

July 2004

**Florida Department of Education
CURRICULUM FRAMEWORK**

Program Title:	Avionics
Occupational Area:	Industrial Education
	<u>PSAV</u>
Program Numbers	I470199
CIP Number	0647.019901
Grade Level	30, 31
Length	2120 hours
SOC	49-2091
Certification	AVIONICS @7 G ELECTRONIC @7 G

- I. **MAJOR CONCEPTS/CONTENT:** The purpose of this program is to prepare students for employment as radio mechanics (85514608) and as avionics technicians (823.281-010).

The course content includes, but is not limited to, troubleshooting, repair, and installation of airborne radio communications, radio navigation, and radar equipment systems in accordance with regulatory and industry standards. Also included is instruction in basics of AM and FM transmitters and receivers and avionics equipment. Skills preparation for passing licensing/certification tests required by industry forms an integral part of the curriculum.

The course content should also include training in communication, leadership, human relations and employability skills, and safe, efficient work practices.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Avionics industry: planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

- II. **LABORATORY ACTIVITIES:** Shop or laboratory activities are an integral part of this program. These activities provide instruction in the use of tools, equipment, materials and processes found in the industry.

TOOLS AND EQUIPMENT: The following tools are the basic entry-level tools required by an Avionics Installer.

1. Screwdrivers: Magnetic w/Apex Bit type inserts (#0, 1, 2 flat and Philips)
2. Jeweler's Screwdriver Set
3. Offset Ratchet w/¼ drive
4. Standard 3/8 drive ¼ to 1 inch Socket Set
5. Nut drives from 1/8 to 3/8 inch Set
6. Standard Small Ignition Open End Wrenches from 1/8 to ½
7. Various size (small and medium) Wire Cutters
8. 6 inch, Needle Nose, Diagonal, and Standard Slip Joint Pliers
9. Teflon Aviation Style Wire Strippers (confirm with instructor before purchasing)
10. Small and Medium Flashlight
11. Small and Medium Inspection Mirror
12. 6 and 12 inch Metal Ruler

III. SPECIAL NOTE:

1. SkillsUSA, Inc. is the appropriate Career and Technical Student Organization (CTSO) for providing leadership training and for reinforcing specific career and technical skills. Career and Technical Student Organizations, when provided, shall be an integral part of the career and technical instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC.

2. Cooperative training - OJT is appropriate for this program. Whenever cooperative training - OJT is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills, and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

3. Electronic Technology and/or Electronic Engineering Technology and/or equipment training and/or work experience are prerequisites for entry into this electronic specialization. Algebra is recommended as a prerequisite for entry into this program.

4. In accordance with Rule 6A-10.040, FAC, the minimum basic-skills grade levels required for adult vocational students to complete this program are: Mathematics 10.0, Language 10.0, Reading 10.0. These grade-level numbers correspond to grade-equivalent scores obtained on one of the state-designated basic-skills examinations. If a student does not meet the basic-skills level required for completion of the program, remediation should be provided concurrently through Vocational Preparatory Instruction (VPI). Please refer to the Rule for exemptions.

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Adult students with disabilities must self-identify and request such services. Students with disabilities may need accommodations in such areas as instructional methods and materials,

assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

5. SCANS Competencies: To accomplish the Secretary's Commission on Achieving Necessary Skills (SCANS) competencies, instructional strategies for this cluster must include methods that require students to identify, organize, and use resources appropriately; to work with each other cooperatively and productively; to acquire and use information; to understand social, organizational, and technological systems; and to work with a variety of tools and equipment. Instructional strategies must also incorporate methods to improve students' personal qualities and higher-order thinking skills.

6. To be transferable statewide between institutions, this program/course must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific program or course articulation agreements with each other.

7. This program may be offered in courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b) F.S.

8. The standard length of this program is 2120 hours.

IV. INSTRUCTOR QUALIFICATIONS Specialty Instructor Qualifications:

Instructors teaching subjects that have certifications in the subject areas should be so certified and have at least three years of industry experience in the subject area. Instructors should have related industry experience (subject matter expertise) applicable to discipline being taught. Instructor qualifications should be minimum certification level for each educational program with specific experience in the discipline they are teaching. Although the specific criteria are beyond the scope of this effort, instructors should have related industry experience (subject matter expertise) applicable to discipline being taught. For vocational education, the minimum should be COE and a subject matter expertise. For universities, the minimum should be in accordance with regional accreditation board and several years of recent experience in the discipline.

All instructors should meet appropriate experience levels required for industry certification where such certifications exist (or experience levels should be reviewed by a school advisory board consisting of industry representatives, if available).

Vocational/technical teachers who teach at the career and technical level should receive educational experience from local post-secondary educational institution (such as workshops for teachers on How to Teach, Test Development and Effective Test Result Evaluations, Classroom Management, and How to integrate Academics into technical courses).

Academic Instructor Qualifications: A Bachelor Degree with eighteen hours of course work in the subject area is recommended, an Associates degree is the minimum.

V. INTENDED OUTCOMES: After successfully completing the program, the student will be able to:

OCCUPATIONAL COMPLETION POINT - DATA CODE - A (250 Hours)

ELECTRONICS ASSEMBLER 726.261-010 (SOC 49-2091)

- 01.0 Demonstrate proficiency in soldering and basic laboratory practices.
- 02.0 Demonstrate proficiency in basic D.C. circuits.
- 03.0 Demonstrate workforce/workplace readiness skills.
- 04.0 Demonstrate an understanding of entrepreneurship.

