Florida Department of Education
CURRICULUM FRAMEWORK

Program Title:	**ENGINEERING ASSISTING**
Program Type:	Job Preparatory
Occupational Area:	**Industrial Education Occupations**
Components:	One Program with One Occupational Completion Point
	Secondary
Program Numbers	8743000
CIP Number	0647.030301
Grade Level	9-12, 30, 31
Standard Length	6 credits
Certification	TEC CONSTR ¶7 ¶G BLDG CONST ¶7 ¶G MILLWRIGHT @7 G IND ENGR @7 G TEC EN AID ¶7 ¶G
Facility Code	245
CTSO	SkillsUSA-VICA
Co-op Method	Yes
Apprenticeship	Yes

I. **MAJOR CONCEPTS/CONTENT:** The purpose of this program is to prepare students for employment as machinery maintenance workers (OES 85128), Engineer Assistants, or general maintenance mechanics.

The course content will include the following: safety and the proper use of tools and equipment, customer service, mathematics, blueprint reading, layout and metal fabrication, welding, electricity, two-stroke, four-stroke, and diesel engine repair, drive components, lubricants, employability skills, and entrepreneurship.

Listed below are the courses that comprise this program when offered at the secondary level:

8743010 - Engineering Assisting 1
8743020 - Engineering Assisting 2
8743030 - Engineering Assisting 3
8743040 - Engineering Assisting 4
8743050 - Engineering Assisting 5
8743060 - Engineering Assisting 6

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Engineering 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 and provide instruction in the use of tools, equipment, materials and processes found in the industry. The laboratory activities provide the student opportunities to apply the skills learned in each of the outcome areas contained in this program.

III. **SPECIAL NOTES:** SkillsUSA-VICA, 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, F.A.C.

When a secondary student with a disability is enrolled in a vocational class with modifications to the curriculum framework, the particular outcomes and student performance standards that the student must master to earn credit must be specified on an individual basis. The job or jobs for which the student is being trained should be reflected in the student's desired postschool outcome statement on the Transition Individual Educational Plan (Transition IEP).

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.

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

OCCUPATIONAL COMPLETION POINT – DATA CODE A
Machinery Maintenance Worker – OES 85128

01.0 Apply safety rules and procedures.
02.0 Use tools and equipment.
03.0 Demonstrate proficiency in applying customer service skills.
04.0 Perform mathematical calculations.
05.0 Demonstrate ability to read plans and drawings.
06.0 Perform measuring and layout operations.
07.0 Describe metals and their properties.
08.0 Operate metalworking machines.
09.0 Perform metal fabrication operations.
10.0 Perform gas welding and cutting operations.
11.0 Perform electric metal-bonding operations.
12.0 Perform bench work skills.
13.0 Demonstrate knowledge of basic electricity and electronics.
14.0 Demonstrate proficiency in repairing and maintaining basic two-stroke cycle engines.
15.0 Demonstrate proficiency in repairing and maintaining basic four-stroke cycle engines.
16.0 Demonstrate proficiency in maintaining and repairing diesel engines.
17.0 Maintain drive components.
18.0 Maintain piping and tubing.
19.0 Troubleshoot hydraulic and pneumatic systems.
20.0 Handle and apply lubricants.
21.0 Demonstrate appropriate communication skills.

22.0 Demonstrate appropriate understanding of basic science.
23.0 Demonstrate employability skills.
24.0 Demonstrate an understanding of entrepreneurship.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Title: Engineering Assisting 1
Course Number: 8743010
Course Credit: 1

OCCUPATIONAL COMPLETION POINT – DATA CODE A
Machinery Maintenance Worker – OES 85128

01.0 APPLY SAFETY RULES AND PROCEDURES--The student will be able to:

01.01 Practice shop safety rules and procedures.
01.02 Practice personal safety rules and procedures.
01.03 Practice fire safety rules and procedures.
01.04 Practice electrical safety rules and procedures.
01.05 Practice tool safety rules and procedures.
01.06 Maintain a clean work and shop area.

