July 2004

Florida Department of Education
Division of Community Colleges
CURRICULUM FRAMEWORK

Program Title: AEROSPACE TECHNOLOGY
Occupational Area: Industrial Education PSV
CIP Number: 0615.080100 A.A.S. 1615.080100 A. S.
Grade level: College Credit
Length: A.S./A.A.S. Degree - 70 hours

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as aerospace technicians that assemble, service, test, operate and repair systems associated with both expendable and reusable space launch vehicles, payloads, related laboratories and ground support equipment. This program also provides supplemental training for persons previously or currently employed in this occupation. Instruction is designed to qualify students for examinations for certification as an aerospace technician in various skill areas. Since 70 credit hours, including hands on experience, are required in this curriculum, two summer terms will probably be required to complete the program within two years.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral and important part of this program. The Aerospace Industry representatives in a formal DACUM determined the laboratory equipment and skill levels required. Course activities will provide hands-on instruction in the use of tools, equipment, materials and current practices and processes found in the industry. Significant capital investments in facilities and equipment may be required in this program. All tools and shop equipment should be maintained in good working order and in a condition for safe operation.

TOOLS AND EQUIPMENT

1. Specialized electronic tools
2. Hand tools
3. Electrical test equipment
4. Precision measuring equipment
5. Pressure gauges
6. Mass spectrometer
7. Torque wrenches
8. Pneumatic tools
9. Power tools
10. Drill press
11. Band Saw
12. Benders
13. Flow meters
14. Brake
15. Shears.
16. Optical comparator
17. Tubing
18. Taps, dies
19. Flares
20. Swaging

III. SPECIAL NOTES:

1. 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.

2. Required certification examinations include written, oral and practical assessments. The only way a person can get authorization to take these examinations is to (1) graduate from an approved aerospace technician course or (2) obtain permission from the FAA to take the test based on current industry experience.

3. Cooperative work experience - On-the-Job-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 will usually receive compensation for work performed.

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.

4. 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 of improving students' personal qualities and higher-order thinking skills. Community colleges initiating this program are strongly encouraged to visit existing Florida schools with two or four-year curriculums in this area.

5. The Aerospace Industry has very strict employment rules on prior and current drug use, citizenship status and criminal record that are additional work requirements students must meet for internships and employment. Students should be aware of these industry requirements prior to registration in the program.

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. For community colleges, the minimum should be in accordance with regional accreditation boards plus at least three years of industry experience in the discipline. All instructors should meet appropriate experience levels

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

Academic Instructor Qualifications: A Masters Degree in the subject area is preferred. A Bachelor Degree with eighteen hours of course work in the subject area is a minimum.

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

01.0 Demonstrate appropriate communications skills.
02.0 Demonstrate appropriate math skills.
03.0 Demonstrate appropriate understanding of basic science.
04.0 Demonstrate understanding of safe, efficient, professional work practices.
05.0 Demonstrate the knowledge, testing and repair of spacecraft systems.
06.0 Demonstrate the use and maintenance of industry tools.
07.0 Perform basic electricity, electronic and fiber optics skills.
08.0 Demonstrate an understanding of appropriate safety/OSHA rules and regulations.
09.0 Demonstrate the ability to fabricate component parts to specifications.
11.0 Prepare, analyze and evaluate technical reports and data.
11.0 Demonstrate the ability to evaluate problems, troubleshoot and implement appropriate corrective action.
12.0 Select, configure, calibrate, operate and evaluate precision, non-destructive test equipment.
13.0 Demonstrate appropriate knowledge of the operation and repair of high-pressure hydraulic and pneumatic systems.
14.0 Demonstrate workforce/workplace readiness skills.
15.0 Successfully complete internship.

VI. STUDENT PERFORMANCE STANDARDS

01.0 <u>DEMONSTRATE APPROPRIATE COMMUNICATIONS SKILLS</u> — The student will be able to:

01.01 Write logical and understandable statements, or phrases, to complete with accuracy the forms/invoices commonly used in business and industry.
01.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
01.03 Read and follow written and oral instructions.
01.04 Answer and ask questions coherently and concisely.
01.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
01.06 Demonstrate appropriate telephone/communication skills

02.0 <u>DEMONSTRATE APPROPRIATE MATH SKILLS</u> — The student will be able to:

02.01 Work with the common sets of real numbers in performing the four basic operations.

02.02 Use the four basic operations in working with polynomial expressions.
02.03 Solve linear equations in one variable and applied problems.
02.04 Solve linear inequalities in one variable and applied problems.
02.05 Factor polynomials.
02.06 Simplify algebraic fractions, complex fractions and solve rational and literal equations and applied problems.
02.07 Extract roots and raise numbers to a given power.
02.08 Determine areas and volumes of various geometrical shapes.
02.09 Solve ratio, proportion, and percentage problems.
02.10 Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.
02.11 Graph linear equations and inequalities in two variables and solve graph systems of linear equations and inequalities in two variables.
02.12 Solve and graph quadratic equations and inequalities with real solutions and solve related word problems.
02.13 Solve problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.
02.14 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
02.15 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
02.16 Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.
02.17 Demonstrate an understanding of federal, state and local taxes and their computation.

03.0 DEMONSTRATE APPROPRIATE UNDERSTANDING OF BASIC SCIENCE— The student will be able to:

03.01 Identify and characterize materials and commodities used in aerospace industry.
03.02 Demonstrate a basic knowledge of metallurgy.
03.03 Identify uses and hazards involved in handling common materials and commodities used in the aerospace industry.
03.04 Identify materials compatibility/incompatibility.
03.05 Demonstrate a knowledge of chemical processes involved in metal treatments.
03.06 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
03.07 Draw conclusions or make inferences from data.
03.08 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.
03.09 Understand pressure measurement in terms of P.S.I. (pressure per square inch), and kPa (kilopascal).
03.10 Recognize type and degree of corrosion.
03.11 Identify various types of contamination.
03.12 Identify symptoms and causes of metal fatigue.
03.13 Identify a good/bad weld.
03.14 Identify symptoms/causes of delamination.

03.15 Identify symptoms/causes of faulty bonds.
03.16 Demonstrate knowledge of spacecraft fuels and oxidizers.
03.17 Demonstrate knowledge of characteristics and handling of cryogenics.
03.18 Demonstrate knowledge of characteristics and handling of hypergolics.
03.19 Identify appropriate emergency procedures.

04.0 DEMONSTRATE UNDERSTANDING OF SAFE EFFICIENT PROFESSIONAL WORK PRACTICES— The student will be able to:
04.01 Observe work area rules and regulations.
04.02 Tether tools and personal items.
04.03 Log tools (ingress/egress).
04.04 Follow clean room/controlled environment procedures.
04.05 Conduct pre-shift/post-shift tool, materials, equipment, and supplies inventory.
04.06 Follow proper foreign object debris (FOD) procedures.
04.07 Inspect for foreign object debris (FOD).
04.08 Demonstrate good housekeeping practices.
04.09 Demonstrate knowledge of static electricity hazards.
04.10 Demonstrate professional work ethics.
04.11 Demonstrate knowledge of ISO 9000.
04.12 Demonstrate knowledge of quality assurance sciences.
04.13 Demonstrate knowledge of computer applications in quality programs.

05.0 DEMONSTRATE THE KNOWLEDGE, TESTING AND REPAIR OF SPACECRAFT SYSTEMS — The student will be able to:
05.01 Identify spacecraft systems and sub systems and how they relate to the entire spacecraft.
05.02 Demonstrate understanding of the operation of spacecraft systems.
05.03 Identify operational differences between expendable and reusable spacecraft.
05.04 Demonstrate knowledge of basic principles of hydraulics/pneumatics.
05.05 Demonstrate knowledge of basic principles of pyrotechnic devices.
05.06 Demonstrate knowledge of basic principles of rocket propulsion.
05.07 Demonstrate knowledge of basic principles of electro-mechanical systems.
05.08 Demonstrate basic knowledge of ground support equipment.
05.09 Assemble/disassemble components from various systems.
05.10 Demonstrate basic knowledge of how to modify or rework major systems and components to close tolerances.
05.11 Perform fit check/functional test.
05.12 Operate ground support equipment (GSE).
05.13 Operate switches, circuit breakers and valves.
05.14 Demonstrate knowledge of thermal barriers.

06.0 DEMONSTRATE THE USE AND MAINTENANCE OF INDUSTRY TOOLS — The student will be able to:
06.01 Identify proper tools.
06.02 Inspect tools for cleanliness.
06.03 Inspect tools for functionality.