OCCUPATIONAL COMPLETION POINT - DATA CODE - B (400 Hours)

ELECTRONICS TESTER Industry title (SOC 49-2091)

- 05.0 Demonstrate proficiency in knowledge of basic computer usage.
- 06.0 Demonstrate proficiency in advanced D.C. circuits.
- 07.0 Demonstrate proficiency in A.C. circuits.
- 08.0 Demonstrate proficiency in solid state devices.

OCCUPATIONAL COMPLETION POINT - DATA CODE - C (375 Hours)

ELECTRONICS EQUIPMENT REPAIRER 726.381-018 (SOC 49-2091)

- 09.0 Demonstrate proficiency in digital circuits.
- 10.0 Demonstrate proficiency in fundamental micro-processors.

OCCUPATIONAL COMPLETION POINT - DATA CODE - D (375 Hours)

ELECTRONICS TECHNICIAN 726.261-018 (SOC 49-2091)

- 11.0 Demonstrate proficiency in analog circuits.
- 12.0 Demonstrate skills in technical recording.
- 13.0 Demonstrate appropriate communications skills.
- 14.0 Demonstrate appropriate understanding of basic math skills.
- 15.0 Demonstrate an understanding of basic science skills.

OCCUPATIONAL COMPLETION POINT - DATA CODE - E (100 Hours)

AVIONICS TECHNICAL PUBLICATIONS TECHNICIAN (SOC 49-2091)

- 16.0 Demonstrate proficiency in avionics radio repair station regulations and procedures.
- 17.0 Demonstrate appropriate communication skills.
- 18.0 Demonstrate appropriate math skills.
- 19.0 Demonstrate appropriate understanding of basic science.

- 20.0 Demonstrate workforce/workplace readiness skills.
- 21.0 Demonstrate an understanding of entrepreneurship.

OCCUPATIONAL COMPLETION POINT - DATA CODE - F (260 Hours)
AVIONICS INSTALLER (SOC 49-2091)

- 22.0 Demonstrate proficiency in AM and FM transmitters.
- 23.0 Demonstrate proficiency in AM and FM receivers.
- 24.0 Demonstrate proficiency in AM and FM transceivers.
- 25.0 Demonstrate proficiency in electromagnetic wave emissions.
- 26.0 Demonstrate proficiency in installing avionics systems.
- 27.0 Demonstrate knowledge about the calibration of test equipment.

OCCUPATIONAL COMPLETION POINT - DATA CODE - G (180 Hours)
AVIONICS COMMUNICATION SYSTEM TECHNICIAN (SOC 49-2091)

- 28.0 Demonstrate proficiency in aircraft electrical systems and ground safety.
- 29.0 Demonstrate proficiency in line and bench maintenance of airborne communication systems.

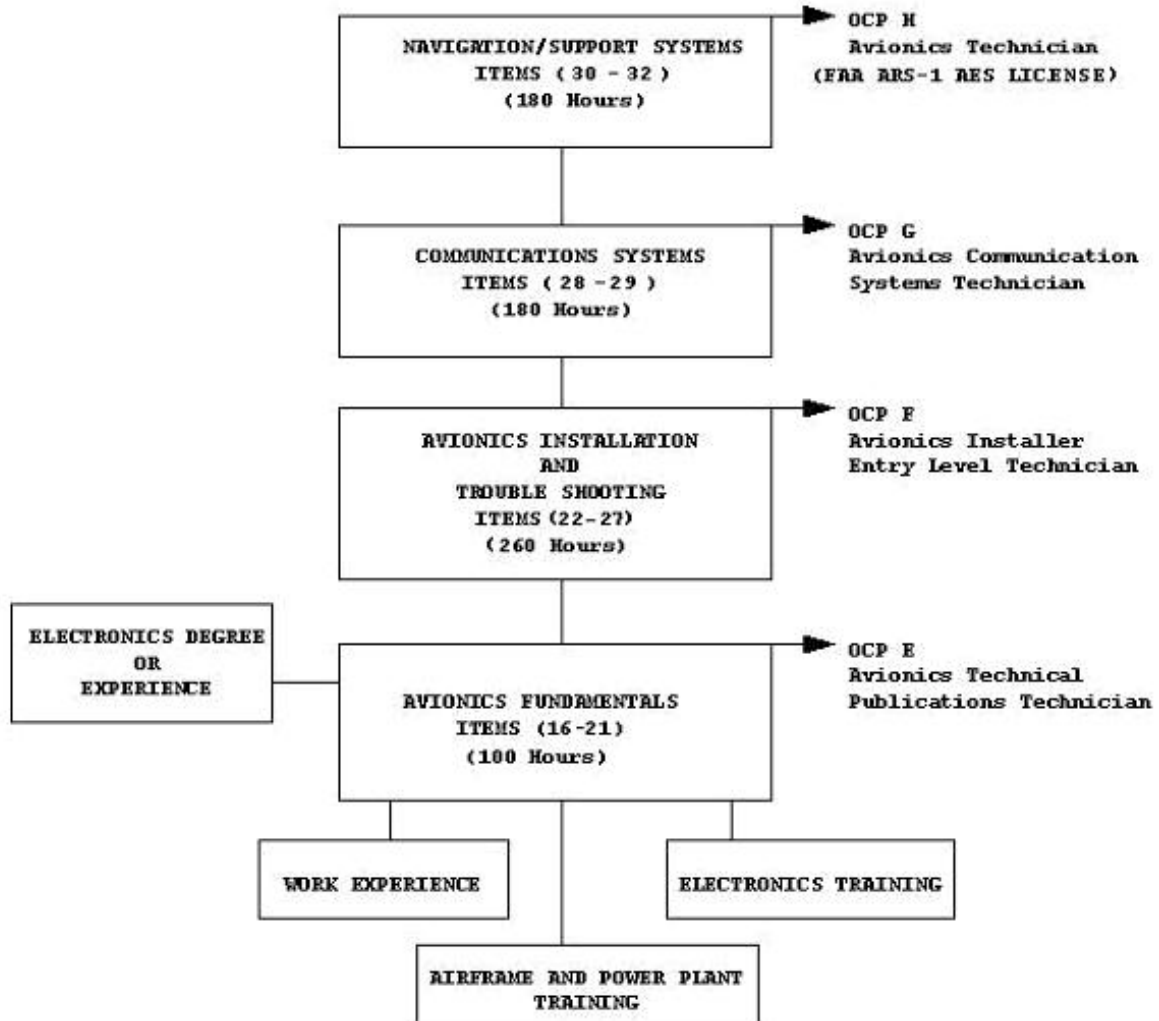
OCCUPATIONAL COMPLETION POINT - DATA CODE - H (180 Hours)
AVIONICS TECHNICIAN - DOT 823.281-010 (SOC 49-2091)