02.0 USE TOOLS AND EQUIPMENT--The student will be able to:

02.01 Use general hand tools.
02.02 Use special hand tools.
02.03 Use precision measuring tools.
02.04 Use power tools.
02.05 Use fasteners.
02.06 Use gaskets and choose sealants.

03.0 DEMONSTRATE PROFICIENCY IN APPLYING CUSTOMER SERVICE SKILLS--The student will be able to:

03.01 Prepare service orders properly.
03.02 Communicate solutions to customers.
03.03 Follow manufacturers' service manuals.
03.04 Locate parts in a parts catalog or on microfiche.

04.0 PERFORM MATHEMATICAL CALCULATIONS--The student will be able to:

04.01 Make job-related decimal and fraction calculations.
04.02 Solve job-related problems by adding, subtracting, multiplying and dividing numbers.
04.03 Solve job-related problems using a hand-held calculator.
04.04 Solve job-related problems using basic formulas.
04.05 Solve job-related problems using basic geometry.
04.06 Measure a workpiece and compare measurements with blueprint specifications.
04.07 Solve job-related problems using mathematical handbooks, charts, and tables.
04.08 Convert measurements from English to metric and from metric to English units.

05.0 DEMONSTRATE ABILITY TO READ PLANS AND DRAWINGS--The student will be able to:

05.01 Identify dimensions.
05.02 Identify lists of materials and specifications.
05.03 Identify section views/detail views.

05.04 Sketch and dimension a part.
05.05 Disassemble and assemble parts using an exploded view drawing.
05.06 Interpret blueprint abbreviations.
05.07 Identify dimensioning of radii, round holes, fillets, and chamfers.
05.08 Identify screw threads and bolt types.
05.09 Apply dimensional tolerances.
05.10 Identify metal fabrication symbols used in blueprints.

06.0 PERFORM MEASURING AND LAYOUT OPERATIONS--The student will be able to:

06.01 Perform basic geometric construction.
06.02 Use marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surfaceplates, depth gages, and circumference rules.
06.03 Develop patterns using parallel line, radial lines, and triangulation.
06.04 Make metal fabrication sketches.
06.05 Read and measure with steel rules.
06.06 Read and measure with micrometers.
06.07 Read and measure with vernier tools.
06.08 Read and measure with dial calipers.
06.09 Read and measure with dial indicators.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Title: Engineering Assisting 2
Course Number: 8743020
Course Credit: 1

07.0 DESCRIBE METALS AND THEIR PROPERTIES--The student will be able to:

07.01 Describe the steelmaking process.
07.02 Describe the differences between ferrous and nonferrous metals.
07.03 Describe casting, alloys, and forging.
07.04 Identify metals such as galvanized iron and steel, aluminum, stainless steel, sheet metal, copper, and brass.
07.05 Identify properties of the most common metals.
07.06 Identify and describe common gages, shapes, and dimensions of purchased materials.

08.0 OPERATE METALWORKING MACHINES--The student will be able to:

08.01 Identify the purpose of various types of machine shop equipment.
08.02 Operate a drill press utilizing the correct drilling speed.
08.03 Operate a band saw utilizing the correct cutting speed.
08.04 Demonstrate clamping devices for securing stock for drilling.
08.05 Identify types and sizes of drill bits.
08.06 Use portable power saw equipment.
08.07 Use a cutoff or power hacksaw.
08.08 Use electric and air utility grinders.
08.09 Sharpen drill bits.
08.10 Select proper type of abrasive wheels for grinding machines.

09.0 PERFORM METAL FABRICATION OPERATIONS--The student will be able to:

09.01 Fabricate metal, edges, and seams.
09.02 Use hand tools to cut, punch, and shear metal.
09.03 Form sheet metal using a brake, a folder, rolls, and a shear.
09.04 Join metals using solder, rivets, and mechanical fasteners.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Title: Engineering Assisting 3
Course Number: 8743030
Course Credit: 1

10.0 PERFORM GAS WELDING AND CUTTING OPERATIONS--The student will be able to:

10.01 Identify welding cylinders, regulators, hoses, pressure gages, and torches.
10.02 Describe welding equipment safety procedures.
10.03 Demonstrate proper flame settings.
10.04 Demonstrate basic gas welding skills.
10.05 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.
10.06 Demonstrate freehand and guide cutting of various metal thickness.

