



Development of a Secondary Level Education Program in Transportation, Logistics, and Supply Chain Management

Final report

By

Principal Investigator (PI):
Doug Greiner
Applied Organizational Technology
College of Business Administration
The University of Toledo
Toledo, Ohio 43606
419-530-3359 (Office)
419-530-3047(Fax)
Doug.Greiner@utoledo.edu

Jeff Osthimer
Applied Organizational Technology
College of Business Administration
The University of Toledo
Toledo Ohio 43606
419-530-3357 419-530-3047
Jeff.Osthimer@utoledo.edu

**Prepared for The University of Toledo University Transportation Center
and the U.S. Department of Transportation**

6/20/09

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Overview:

It is essential to train and educate students at the secondary level who are interested in becoming responsible for managing and organizing transportation and logistics services. These services are vital to the success and continuing improvement of the supply chains that connect various industries to consumers both nationally and internationally. The program that is being developed is a for credit program to be offered in Career-Technical High Schools and Career Centers, and will ultimately lead students to receive college credit through articulation agreements with The University of Toledo. The program will focus on basic concepts of transportation and logistics systems such as dispatching, inventory, and scheduling. The efforts to develop the curriculum will be guided by private sector shippers and carriers as well as companies who support these carriers such as firms who provide insurance or equipment. This program is targeted at students in grades 11/12 who indicated an interest in working in transportation and logistics and who are interested in furthering their education in these fields. Based on information provided by the National Trucking Association, over the next 10 years the trucking industry will require up to 10,000 new driver/operators. The need for entry level management personnel is expected to increase in proportion to this growth. Vocational schools and Career centers are ideally positioned to provide the educational opportunities for this growth.

Curriculum Design:

The Principal Investigator Doug Greiner found that many of the local resources including Toledo Trucking Association were unable to participate due to the recession that is affecting the local economy. The follow curriculum was developed with the assistance of the Department of Applied Organizational Technology and aligns to some of the Ohio Field Competencies (specifically to business management topics) listed in the Appendix.

Principles of Transportation

This course introduces the transportation services available in the marketplace, public policy decisions and concerns, pricing of transportation services and transportations relationship to other functions in the business world.

Regulation of Transportation in a Changing Environment

This course focuses on the regulatory issues facing the modern transportation/logistics manager including, but not limited to environmental issues, hazardous materials and NAFTA regulations.

Technology Uses in Logistics

This course will introduce the student technologies used by transportation companies and the business world. Students will gain practical experience by completing assignments using technology based tools.

Warehousing and Terminal Management

This course studies the management of the storage of goods from the time the journey begins as raw materials until the finished product is delivered to the consumer.

Management of Commercial Transportation

This course is taught from the perspective of users of transportation/logistical services. It ties the concepts introduced in earlier courses together with emphasis on current management philosophies in the industry.

Pedagogy Plan:

The program was to be offered in a distance learning format, so that the students may enroll as a regular part of their High School curriculum or as an additional elective. The curriculum could also be integrated into the traditional classroom setting via online modules or instructor led interaction. The latter would require professional development for the instructor(s). Because these courses are offered with the possibility of college credit, they could become part of a plan to achieve an Associate Degree and eventually a Bachelors Degree in the field.

Budget Plan:

Costs for a new program at a local comprehensive high school and Career Technology Centers have been identified as primarily salary for teachers, classroom space, and additional equipment. Regional Career Technology directors, including Dr. Edith Wannamaker director of Millstream Career Center, have cited a decline in enrollment and lack of funding to create new programs including a Transportation Technology.

Marketing Plan:

When local secondary education is ready to offer a logistics program articulation agreements can be established to encourage the growth of the program at the high school level and bolster enrollment at the post secondary level. Target schools include, but are not limited to, Appollo Career Center in Lima, Monroe High School, Penta Career Center in Rossford, Sentinel Career Center in Tiffin. Vanguard Career Center in Freemont, and Bowsher, Libbey, Rogers, Start, Waite, Whitmer, and Woodward High Schools in Toledo.