- 30.0 Demonstrate proficiency in line and bench maintenance of airborne radio navigation systems and equipment.
- 31.0 Demonstrate proficiency in line and bench maintenance of airborne radar systems.
- 32.0 Demonstrate proficiency in the principles of operation of area navigation (R-NAV) systems.

The following diagram illustrates the program structure:

AVIONICS

OCP E - AVIONICS PUBLICATION TECHNICIAN (Industry Title)
 OCP F - AVIONICS INSTALLER ENTRY LEVEL TECHNICIAN (Industry Title)
 OCP G - AVIONICS COMMUNICATIONS SYSTEMS TECHNICIAN (Industry Title)
 OCP H - AVIONICS TECHNICIAN (DOT 823.281-010)



Future career paths include AS Degree and BS Degree for supervision and management positions as well as many entrepreneurship opportunities.

Equipment includes a large range of aircraft/spacecraft type equipment and test fixtures.

VI. STUDENT PERFORMANCE STANDARDS

OCCUPATIONAL COMPLETION POINT – DATA CODE - A ELECTRONICS ASSEMBLER 726.261-010

01.0 DEMONSTRATE PROFICIENCY IN SOLDERING BASIC LABORATORY PRACTICES--The student will be able to:

- 01.01 Apply proper Occupational Safety Health Administration (OSHA) safety standards.
- 01.02 Make electrical connections.
- 01.03 Identify and use hand tools properly.
- 01.04 Identify and use power tools properly.
- 01.05 Demonstrate acceptable soldering techniques.
- 01.06 Demonstrate acceptable de-soldering techniques.
- 01.07 Demonstrate electrostatic discharge (ESD) safety procedures.
- 01.08 Describe the construction of printed circuit boards (PCB's).
- 01.09 Explain the theoretical concepts of soldering.
- 01.10 Demonstrate rework and repair techniques.

02.0 DEMONSTRATE PROFICIENCY IN BASIC DIRECT CURRENT (DC) CIRCUITS--The student will be able to:

- 02.01 Demonstrate proficiency in basic D.C. circuits.
- 02.02 Solve problems in electronic units utilizing metric prefixes.
- 02.03 Identify sources of electricity.
- 02.04 Define voltage, current, resistance, power and energy.
- 02.05 Apply Ohm's law and power formulas.
- 02.06 Read and interpret color codes and symbols to identify electrical components and values.
- 02.07 Measure properties of a circuit using volt-ohm meter (VOM) and digital volt-ohm meter (DVM) and oscilloscopes.
- 02.08 Compute conductance and compute and measure resistance of conductors and insulators.
- 02.09 Apply Ohm's law to series circuits.
- 02.10 Construct and verify operation of series circuits.
- 02.11 Analyze and troubleshoot series circuits.
- 02.12 Apply Ohm's law to parallel circuits.
- 02.13 Construct and verify the operation of parallel circuits.
- 02.14 Analyze and troubleshoot parallel circuits.

03.0 DEMONSTRATE WORKFORCE/WORKPLACE READINESS SKILLS—

The student will be able to:

- 03.01 Identify reasons people work.