06.04 Clean/decontaminate tools/equipment.
06.05 Demonstrate knowledge/use of hydrasets.

07.0 PERFORM BASIC ELECTRICITY, ELECTRONIC AND FIBER OPTICS SKILLS — The student will be able to:
07.01 Measure capacitance and inductance.
07.02 Calculate and measure electrical power.
07.03 Measure voltage, current, resistance, continuity, and leakage.
07.04 Determine the relationship of voltage, current, and resistance in electrical circuits
07.05 Read and interpret electrical circuit diagrams.
07.06 Inspect and service batteries.
07.07 Utilize proper electrical safety procedures.
07.08 Demonstrate basic knowledge of wire wrapping, potting, crimping, cable lacing and repair.
07.09 Demonstrate basic soldering skills and the identification of components common to electronics.
07.10 Troubleshoot electrical systems.
07.11 Demonstrate knowledge of safety procedures when handling fiber optics.
07.12 Demonstrate knowledge of different types of fiber optic materials and their characteristics.
07.13 Make terminations, splices, and connections.
07.14 Test fiber optic systems using various test equipment.
07.15 Perform fiber optic troubleshooting and diagnosis.

08.0 DEMONSTRATE AN UNDERSTANDING OF APPROPRIATE SAFETY/OSHA RULES AND REGULATIONS — The student will be able to:
08.01 Identify workplace hazards.
08.02 Use appropriate personal protective equipment.
08.03 Use appropriate lifting techniques.
08.04 Place catch nets/bags.
08.05 Set up safe work zone.
08.06 Implement lock out/tag out.
08.07 Use buddy system where required.
08.08 Monitor breathing zones and wind direction.
08.09 Interpret safety equipment readings.
08.10 Demonstrate knowledge of safety/OSHA regulations.
08.11 Identify hazardous materials handling.
08.12 Demonstrate appropriate fire extinguisher use.
08.13 Demonstrate safe confined space entry procedure.

09.0 DEMONSTRATE THE ABILITY TO FABRICATE COMPONENT PARTS TO SPECIFICATIONS — The student will be able to:
09.01 Demonstrate a basic knowledge of applied trigonometry.
09.02 Demonstrate a basic knowledge of machine tools.
09.03 Interpret a basic drawing/blueprint.
09.04 Produce a layout/template.

09.05 Fabricate a sample project.
09.06 Demonstrate the use of brake and shear.
09.07 Demonstrate the ability to finish a component per given requirements.
09.08 Demonstrate the use of precision measuring tools including micrometer and vernier caliper, square, etc.
09.09 Fabricate a project per drawings and specifications.
09.10 Recognize good and bad welds.
09.11 Complete a repair project per drawings and specifications.
09.12 Inspect finished product for conformity.

10.0 PREPARE, ANALYZE AND EVALUATE TECHNICAL REPORTS AND DATA — The student will be able to:
10.01 Interpret technical drawings and schematics.
10.02 Demonstrate application of technical drawings and/or schematic specifications.
10.03 Interpret work authorization documents.
10.04 Demonstrate application of work authorization document to task.
10.05 Perform technical reporting and documentation.
10.06 Demonstrate knowledge of work team protocols (engineering support).

11.0 DEMONSTRATE THE ABILITY TO EVALUATE PROBLEMS, TROUBLESHOOT AND IMPLEMENT APPROPRIATE CORRECTIVE ACTIONS— The student will be able to:
11.01 Evaluate a given job.
11.02 Select appropriate equipment for a given job.
11.03 Select appropriate materials and supplies for a given job.
11.04 Identify essential personnel for a given job.
11.05 Apply troubleshooting skills where necessary.
11.06 Identify and take corrective action where necessary.

12.0 SELECT, CONFIGURE, CALIBRATE, OPERATE AND EVALUATE PRECISION TEST EQUIPMENT — The student will be able to:
12.01 Interpret test procedures.
12.02 Select appropriate test equipment for given test.
12.03 Verify tool and equipment calibration.
12.04 Configure test set up.
12.05 Perform test operations.
12.06 Evaluate test results.
12.07 Identify precision measuring and test equipment.
12.08 Differentiate between destructive and non-destructive testing.

13.0 DEMONSTRATE APPROPRIATE KNOWLEDGE OF THE OPERATION AND REPAIR OF HIGH PRESSURE HYDRAULIC AND PNEUMATIC SYSTEMS— The student will be able to:
13.01 Identify various mechanical connections.
13.02 Demonstrate knowledge of the function of regulators, valves, and gauges.

13.03 Identify unique safety requirements and hazards involved with various fluid systems.
13.04 Identify and inspect components and conduits for compatibility with commodities.
13.05 Differentiate between dedicated and multi-purpose components and conduits.
13.06 Assemble, operate, inspect, and test fluid systems.