11.0 PERFORM ELECTRIC METAL-BONDING OPERATIONS--The student will be able to:

11.01 Describe and demonstrate the spot and arc welding process.
11.02 Demonstrate basic procedures for safely adjusting and operating an arc welder, selecting a rod, striking and maintaining an arc, welding in various positions, and clamping.
11.03 Set up and operate a spot welder.
11.04 Explain and demonstrate the MIG welding process.
11.05 Apply basic procedures for safely adjusting, operating, cleaning, and maintaining MIG welding equipment.
11.06 Apply basic procedures for safely adjusting and operating a TIG welder, welding in various positions, selecting proper tips, and choosing filler metal.

12.0 PERFORM BENCH WORK SKILLS--The student will be able to:

12.01 Cut materials by using hand hacksaws.
12.02 Cut threads by using hand taps.
12.03 Cut threads by using dies.
12.04 Repair threads by chasing and thread inserts.
12.05 Ream holes by using hand reamers.
12.06 Hand-sharpen cutting tools by using abrasive stones.
12.07 Hone and lap surfaces.
12.08 Remove damaged screws and other hardware.
12.09 Deburr workpieces.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Title: Engineering Assisting 4
Course Number: 8743040
Course Credit: 1

13.0 DEMONSTRATE KNOWLEDGE OF BASIC ELECTRICITY AND ELECTRONICS--The student will be able to:

13.01 Define electrical/electronic terms.
13.02 Explain the theory and application of magnetism.
13.03 Explain Ohm's Law.
13.04 Describe DC and AC circuits.
13.05 Demonstrate an entry-level understanding of electrical control equipment.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Title: Engineering Assisting 5
Course Number: 8743050
Course Credit: 1

14.0 DEMONSTRATE PROFICIENCY IN REPAIRING AND MAINTAINING BASIC TWO-STROKE CYCLE ENGINES--The student will be able to:

14.01 Explain the basic principles of the operation of the two-stroke cycle internal combustion engine.
14.02 Identify types of engines.
14.03 Locate engine serial and model numbers.
14.04 Identify engine assemblies and systems.
14.05 Disassemble engines.
14.06 Remove, clean, and inspect the head for cracks, warpage, and damaged spark plug threads.
14.07 Remove, clean, and inspect piston rods and assemblies.
14.08 Measure out-of-round and cylinder taper.
14.09 Check the total bearing surface of connecting rod bearings.
14.10 Measure piston skirts and ring grooves.
14.11 Measure the piston ring gap in the cylinder bore.
14.12 Accurately fit piston to cylinder.
14.13 Install piston pins according to manufacturer's specification.
14.14 Check rod and piston assembly alignment.
14.15 Install rings on pistons.
14.16 Install piston rod assemblies.
14.17 Check needle bearings.
14.18 Inspect crankshafts and install seals.
14.19 Inspect, clean, and/or replace reed valves.
14.20 Reassemble engines.

15.0 DEMONSTRATE PROFICIENCY IN REPAIRING AND MAINTAINING BASIC FOUR-STROKE CYCLE ENGINES--The student will be able to:

15.01 Explain the basic principles of the operation of the four-stroke cycle internal combustion engine.
15.02 Identify types of four-stroke cycle engines.
15.03 Locate engine serial and model numbers.
15.04 Identify engine assemblies and systems.
15.05 Disassemble engines.
15.06 Clean and inspect heads for cracks, warpage, and damaged spark plug threads.
15.07 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and margin.
15.08 Grind valve seats and reface valves.
15.09 Check and inspect springs for free height, distortion, and installed height.
15.10 Adjust valve lash.
15.11 Remove and inspect camshafts and lifters.
15.12 Measure camshafts.
15.13 Service camshaft bearings.
15.14 Clear and inspect lifters for wear.
15.15 Time valve drive assemblies.
15.16 Remove piston from rod assemblies.