- 03.02 Describe connections between jobs, careers, family life, etc.
- 03.03 Conduct an individual inventory of personal work experience skills.
- 03.04 Develop a career plan.
- 03.05 Understand the information and ability required for different careers.
- 03.06 Compare occupation requirements and benefits associated with employment.
- 03.07 Locate, select, and process classified newspaper and magazine advertisements.
- 03.08 Identify and locate government and private employment agencies and/or computer-assisted job search programs.
- 03.09 Identify and locate personal resource materials (birth certificates, diplomas, training certificates, driver's license, and social security card).
- 03.10 Understand the importance of personal/professional job search information.
- 03.11 Develop a job card file (for specific job leads, requirements, employer names, interview information, and personal notes).
- 03.12 Use appropriate communication skills when using the telephone or email to talk with an employer.
- 03.13 Describe and give examples of job interview situations, including prepared questions to ask the job interviewer.
- 03.14 Identifies proper behavior/attitudes for job interviews.
- 03.15 Demonstrates skillful methods in job interviews (grooming, dress, and verbal/nonverbal communication techniques).
- 03.16 Develop a personal fact sheet that includes personal references, work history, educational information, and other related information.
- 03.17 Read, interpret, and complete a job application and attach a well composed resume' with cover letter.
- 03.18 Write a follow-up letter after the interview with appropriate comments.
- 03.19 Interpret wages, deductions, benefits, and taxes.
- 03.20 Interpret timekeeping forms, timecards, and timesheets, as applicable.
- 03.21 Interpret pay schedules and fringe benefits, medical insurance, and retirement plans.
- 03.22 Understand the importance of contracts and union agreements.
- 03.23 Show knowledge of employee handbooks, personnel policies, and workers compensation.
- 03.24 Identify safety signs found in places of employment and safe work procedures.
- 03.25 Understand the importance of reporting health and safety questions to the appropriate person.
- 03.26 Understand safe work clothes and good health rules/appropriate dress habits.
- 03.27 Understand relations to job training, performance, retention, promotion and changes by describing career job goals.
- 03.28 Identify feelings and opportunities that affect success for job advancement and retention.
- 03.29 Demonstrate the ability to apply or transfer skills learned in one job situation to another.
- 03.30 Identify computer skills that affect job retention and advancement.
- 03.31 Interpret and write work related correspondence (notes, memos, and letters).
- 03.32 Know how to react to constructive criticism and when to make personal changes or resign from a job.

- 03.33 Analyze and solve workforce problems.
- 03.34 Demonstrate appropriate use of the phone or cell phone in a workplace setting.
- 03.35 Demonstrate the ability to work with others and communication skills while addressing customers and clients.
- 03.36 Demonstrate the process of taking action to meet the needs and solve the problems of customers.
- 03.37 Demonstrate effective body language and its influence on the observer.
- 03.38 Identify sexual harassment issues in the workplace.
- 03.39 Identify and use different approaches when working within multicultural workforce groups.
- 03.40 Identify techniques for handling stress and time management problems on the job.
- 03.41 Understand the advantages and disadvantages of a computer, possible uses of a computer system, and proper procedures to maintain computer/network security.
- 03.42 Demonstrate knowledge of "Florida Right-To-Know Law" as recorded in Florida statues Chapter 442.
- 03.43 Demonstrate ability to pass Aerospace Technician Certification written, oral and performance tests.

04.0 **DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--**

The student will be able to:

- 04.01 Define entrepreneurship.
- 04.02 Describe the importance of entrepreneurship to the American economy.
- 04.03 List the advantages and disadvantages of business ownership.
- 04.04 Identify the risks involved in ownership of a business.
- 04.05 Identify the necessary personal characteristics of a successful entrepreneur.
- 04.06 Identify the business skills needed to operate a small business efficiently and effectively.

OCCUPATIONAL COMPLETION POINT – DATA CODE - B

ELECTRONICS TESTER 726.266-018

05.0 DEMONSTRATE PROFICIENCY IN KNOWLEDGE OF BASIC COMPUTER USAGE--The student will be able to:

- 05.01 Demonstrate the use of a micro-computer operating system.
- 05.02 Demonstrate the use of a high level computer language.
- 05.03 Demonstrate the use of micro-computer application programs (i.e., word processing, data base and spreadsheet).

06.0 DEMONSTRATE PROFICIENCY IN ADVANCED D.C. CIRCUITS--The student will be able to:

- 06.01 Solve algebraic problems to include exponentials to DC.
- 06.02 Relate electricity to the nature of matter.
- 06.03 Apply Ohm's law to series-parallel and parallel-series circuits.

- 06.04 Construct and verify the operation of series-parallel and parallel-series and bridge circuits.
- 06.05 Troubleshoot series-parallel and parallel-series and bridge circuits.
- 06.06 Identify and define voltage divider circuits (loaded and unloaded).
- 06.07 Construct and verify the operation of voltage divider circuits (loaded and unloaded).
- 06.08 Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
- 06.09 Apply maximum power transfer theorem.
- 06.10 Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
- 06.11 Describe magnetic properties of circuits and devices.
- 06.12 Determine the physical and electrical characteristics of capacitors and inductors.
- 06.13 Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.
- 06.14 Set up and operate power supplies for DC circuits.

07.0 DEMONSTRATE PROFICIENCY IN A.C. CIRCUITS--The student will be able to:

- 07.01 Solve basic trigonometric problem as applicable to electronics.
- 07.02 Define the characteristics of AC capacitive circuits.
- 07.03 Construct and verify the operation of AC capacitive circuits.
- 07.04 Analyze and troubleshoot AC capacitive circuits.
- 07.05 Define the characteristics of AC inductive circuits.
- 07.06 Construct and verify the operation of AC inductive circuits.
- 07.07 Analyze and troubleshoot AC inductive circuits.
- 07.08 Define and apply the principles of transformers to AC circuits.
- 07.09 Construct and verify the operation of AC circuits utilizing transformers.
- 07.10 Analyze and troubleshoot AC circuits utilizing transformers.
- 07.11 Construct and verify the operation of differentiators and integrators to determine R-C and R-L time constraints.
- 07.12 Analyze and troubleshoot differentiator and integrator circuits.
- 07.13 Define the characteristics of resistive, Inductive, and Capacitive (RLC) circuits (series, parallel and complex).
- 07.14 Construct and verify the operation of series and parallel resonant circuits.
- 07.15 Define the characteristics of series and parallel resonant circuits.
- 07.16 Construct and verify the operation of series and parallel resonant circuits.
- 07.17 Analyze and troubleshoot R-C, R-L, and RLC circuits.
- 07.18 Define the characteristics of frequency selective filter circuits.
- 07.19 Construct and verify the operation of frequency selective filter circuits.
- 07.20 Analyze and troubleshoot frequency selective filter circuits.
- 07.21 Define the characteristics of polyphase circuits.
- 07.22 Define basic motor theory and operation.
- 07.23 Define basic generator theory and operation.
- 07.24 Set up and operate power supplies for AC circuits.
- 07.25 Analyze and measure power in AC circuits.