Transportation Systems Competency Chart

At the end of the secondary program (12) and associate degree (AD) each competency is coded:
I = Introductory; P = Proficient; R = Reinforce. In addition, the business, industry and labor (BIL)
partnership validated each competency: BIL: E = Essential; R = Required

Competency	12	AD	BIL
Transportation Systems Core Body of Knowledge			
Unit 1: Career Exploration and Development			
1.1 Explore career pathways in transportation systems.	P	R	E
1.2 Explore professional development and career advancement opportunities for a transportation professional.	P	R	E
1.3 Demonstrate positive work behaviors and personal qualities.	P	R	E
1.4 Develop personal career goals and the objectives to meet those career goals.	P	R	E
Unit 2: Business Foundations			
2.1 Analyze the roles and major functions of transportation systems.	I	P	E
2.2 Develop a business process model for a transportation organization.	I	P	R
2.3 Explain the impact of economic, social and technological changes on a transportation organization.	I	P	E
2.4 Explain how planning and budgeting are used to accomplish organizational goals and objectives.	I	P	R
2.5 Explain material control and product inventories necessary to meet customer and business requirements.	I	P	R
2.6 Maintain compliance with organizational policies and government laws and regulations.	I	P	E
2.7 Explain how transportation businesses manage customer relationships.	I	P	E
2.8 Describe a management plan for business.	I	P	E
2.9 Identify basic procedures in the accounting cycle.	I	R	R
2.10 Define and explain the major measures transportation organization uses to manage and improve performance.	I	P	E
2.11 Explain the role of risk management in reducing risks and improving performance.	I	P	E
2.12 Explain entrepreneurship.	I	R	R
2.13 Explain the role of small business in the economy.	I	R	R
Unit 3: Communications			
3.1 Utilize reading strategies to interpret transportation systems data, information and analysis.	P	R	E
3.2 Locate, organize and reference written transportation systems information from various sources.	P	R	E
3.3 Write and utilize coherent and focused technical communications that support a defined perspective for transportation systems.	P	R	E

Competency		12	AD	BIL
3.4	Deliver formal and informal presentations that demonstrate organization and delivery skill.	P	R	E
3.5	Listen and speak effectively to contribute to group discussions and meetings.	P	R	E
3.6	Apply active listening skills to obtain and clarify information provided in oral communications.	P	R	E
3.7	Utilize written documents to direct the transportation systems operations.	P	R	E
3.8	Research and respond to customer needs.	I	P	E
Unit 4: Problem Solving and Critical Thinking				
4.1	Employ critical thinking and problem solving skills independently and in teams to formulate solutions to problems.	P	R	E
4.2	Apply problem solving and critical thinking techniques to the conflict between available resources, requirements of the project and timelines.	I	P	E
4.3	Combine critical thinking and team-building skills to solve problems.	P	R	E
4.4	Evaluate and adjust plans and schedules to respond to unexpected events and conditions.	I	P	E
4.5	Apply mathematical principles and formulas to transportation systems problems.	I	P	E
4.6	Apply science theory and applications to transportation systems problems.	I	P	E
Unit 5: Leadership and Teamwork				
5.1	Summarize the interpersonal skills that contribute to positive leadership and teamwork.	P	R	E
5.2	Demonstrate the ability to work on a team and recognize the importance of teamwork and its impact on business in a transportation environment.	P	R	E
5.3	Perform responsibly as a team member.	P	R	E
5.4	Use motivational techniques to enhance performance in others.	I	P	E
5.5	Examine the different responses to conflict as they relate to results.	I	P	E
5.6	Resolve conflicts to maintain a smooth workflow.	I	P	E
Unit 6: Legal and Ethical Aspects				
6.1	Differentiate between legal and ethical issues.	I	P	E
6.2	Complete work-related duties within an ethical framework.	I	P	E
6.3	Assess the implications of ethical and unethical behavior.	I	P	E
6.4	Perform duties according to laws, regulations, contract provisions and policies.	I	P	E
6.5	Comply with applicable governmental regulations and codes.	I	P	E
6.6	Explain employee and employer liability (e.g., monetary and personal).	I	P	E
Unit 7: Information Technology Applications				
7.1	Use computer-based technology.	P	R	E
7.2	Employ information technology applications.	I	P	E
7.3	Use geographic information systems.	I	P	E
Unit 8: Safety, Health and Environmental Aspects				