15.17 Measure out-of-round and cylinder taper with a dial bore gage or micrometer.
15.18 Check piston pins and bosses for wear.
15.19 Measure piston ring lands width, out-of-round, and taper.
15.20 Measure the piston ring gap in the cylinder bore.
15.21 Install and fit piston pins.
15.22 Check rod and piston assembly alignment.
15.23 Remove and replace rod bearings.
15.24 Hone and clean cylinders.
15.25 Install rings on pistons.
15.26 Measure and check crankshafts with a micrometer.
15.27 Check for endplay.
15.28 Check the bearing bore with a telescoping gage using special tools provided by the engine manufacturer.
15.29 Reassemble engines.
15.30 Install oil seals.

16.0 DEMONSTRATE PROFICIENCY IN MAINTAINING AND REPAIRING DIESEL ENGINES--The student will be able to:

16.01 Identify diesel engine operating principles (two- and four-stroke cycle engines).
16.02 Identify components of two- and four-stroke cycle engines.
16.03 Troubleshoot and repair cooling systems.
16.04 Troubleshoot and repair lubrication systems.
16.05 Troubleshoot and repair induction and exhaust systems.

17.0 MAINTAIN DRIVE COMPONENTS--The student will be able to:

17.01 Demonstrate safety procedures for maintaining drive components.
17.02 Identify types of bearings.
17.03 Remove, inspect, and/or replace bearings.
17.04 Remove and replace seals.
17.05 Perform shaft alignment.
17.06 Identify types of belts.
17.07 Identify types of chains.
17.08 Perform tension adjustments on belt and chain drives.
17.09 Troubleshoot belts and chain drives.

Florida Department of Education
STUDENT PERFORMANCE STANDARDS

Course Title: Engineering Assisting 6
Course Number: 8743060
Course Credit: 1

18.0 MAINTAIN PIPING AND TUBING--The student will be able to:

18.01 Identify components of a piping system.
18.02 Explain maintenance considerations of metallic and non-metallic piping system.
18.03 Join copper tubing.
18.04 Join common fittings.
18.05 Join metallic pipe.
18.06 Join plastic pipe.
18.07 Explain valve operation and maintenance.

19.0 TROUBLESHOOT HYDRAULIC AND PNEUMATIC SYSTEMS--The student will be able to:

19.01 Explain safety procedures for troubleshooting hydraulic and pneumatic systems.
19.02 Read hydraulic and pneumatic schematics.
19.03 Explain hydraulic and pneumatic troubleshooting techniques.
19.04 Install hydraulic and pneumatic system components.
19.05 Troubleshoot, repair, and install valves.
19.06 Troubleshoot air compressors and hydraulic pumps.

20.0 HANDLE AND APPLY LUBRICANTS--The student will be able to:

20.01 Explain the functions of lubrication.
20.02 Explain the properties of oil lubricants and factors determining the selection of lubricants.
20.03 Identify the types, advantage, and functions of lubricant additives.
20.04 Identify grease application.
20.05 Identify lubricating systems and methods.
20.06 Explain lubricant storage and handling methods.
20.07 Lubricate a piece of industrial equipment.

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

21.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
21.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
21.03 Read and follow written and oral instructions.
21.04 Answer and ask questions coherently and concisely.
21.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
21.06 Demonstrate appropriate telephone/communication skills.

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

22.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
22.02 Draw conclusions or make inferences from data.
22.03 Identify health-related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
22.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.

23.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

23.01 Conduct a job search.
23.02 Secure information about a job.
23.03 Identify documents that may be required when applying for a job interview.
23.04 Complete a job application form correctly.
23.05 Demonstrate competence in job interview techniques.
23.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, and other employees.
23.07 Identify acceptable work habits.
23.08 Demonstrate knowledge of how to make appropriate job changes.
23.09 Demonstrate acceptable employee health habits.
23.10 Demonstrate a knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes Chapter 442.

24.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

24.01 Define entrepreneurship.
24.02 Describe the importance of entrepreneurship to the American economy.
24.03 List the advantages and disadvantages of business ownership.
24.04 Identify the risks involved in ownership of a business.
24.05 Identify the necessary personal characteristics of a successful entrepreneur.
24.06 Identify the business skills needed to operate a small business efficiently and effectively.