07.26 Set up and operate capacitor and inductor analyzers for AC circuits.

08.0 DEMONSTRATE PROFICIENCY IN SOLID STATE DEVICES--The student will be able to:

- 08.01 Identify and define properties of semiconductor materials.
- 08.02 Identify and define operating characteristics and applications of junction diodes.
- 08.03 Identify and define operating characteristics and applications of special diodes.
- 08.04 Construct diode circuits.
- 08.05 Analyze and troubleshoot diode circuits.
- 08.06 Identify and define operating characteristics and applications of bipolar transistors,
- 08.07 Identify and define operating characteristics and applications of field effect transistors.
- 08.08 Identify and define operating characteristics and applications of single-stage amplifiers.
- 08.09 Construct single-stage amplifiers.
- 08.10 Analyze and troubleshoot single-stage amplifiers.
- 08.11 Construct thyristor circuitry.
- 08.12 Analyze and troubleshoot thyristor circuitry.
- 08.13 Set up and operate VOM for solid-state devices.
- 08.14 Set up and operate DVM for solid-state devices.
- 08.15 Set up and operate power supplies for solid-state devices.
- 08.16 Set up and operate oscilloscopes for solid-state devices.
- 08.17 Set up and operate function generators for solid-state devices.
- 08.18 Set up and operate capacitor and inductor analyzers for solid-state devices.
- 08.19 Set up and operate curve tracers.
- 08.20 Set up and operate transistor testers.

OCCUPATIONAL COMPLETION POINT – DATA CODE - C
ELECTRONIC EQUIPMENT REPAIRER 726.381-018

09.0 DEMONSTRATE PROFICIENCY IN DIGITAL CIRCUITS--The student will be able to:

- 09.01 Define and apply numbering systems to codes and arithmetic operations.
- 09.02 Analyze and minimize logic circuits using Boolean operations.
- 09.03 Set up and operate logic probes for digital circuits.
- 09.04 Set up and operate power supplies for digital circuits and solve power distribution and noise problems.
- 09.05 Set up and operate pulsers for digital circuits.
- 09.06 Set up and operate oscilloscopes for digital circuits.
- 09.07 Set up and operate logic analyzers for digital circuits.
- 09.08 Set up and operate pulse generators for digital circuits.
- 09.09 Identify types of logic gates and their truth tables.
- 09.10 Construct combinational logic circuits using integrated circuits.

- 09.11 Troubleshoot logic circuits.
- 09.12 Analyze types of flip-flops and their truth tables.
- 09.13 Construct flip-flops using integrated circuits.
- 09.14 Troubleshoot flip-flops.
- 09.15 Identify, define and measure characteristics of integrated circuit (IC) logic families.
- 09.16 Identify types of registers and counters.
- 09.17 Construct registers and counters using flip-flops and logic gates.
- 09.18 Troubleshoot registers and counters.
- 09.19 Analyze clock and timing circuits.
- 09.20 Construct clock and timing circuits.
- 09.21 Troubleshoot clock and timing circuits.
- 09.22 Identify types of arithmetic-logic circuits.
- 09.23 Construct arithmetic-logic circuits.
- 09.24 Troubleshoot arithmetic-logic circuits.
- 09.25 Identify types of encoding and decoding devices.
- 09.26 Construct encoders and decoders.
- 09.27 Troubleshoot encoders and decoders.
- 09.28 Identify types of multiplexer and demultiplexer circuits.
- 09.29 Construct multiplexer and demultiplexer circuits using integrated circuits.
- 09.30 Troubleshoot multiplexer and demultiplexer circuits.
- 09.31 Identify types of memory circuits.
- 09.32 Relate the uses of digital-to-analog and analog-to-digital conversions.
- 09.33 Construct digital-to-analog and analog-to-digital circuits.
- 09.34 Troubleshoot digital-to-analog and analog-to-digital circuits.
- 09.35 Identify types of digital displays.
- 09.36 Construct digital display circuits.
- 09.37 Troubleshoot digital display circuits.

10.0 DEMONSTRATE PROFICIENCY IN FUNDAMENTAL MICRO PROCESSORS--The student will be able to:

- 10.01 Identify central processing unit (CPU) building blocks and their uses (architecture).
- 10.02 Analyze bus concepts.
- 10.03 Analyze various memory schemes.
- 10.04 Use memory devices in circuits.
- 10.05 Troubleshoot memory device circuits.
- 10.06 Set up and operate oscilloscopes for microprocessor systems.
- 10.07 Set up and operate logic-data analyzers to troubleshoot microprocessor systems.
- 10.08 Identify types of input and output devices and peripherals.
- 10.09 Interface input and output ports to peripherals.
- 10.10 Analyze and troubleshoot input and output ports.
- 10.11 Write a microprocessor program in assembly language.
- 10.12 Write a microprocessor program in machine language.
- 10.13 Execute microprocessor instruction sets.

