

## PASSAIC COUNTY TECHNICAL INSTITUTE

Revised April 2006

**COURSE NUMBER & TITLE:** Electronics Technology Training III**PROGRAM AREA:** Electronics Technology Training**CREDITS:** 15**COURSE DESCRIPTION:**

Electronics III is a junior level course designed for enabling students to obtain a Federal Communications Commission General Radiotelephone Operators License (GROL). Successful candidates are eligible for career opportunities in aeronautics, Communications, and Radar Technology. GROL licensees are authorized by the Commission to maintain, calibrate, and repair commercial communication equipment in the United States. With emphasis on the GROL, the course is designed to enhance the student's ability to identify components, prototype and mathematically analyze circuits, and utilize test equipment in investigating circuit parameters.

**Course Recommendation:**

- Students are recommended to pursue career related mathematics in Electronics Technology. Appropriate courses will include Algebra, Trigonometry, Geometry, Pre-Calculus, Calculus, and Statistics.

**REQUIRED TEXTBOOKS/SOFTWARE/MATERIALS:**

Recommended Materials, Supplies workbook, Test instruments, Projects and Software

- **Equipment and Trainers**
  - PAD-234 Digital/Analog Trainer Kit
  - Dual Trace Oscilloscope
  - VOM/DMM
  - Signal Generator
- **Software**
  - Altium Electronic Design Explorer (DXP)

- **Projects**

Analog (TBA)

Digital (TBA)

Circuit Simulations (TBA)

## INSTRUCTIONAL STRATEGIES:

Various teaching methods are used in this course. Instruction will be given using prepared customized projects, class notes and software. Classroom demonstrations and lab activities will be included. Group activities and cooperative learning will be used.

## Evaluation:

Students are evaluated using the following criteria:

1. Class participation
2. Attendance
3. Lab Reports
4. Projects
5. Class assignments

The following major topical units are presented in the Electronics Program.

**Standard 5: All Students Will Apply Safety Principles.** ..... 5.1, .2, .4

## TOPICS:

The following major topical units are presented in the Electronics Careers Program.

### ELECTRONICS CAREER PROGRAM I

2033.00 Safety/Basic Concepts

2033.01 Self Management Skills

2033.02 Electrical Concepts

2033.03 Technical Mathematics

2033.04 Basic Circuits, Loads and Measurements

## VII. OBJECTIVES:

**Students will understand that the process of designing an electronic circuit takes into account many factors, including environment concerns, and will be familiar with precautionary measures.**

**2033.00 SAFETY CONCEPTS**

01. List rules for personal safety.
02. List rules for general shop safety.
03. List the safe use of tools and equipment.
04. Identify safety equipment.
05. Explain how to use safety equipment.

Utilizing Standard 3.2, all students will be able to write in a clear, concise, and organized language that varies in content and form for various audiences and purposes.....A.4-.5

**2033.01 Self Management Skills**

01. List the names of the most famous scientist, latest inventions and Inventor.
02. List a variety of different career opportunities
03. Describe the function of each listed component.
04. List the names of the most common components
05. List the names of the most common test instruments.
06. Describe the main function of Electronic test instruments

**2033.02 Electrical Concepts**

01. Switching circuit biasing and design using diodes.
02. Switching circuit biasing and design using transistors.
03. Amplifier circuit biasing and design using transistors.
04. Amplifier circuit biasing and design using Operational Amplifiers.
05. Voltmeter concepts and design.
06. Ammeter concepts and design.
07. Ohmmeter concepts and design.
08. Resonance circuit design.
09. Time constant circuit design.
10. Voltage divider circuit design.
11. Current divider circuit design.
12. Digital logic gate design.
13. Sequential logic circuit design.
14. Digital clock design.
15. Digital counter design.
16. Digital encoder design.
17. Digital decoder design.
18. Digital register design.

19. Digital memory design.
20. Filter circuit concepts and design.

### 2033.03 Technical Mathematics

***STANDARD 4.4 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA***

01. Algebraic substitution and circuit applications.
02. Inverse operations and circuit applications.
03. Number System Conversions and circuit applications.
04. Exponents and circuit applications.
05. Radicals and circuit applications.
06. Trigonometric operations and circuit applications.
07. Logarithm functions and circuit applications.

### 2033.04 Basic Circuits, Loads, and Measurements

01. Measure tap voltages, using DMMs, to evaluate voltage division.
02. Measure branch currents, using DMMs, to evaluate current division.
03. Establish Q point in amplifier circuits and verify using the DMM.
04. Establish input/output phase relationships of various amplifier configurations.
05. Use Operational Amplifiers in various analog applications and evaluate Circuit performance using the DMM and Oscilloscope.
06. Establish timing relationships in various digital applications using the oscilloscope.
07. Evaluate series and parallel resonance using the DMM and Oscilloscope.
08. Plot Frequency response of filter circuits using the DMM and Oscilloscope.