14.0 DEMONSTRATE WORKFORCE/WORKPLACE READINESS SKILLS — The student will be able to:

14.01 Identify reasons people work.
14.02 Describe connections between jobs, careers, family life, etc.
14.03 Conduct an individual inventory of personal work experience skills.
14.04 Develop a career plan.
14.05 Understand the information and ability required for different careers.
14.06 Compare occupation requirements and benefits associated with employment.
14.07 Locate, select, and process classified newspaper and magazine advertisements.
14.08 Identify and locate government and private employment agencies and/or computer-assisted job search programs.
14.09 Identify and locate personal resource materials (birth certificates, diplomas, training certificates, driver's license, and social security card).
14.10 Understand the importance of personal/professional job search information.
14.11 Develop a job card file (for specific job leads, requirements, employer names, interview information, and personal notes).
14.12 Use appropriate communication skills when using the telephone or email to talk with an employer.
14.13 Describe and give examples of job interview situations, including prepared questions to ask the job interviewer.
14.14 Identifies proper behavior/attitudes for job interviews.
14.15 Demonstrates skillful methods in job interviews (grooming, dress, and verbal/nonverbal communication techniques).
14.16 Develop a personal fact sheet that includes personal references, work history, educational information, and other related information.
14.17 Read, interpret, and complete a job application and attach a well composed resume' with cover letter.
14.18 Write a follow-up letter after the interview with appropriate comments.
14.19 Interpret wages, deductions, benefits, and taxes.
14.20 Interpret timekeeping forms, timecards, and timesheets, as applicable.
14.21 Interpret pay schedules and fringe benefits, medical insurance, and retirement plans.
14.22 Understand the importance of contracts and union agreements.
14.23 Show knowledge of employee handbooks, personnel policies, and workers compensation.
14.24 Identify safety signs found in places of employment and safe work procedures.
14.25 Understand the importance of reporting health and safety questions to the appropriate person.
14.26 Understand safe work clothes and good health rules/appropriate dress habits.

14.27 Understand relations to job training, performance, retention, promotion and changes by describing career job goals.
14.28 Identify feelings and opportunities that affect success for job advancement and retention.
14.29 Demonstrate the ability to apply or transfer skills learned in one job situation to another.
14.30 Identify computer skills that affect job retention and advancement.
14.31 Interpret and write work related correspondence (notes, memos, and letters).
14.32 Know how to react to constructive criticism and when to make personal changes or resign from a job.
14.33 Analyze and solve workforce problems.
14.34 Demonstrate appropriate use of the phone or cell phone in a workplace setting.
14.35 Demonstrate the ability to work with others and communication skills while addressing customers and clients.
14.36 Demonstrate the process of taking action to meet the needs and solve the problems of customers.
14.37 Demonstrate effective body language and its influence on the observer.
14.38 Identify sexual harassment issues in the workplace.
14.39 Identify and use different approaches when working within multicultural workforce groups.
14.40 Identify techniques for handling stress and time management problems on the job.
14.41 Understand the advantages and disadvantages of a computer, possible uses of a computer system, and proper procedures to maintain computer/network security.
14.42 Demonstrate knowledge of "Florida Right-To-Know Law" as recorded in Florida statues Chapter 442.
14.43 Demonstrate ability to pass Aerospace Technician Certification written, oral and performance tests.

15.0 SUCCESSFULLY COMPLETE INTERNSHIP — The student will be able to:
15.01 Demonstrate a good work attitude
15.02 Demonstrate proper work ethics
15.03 Demonstrate communication skills
15.04 Show job knowledge and basic procedures.

WEBSITE AND DISTANCE LEARNING INFORMATION

AEROSPACE 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 Aerospace Technology program. It is not intended to recommend any specific vendor or online program.

Web Sites
www.amtech.com www.au.af.mil/au/ccaf http://www.e-publishing.af.mil/pubfiles/afspc/21/afspci21-0108/afspci21-0108.pdf USAF Missile Maintenance Manual http://nctn.hq.nasa.gov> www.faa.gov http://florida.echoices.com http://www.excelsior.edu/ http://www.uvsc.edu/disted/ http://www.space-education.org/ http://www.aerolearn.com/
Institutions with related Distance Learning programs in related maintenance, engineering or space operations
*Embry Riddle Aeronautical Univ: Http://www.db.erau.edu *Florida Institute of Technology http://www.fit.edu *University of Central Florida www.ent.engr.ucf.edu *Allan Hancock College www.hancock.cc.ca.us *Brevard Community College: http://web2010.brevard.cc.fl.us/ *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/ * = These programs are offered at a cost.