OCCUPATIONAL COMPLETION POINT – DATA CODE - D
ELECTRONICS TECHNICIAN

11.0 DEMONSTRATE PROFICIENCY IN ANALOG CIRCUITS--The student will be able to:

- 11.01 Identify and define operational characteristics and applications of multistage amplifiers.
- 11.02 Construct multistage amplifiers.
- 11.03 Analyze and troubleshoot multistage amplifiers.
- 11.04 Identify and define operating characteristics and applications of linear integrated circuits.
- 11.05 Identify and define operating characteristics and applications of basic power supplies and filters.
- 11.06 Construct basic power supplies and filters.
- 11.07 Identify and define operating characteristics and applications of differential and operational amplifiers.
- 11.08 Construct differential and operational amplifier circuits.
- 11.09 Analyze and troubleshoot differential and operational amplifier circuits.
- 11.10 Identify and define operating characteristics of audio power amplifiers.
- 11.11 Construct audio power amplifiers.
- 11.12 Analyze and troubleshoot audio power amplifiers.
- 11.13 Identify and define operating characteristics and applications of power supply regulator circuits.
- 11.14 Construct power supply regulator circuits.
- 11.15 Analyze and troubleshoot power supply regulator circuits.
- 11.16 Identify and define operating characteristics and applications of active filters.
- 11.17 Construct active filter circuits.
- 11.18 Analyze and troubleshoot active filter circuits.
- 11.19 Identify and define operating characteristics and applications of sinusoidal and nonsinusoidal oscillator circuits.
- 11.20 Construct oscillator circuits.
- 11.21 Analyze and troubleshoot oscillator circuits.
- 11.22 Identify and define operating characteristics and applications of cathode ray tubes.
- 11.23 Identify and define operating characteristics and applications of optoelectronic devices.
- 11.24 Set up and operate measuring instruments for analog circuits.

12.0 DEMONSTRATE SKILLS IN TECHNICAL RECORDING--The student will be able to:

- 12.01 Draw and interpret electronic schematics.
- 12.02 Record data and design curves and graphs.
- 12.03 Write reports and make oral presentations.
- 12.04 Maintain test logs.

- 12.05 Make equipment failure reports.
- 12.06 Specify and requisition simple electronic components.
- 12.07 Compose technical letters and memoranda.
- 12.08 Write formal reports of laboratory experiences.
- 12.09 Draft preventive maintenance and calibration procedures.

13.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

- 13.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
- 13.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
- 13.03 Read and follow written instructions.
- 13.04 Answer and ask questions coherently and concisely.
- 13.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
- 13.06 Demonstrate appropriate telephone/communication skills.

14.0 DEMONSTRATE APPROPRIATE UNDERSTANDING OF BASIC MATH SKILLS--The student will be able to:

- 14.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
- 14.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
- 14.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
- 14.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
- 14.05 Demonstrate and understanding of federal, state, and local taxes and their computation.

15.0 DEMONSTRATE AN UNDERSTANDING OF BASIC SCIENCE SKILLS--The student will be able to:

- 15.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
- 15.02 Draw conclusions or make inferences from data.
- 15.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
- 15.04 Understand pressure measurement in terms of P.S.I. (pounds per square inch), and kPa (kilopascal).

**OCCUPATIONAL COMPLETION POINT – DATA CODE - E (100 HOURS)
AVIONICS TECHNICAL PUBLICATIONS TECHNICIAN (SOC 49-2091)**

16.0 DEMONSTRATE PROFICIENCY IN AVIONICS RADIO STATION REGULATIONS AND PROCEDURES--The student will be able to:

- 16.01 Define repair station related regulatory and standardization agencies and their purposes.
- 16.02 Define repair station certification requirements.
- 16.03 Define requirements for certification of radio repairmen.
- 16.04 Practice proper station operation procedures.
- 16.05 Prepare repair station reports and documentation.

17.0 DEMONSTRATE APPROPRIATE COMMUNICATIONS SKILLS--The student will be able to:

- 17.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
- 17.02 Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation area.
- 17.03 Read and follow written and oral instructions.
- 17.04 Answer and ask questions coherently and concisely.
- 17.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
- 17.06 Demonstrate appropriate telephone/communication skills.

18.0 DEMONSTRATE APPROPRIATE MATH SKILLS--The student will be able to:

- 18.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
- 18.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
- 18.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
- 18.04 Determine the correct purchase price, including sales tax for a materials list containing a minimum of six items.
- 18.05 Demonstrate an understanding of federal, state and local taxes and their computation.

19.0 DEMONSTRATE APPROPRIATE UNDERSTANDING OF BASIC SCIENCE--The student will be able to:

- 19.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
- 19.02 Draw conclusions or make inferences from data.
- 19.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.

19.04 Understand pressure measurement in terms of P.S.I. (pounds per square inch), and kPa (kilopascal).

20.0 DEMONSTRATE WORKFORCE/WORKPLACE READINESS SKILLS--

The student will be able to:

See student performance number 03.0 above.

21.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--

The student will be able to:

- 21.01 Identify characteristics of the American enterprise system.
- 21.02 Define inflation and deflation.
- 21.03 Illustrate the basic economic questions facing any society.
- 21.04 Determine the results of a change in demand or a change in supply.
- 21.05 List factors, which contribute to economic growth.
- 21.06 Identify characteristics of different types of business ownership.
- 21.07 Choose appropriate action in a situation requiring application of business ethics.