**COURSE POLICIES:**

- A. Attendance: Attendance and punctuality are expected for each student. Excessive absences will affect the student's performance and grade in this course.
- B. Laboratory Activities: Students are responsible for all course material and activities covered in class. Project Task Sheets are utilized extensively for recording student projects. Absences do not exclude students from based extensive absences are reflected in a student's percentage of entry level skills.
- C. Homework Assignments: Students are required to complete a given number of assignments outside class. All assignments must be completed by the due date. Assignments that are missed will be reflected in ability to score well in the formal test area.
- D. Use of Equipment: Safety is the predominant objective in all training. Appropriate clothing and work shoes are required in all areas. Prior to the beginning of any project utilizing equipment, a student must write the safety precautions to be taken on the "Project Task Sheet".
- E. Working Area: Working areas should be free of discarded papers or any other unnecessary objects. The student is responsible for maintaining and leaving the working area neat and clean.
- F. Safety: The student must pass a general written safety test with a 100%, prior to starting class. The test will be placed on the student's folder. All projects must incorporate a safety statement written by the student and initialed by the instructor, prior to beginning the project on each task sheet.
- G. Unit Test: Students are required to complete unit test on each topic. Students will be offered 3 trails to achieve their best scores. This is required in the CBE grading system. (Typical for each section).
- H. Expectations for Student Behavior: All students are expected to fulfill the behavioral expectations of the school community, and to:
- \*Prepare themselves mentally and physically for the process of learning.
  - \*Demonstrate respect for people and property.
  - \*Take responsibility for their own behavior and learning.
  - \*Use time and other resources responsibly.
  - \*Share responsibilities when working as members of a group.
  - \*Meet the unique requirements of each class.
  - \*Monitor their own progress toward objectives.

**SPECIAL PROJECTS/ACTIVITIES:**

- Field trips to related industries.

- Parent's Night Display.
- Instructors are expected to encourage students to enter their final project in trade competition i.e., Craftmans Fair and VICA.
- Students will maintain "Project Task Sheets" on all projects which are assigned by the instructor.

## SCOPE AND SEQUENCE:

Key: I= Introduced  
 D= Developed in Depth  
 R= Reinforced

## SKILL TO BE LEARNED

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Understand and use Engineering Notation	<b>DR</b>
Differentiate between an Atom and an Ion	<b>DR</b>
Understand how to read resistor color codes	<b>DR</b>
Understand how to use a Digital Multi-meter and Power Supply	<b>DR</b>
Understand how to identify component symbols	<b>DR</b>
Understand how to read schematic	<b>DR</b>
Understand how to use a breadboard	<b>DR</b>
Understand the principles of Ohm's Law	<b>DR</b>
Understand the difference between a short and open circuit.	<b>DR</b>
Understand how to troubleshoot properly	<b>DR</b>
Understand Safety Rules	<b>DR</b>
Understand how to use Test Equipment properly	<b>DR</b>
Understand Electronic controls and devices	<b>DR</b>
Differentiate between a potentiometer and a rheostat	<b>DR</b>
Differentiate between Inductors and Capacitors	<b>DR</b>
Differentiate between Transistors and Diodes	<b>DR</b>
Differentiate between Fuses and Circuit breakers	<b>DR</b>
Differentiate between Buzzers and Speakers	<b>DR</b>
Understand how to design a Printed Circuit Board	<b>DR</b>
Understand how to use software design program	<b>DR</b>
Analyze Series and Parallel Circuits	<b>DR</b>
Analyze Series / Parallel Circuits	<b>DR</b>

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### **PROFICIENCIES**

Upon successful completion of the requirements for this course, the student will be able to:

- Understand and use Engineering Notation
- Differentiate between an Atom and an Ion
- Understand how to read resistor color codes
- Understand how to use a Digital Multi-meter and Power Supply
- Understand how to identify component symbols
- Understand how to read schematic
- Understand how to use a breadboard
- Understand the principles of Ohm's Law
- Understand the difference between a short and open circuit.
- Understand how to troubleshoot properly
- Understand Safety Rules
- Understand how to use Test Equipment properly
- Understand Electronic controls and devices
- Differentiate between a potentiometer and a rheostat
- Differentiate between Inductors and Capacitors
- Differentiate between Transistors and Diodes

Differentiate between Fuses and Circuit breakers  
Differentiate between Buzzers and Speakers  
Understand how to design a Printed Circuit Board  
Understand how to use software design program  
Analyze Series and Parallel Circuits  
Analyze Series / Parallel Circuits  
Understand Kirchoff's Law