems. Addition, subtraction, division and multiplication. Basic encoding and decoding. Student will have a variety discussions, worksheets and projects available to learn the material. Student will construct ad test analog and digital compatible circuits utilizing oscopes, DMM and logic probes.	Elenco XK-550K digital trainer kit. Text & lab book: Digital electronics principles and applications, Roger Tokheim 35 and 1 digital circuits or digital magic progressive lab ‘ Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment.

				. Text & lab book: Digital electronics principles and applications, Roger Tokheim. 35 and 1 digital circuits or digital magic progressive labs.
CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
Course: H) Digital circuits 2	**S2 Grade 11**		**Unit character length:**	**8-10 weeks**
	What is combining logic gates?	Explain what combinational logic is.		
CRP8 CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2	What is Boolean expression? How does Karnaugh mapping reduce a digital expression? What is IC specifications and	Explain what a boolean expression is. Explain what a karnaugh map is and how it is used. Explain NAND gate substitutions. Explain what is digital	Student will have a variety discussions, worksheets and projects available to learn the material. IC research.	Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal

9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	interfacing? What is encoding/decoding and seven segment displays? What are flip flops and how are the used in digital circuits? What is a counter and how is it used in digital electronics?	IC specifications. Explain TTL. and CMOS IC's. Explain the various codes such as BCD, Gray and ASCII. Explain the function of a seven segment and LCD display. Explain the various types of flip flops and their applications. Explain the use of a counter and the various types.	Interfacing construction utilizing LED's, motors, relay's, buzzers and keyboards. Seven segment and LCD pin mapping. Student will have a variety discussions, worksheets and projects available to learn the material. Student will have a variety discussions, worksheets and projects available to learn the material. Student will construct a variety of labs to reinforce content learned utilizing the	assessment. Elenco XK-550K digital trainer kit. Text & lab book: Digital electronics principles and applications, Roger Tokheim Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text & lab book: Digital electronics principles and applications, Roger Tokheim

		Explain the uses and applications of the counter.	Electronics express 32BCIT pk 5 Tokheim Lab kit.	
	What is a serial load shift register? What is a parallel load shift register? What is a universal shift register? How are are arithmetic circuits used in digital electronics?	Explain the what a register is and the various types. Explain the uses and applications of shift registers. Explain the various types of adders used in digital electronics.	Student will construct a variety of labs to reinforce content learned utilizing the Electronics express 32BCIT pk 5 Tokheim Lab kit. Student will have a variety discussions, worksheets and projects available to learn the material.	Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text & lab book: Digital electronics principles and applications, Roger Tokheim

	What digital memories and how are they utilized in digital electronics? What are digital systems?	Explain an overview of digital memories. Explain the various memory types such as RAM and ROM. Explain the elements of a digital system.	Student will have a variety discussions, worksheets and projects available to learn the material. Student will construct a variety of labs to reinforce content learned utilizing the Electronics express 32BCIT pk 5 Tokheim Lab kit. Student will construct a variety of labs or kits to reinforce content learned utilizing the Electronics express 32BCIT pk 5 Tokheim Lab kit.	Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Elenco XK-550K digital trainer kit. Text & lab book: Digital electronics principles and applications, Roger Tokheim

CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
Course: I) Microprocessor applications	**S1 Grade 12**		**Unit character length:**	**10-16 weeks**
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2	Why is review an important aspect of learning?	Review circuits AC and DC circuits 1 & 2. Review Digital circuits 1 & 2	Students will get an accelerated review	Vocabulary definitions Written/Performance

9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7 RST.11-12.4. RST.11-12.3. RST.11-12.8.	What are the elements of computer systems? What are the functions of each element of the computer system?	Explain the elements of computer systems. Explain the individual element function.	Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering, Student will construct a variety of labs or kits to reinforce content learned utilizing the Electronics express 32BCIT pk 5 Tokheim Lab kit. Utilizing block diagrams and flow analysis student will learn the elements of a computer system. Students will learn the functions of the individual elements and relationship to the computer as whole.	Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal assessment. Text book: Essentials of Electronics(Petruzella) Text & lab book: Digital electronics principles and applications, Roger Tokheim Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing,

			Student will construct a variety of labs or kits to reinforce content learned.	operation and verbal assessment. Text book: Essentials of Electronics(Petruzella) Text & lab book: Digital electronics principles and applications, Roger Tokheim

CTE Proficiencies	**Essential Questions**	**Content**	**Skills**	**Assessments**
Course: J) Independent study	**S2 Grade 12**		**Unit character length:**	**10-16 weeks**
CRP8 .CRP7. CRP4 CRP2 9.3.MN-PRO.1 9.3.MN-PRO.2 9.3.MN-PRO.3 9.3.MN-PPD.2 9.3.MN-PPD.5 9.3.MN-PPD.1 WHST.9-10.2 WHST.9-10.4. WHST.9-10.7	What is the importance of a certification? What is the importance of independent projects?	Students will learn about the international society of certified electronic technicians (ISCET) Students will learn the certification are a foundation a student can elect to build upon. Students are given the opportunity to individualize their electronic experience.	Students will have an opportunity to prepare for their certification through review and and hands on reinforcement. Students will be given an opportunity to work as a group on a project based assignment or branch off as an individual to learn fire control systems, residential electrical or motor controllers.	ISCSET test will be an independently proctored certification. Vocabulary definitions Written/Performance Various project based kits includes(All or some elements of the following): inventory, project layout, boardstuffing, soldering,testing, operation and verbal

RST.11-12.4. RST.11-12.3. RST.11-12.8.				assessment.

Textbook Resources:

Essential Electronics second edition, Frank Petruzella, Isbn # 978-0-07-4027, year 2001
Grob's basic Electronics 11 edition, Michael E Schultz ISBN 978-0-07-351085-9, year2013
Digital Electronics principles & application, 7th edition Roger Tokheim, ISBN 978-0-07-312634-0 year 2008