OCCUPATIONAL COMPLETION POINT - DATA CODE - F (180 Hours)

AVIONICS INSTALLER

22.0 DEMONSTRATE PROFICIENCY IN AM AND FM TRANSMITTERS--

The student will be able to:

- 22.01 Define DSB, SSB, FM, and various digital forms of modulation.
- 22.02 Draw, analyze and troubleshoot AM and FM RF oscillator circuits.
- 22.03 Draw, analyze and troubleshoot buffer and multiplier circuits.
- 22.04 Draw, analyze and troubleshoot RF power amplifier circuits.
- 22.05 Draw, analyze and troubleshoot AM and FM modulation circuits.
- 22.06 Draw, analyze and troubleshoot microphone circuits.
- 22.07 Draw, analyze and troubleshoot balanced modulators and SSB filter circuits.
- 22.08 Draw, analyze and troubleshoot AM and FM power supply circuits.
- 22.09 Make power, frequency and modulation measurements of AM and FM transmitters.
- 22.10 Align and troubleshoot AM and FM transmitters.
- 22.11 Describe FCC rules pertaining to AM and FM transmitter maintenance and operation.

23.0 DEMONSTRATE PROFICIENCY IN AM AND FM RECEIVERS--The

student will be able to:

- 23.01 Draw, analyze and troubleshoot receiver audio voltage and power amplifiers and speaker/headphone circuits.
- 23.02 Draw, analyze and troubleshoot AM and FM detector circuits.
- 23.03 Draw, analyze and troubleshoot AM IF amplifier circuits.

- 23.04 Draw, analyze and troubleshoot FM IF amplifier and limited circuits.
- 23.05 Draw, analyze and troubleshoot receiver oscillator and AFC circuits.
- 23.06 Draw, analyze and troubleshoot RF mixer/hetrodyne circuits.
- 23.07 Draw, analyze and troubleshoot receiver RF amplifier circuits.
- 23.08 Draw, analyze and troubleshoot AVC/AGC circuits.
- 23.09 Draw, analyze and troubleshoot receiver power supplies.
- 23.10 Make receiver sensitivity, selectivity, bandwidth, image rejection and adjacent channel rejection measurements.
- 23.11 Align and troubleshoot AM and FM receivers.

24.0 DEMONSTRATE PROFICIENCY IN AM AND FM TRANSCEIVERS--The student will be able to:

- 24.01 Analyze and troubleshoot transceiver control, metering and switching circuits.
- 24.02 Analyze and troubleshoot transceiver frequency synthesizers and phase locked loop circuits.
- 24.03 Analyze and troubleshoot squelch circuits.
- 24.04 Align and troubleshoot transceivers.

25.0 DEMONSTRATE PROFICIENCY IN ELECTROMAGNETIC WAVE EMISSIONS--The student will be able to:

- 25.01 Define the radio frequency spectrum.
- 25.02 Define types and classification of RF emissions.
- 25.03 Define the characteristics of radio waves.
- 25.04 Define radio wave propagation method.
- 25.05 Define the basic types of antennas.
- 25.06 Draw the voltage and current relationships and radiation patterns for the basic types of antennas.
- 25.07 Solve signal strength problems and measure signal strength.
- 25.08 Solve problems pertaining to antenna length, propagation velocity and frequency.
- 25.09 Define methods for antenna tuning, gain and directivity.
- 25.10 Define transmission lines in terms of electrical and physical properties.
- 25.11 Define standing waves, cause and effect, and measure standing wave ratios.
- 25.12 Define tuned transmission lines and describe applications.
- 25.13 Draw voltage, current and impedance relationships for tuned transmission lines.
- 25.14 Compute transmission line losses.
- 25.15 Construct transmission lines.
- 25.16 Define waveguides, resonant cavities and their applications.

26.0 DEMONSTRATE PROFICIENCY IN INSTALLING AVIONICS SYSTEMS--The student will be able to:

- 26.01 Draw an interconnecting diagram and interconnect an IFR Avionics system for a single engine or light twin aircraft using acceptable methods, techniques and practices.

- 26.02 Determine proper placement of the various antennas required for an IFR Avionics package on a light twin or single engine aircraft.
- 26.03 Describe the effects of precipitation static on aircraft radios and standard methods of reduction.
- 26.04 Apply the formula for weight and balance computation.

27.0 DEMONSTRATE KNOWLEDGE ABOUT THE CALIBRATION OF TEST EQUIPMENT--The student will be able to:

- 27.01 Describe the regulatory requirements for repair station test equipment calibration.

**OCCUPATIONAL COMPLETION POINT – DATA CODE - G (180 Hours)
AVIONICS COMMUNICATION SYSTEM TECHNICIAN**

28.0 DEMONSTRATE PROFICIENCY IN AIRCRAFT ELECTRICAL SYSTEMS AND GROUND SAFETY--The student will be able to:

- 28.01 Define standard aircraft bus voltage.
- 28.02 Analyze aircraft electrical power generation and charging systems.
- 28.03 Analyze aircraft electrical power control and distribution systems.
- 28.04 Analyze aircraft electrical warning systems.
- 28.05 Analyze aircraft ground handling safety.
- 28.06 Describe and practice aircraft ground handling safety procedures pertaining to avionics maintenance.

29.0 DEMONSTRATE PROFICIENCY IN LINE AND BENCH MAINTENANCE OF AIRBORNE COMMUNICATION SYSTEMS--The student will be able to:

- 29.01 Describe theory of operation of air to ground communication systems.
- 29.02 Determine serviceability through performance checks of avionics communication systems.
- 29.03 Troubleshoot to the component/module level malfunctioning communication systems/equipment.
- 29.04 Repair and return to service air to ground communication systems/equipment.
- 29.05 Analyze and troubleshoot communication transmitter switching and audio distribution circuits and equipment.
- 29.06 Describe the theory of operation of emergency locator transmitters (ELTs).
- 29.07 Perform preventative and regulatory maintenance and performance tests of ELTs.

**OCCUPATIONAL COMPLETION POINT – DATA CODE - H (180 Hours)
AVIONICS TECHNICIAN - DOT 823.281-010**

30.0 DEMONSTRATE PROFICIENCY IN LINE AND BENCH MAINTENANCE OF AIRBORNE RADIO NAVIGATION SYSTEMS AND EQUIPMENT--The student will be able to:

- 30.01 Describe the principles and theory of operation of VHF omnirange receivers, converters and indicators.
- 30.02 Determine through performance checks, the serviceability of VHF omnirange systems.
- 30.03 Troubleshoot malfunctioning omnirange systems to the component/module level.
- 30.04 Repair and return to service omnirange systems equipment.
- 30.05 Describe the principles and theory of operation of instrument landing systems (ILS).
- 30.06 Determine through performance checks the serviceability of localizer, glideslope and marker beacon receivers, converters and indicators.
- 30.07 Troubleshoot to the component/module level malfunctioning ILS systems and equipment.
- 30.08 Repair and return to service ILS systems and equipment.
- 30.09 Describe the principles of operation of microwave landing systems.
- 30.10 Describe the principles and theory of operation of Automatic Direction Finders (ADF).
- 30.11 Determine through performance checks the serviceability of ADF systems.
- 30.12 Troubleshoot to the component/module level malfunctioning ADF systems.
- 30.13 Repair and return to service ADF systems.
- 30.14 Describe radio navigation systems/equipment interface with other aircraft instruments and systems.

31.0 DEMONSTRATE PROFICIENCY IN LINE AND BENCH MAINTENANCE OF AIRBORNE RADAR SYSTEMS

--The student will be able to:

- 31.01 Describe the principles and theory of operation of Air Traffic Control (ATC) transponders and altitude encoders.
- 31.02 Determine through performance checks the serviceability of ATC transponders and altitude encoders.
- 31.03 Troubleshoot to the component/module level ATC transponders.
- 31.04 Repair and return to service ATC transponders.
- 31.05 Describe the principles and theory of operation and Distance Measurements Equipment (DME).
- 31.06 Determine through performance checks the serviceability of DME systems.
- 31.07 Troubleshoot to the component/module level malfunctioning DME systems.
- 31.08 Repair and return to service DME transponders.
- 31.09 Describe the principles and basic theory of operation of weather radar systems.
- 31.10 Describe the basic principles of operation of a basic radar system.

32.0 DEMONSTRATE PROFICIENCY IN THE PRINCIPLES OF OPERATION OF AREA NAVIGATION (R-NAV) SYSTEMS

--The student will be able to:

- 32.01 Describe the principles of operation of VHF R-NAV systems (VOR-DME).

- 32.02 Describe the principles of operation of hyperbolic R-NAV systems such as Loran C.
- 32.03 Describe the principles of operation of GPS-based navigation.
- 32.04. Describe the principles of operation of Radar/Radio Altimeters.
- 32.05. Describe the principles of operation of Safety Systems such as:
 - Terrain Awareness Warning System (TAWS)
 - Ground Proximity Warning System and Enhanced Version (GPWS, EGPWS)
 - Cockpit Voice Recorder (CVR)
 - Flight Data Recorder (FDR)
 - Terminal Collision Avoidance System (TCAS)
- 32.06. Describe the principles of operation of Satellite Communications.
- 32.07. Describe the principles of operation of Autopilots.
- 32.08 Describe the principles of operation of other emerging technologies.

WEBSITE AND DISTANCE LEARNING INFORMATION

AVIONICS TECHNICIAN: The purpose of this section is to provide a sample of the currently available distance learning products and website resources which can be used to enhance the Avionics Technology program. It is not intended to recommend any specific vendor or online program.

Web Sites
<p>www.au.af.mil/au/ccaf http://trc.dfrc.nasa.gov/Education/Educator/OnlineEducation/Careers/comm.html www.faa.gov http://www.fcc.gov/ http://florida.echoices.com http://www.excelsior.edu/ http://www.uvsc.edu/disted/ http://www.aerolearn.com/ http://www.aea.net http://www.aopa.org/asf/ http://www.GAMA.aero http://www.eaa.org</p>
Institutions with related Distance Learning programs in related maintenance, engineering or space operations
<p>*Embry Riddle Aeronautical Univ: Http://www.db.erau.edu *San Jacinto College, Texas www.sjcd.cc.tx.us *University of North Dakota Http://www.und.edu *Utah Valley State College: http://www.uvsc.edu/disted/ Aerolearn: http://www.aerolearn.com/</p> <p>George T. Baker Aviation School in Miami, FL is the only Vocational school that teaches the Avionics program.</p> <p>* = These programs are offered at a cost.</p>