Competency		12	AD	BIL
8.1	Maintain general safety in accordance with government regulations, health standards, company policy, procedure and practices.	P	R	E
8.2	Evaluate the human and ergonomic factors associated with the transportation industry.	P	R	E
8.3	Identify state, federal and local worker safety, health and environmental regulations.	I	P	E
8.4	Demonstrate practices that contribute to a safe workplace environment.	I	P	E
8.5	Complete the requirements for first aid and CPR certification.	I	R	R
8.6	Complete and apply operations and safety training on pertinent equipment.	P	R	E
8.7	Identify practices that contribute to a healthy environment.	P	R	E
8.8	Handle hazardous materials in accordance with government regulations and health standards.	P	R	E
8.9	Analyze regulations for transporting hazardous materials.	I	P	E
Unit 9: Transportation Fuels				
9.1	Discuss the historical and economic impact of the petroleum industry.	I	P	R
9.2	Discuss the alternative vehicular fuel industry.	I	P	R
9.3	Compare and contrast viable fuels.	I	P	R
9.4	Discuss engine modifications related to the use of alternative fuels.	I	P	R
9.5	Discuss future vehicular fuel sources.	I	P	R
Unit 10: Transportation Systems Technical Skills Sets				
10.1	Explore the performance skills of an automotive technician.	I	P	E
10.2	Explore the performance skills of a medium and heavy transportation technician.	I	P	E
10.3	Explore the performance skills of a collision repair technician.	I	P	E
10.4	Explore the performance skills of an aviation maintenance technician.	I	P	E
10.5	Explore the performance skills of an aviation technology employee.	I	P	E
10.6	Explore the performance skills of a power equipment technician.	I	P	E
GROUND TRANSPORTATION PATHWAY				
Automotive Technician				
Unit 11: Orientation to the Automotive Industry				
11.1	Define the industry.	P	R	E
11.2	Determine the skills needed to work in the automotive industry.	P	R	E
Unit 12: Tools and Equipment				
12.1	Identify basic tools and equipment appropriate to the automotive industry.	P	R	E
12.2	Demonstrate appropriate use of basic hand tools to complete work functions.	P	R	E
12.3	Operate power tools and stationary equipment.	P	R	E
12.4	Maintain hand and power tools appropriate to the automotive industry.	P	R	E
12.5	Use appropriate personal protective equipment (PPE).	P	R	E
Unit 13: Engine Repair				

Competency	12	AD	BIL
13.1 Perform general engine diagnosis, removal and reinstallation (R&R).	I	P	E
13.2 Perform cylinder head and valve train diagnosis and repair.	I	P	E
13.3 Perform engine block assembly diagnosis and repair.	I	P	E
13.4 Perform lubrication and cooling systems diagnosis and repair.	I	P	E
Unit 14: Automatic Transmission and Transaxle			
14.1 Perform general transmission and transaxle diagnosis.	I	P	E
14.2 Perform transmission and transaxle maintenance and adjustment.	I	P	E
14.3 Perform in-vehicle transmission and transaxle repair.	I	P	E
14.4 Perform off-vehicle transmission and transaxle repair.	I	P	E
14.5 Inspect, measure and reseal oil pump and converter.	I	P	E
14.6 Inspect and measure gear train, shafts, bushings and case.	I	P	E
14.7 Inspect and determine necessary action for friction and reaction units.	I	P	E
Unit 15: Manual Drive Train and Axles			
15.1 Perform general drive train diagnosis.	I	P	E
15.2 Perform clutch diagnosis and repair.	I	P	E
15.3 Perform transmission and/or transaxle diagnosis and repair.	I	P	E
15.4 Perform drive shaft and half shaft, universal and constant-velocity (CV) joint diagnosis and repair.	I	P	E
15.5 Evaluate ring and pinion gears and differential case assembly.	I	P	E
15.6 Diagnose limited slip differential.	I	P	E
15.7 Inspect drive axle shaft.	I	P	E
15.8 Perform four-wheel drive and all-wheel drive component diagnosis and repair.	I	P	E
Unit 16: Suspension and Steering			
16.1 Perform general suspension and steering systems diagnosis.	I	P	E
16.2 Perform steering systems diagnosis and repair.	I	P	E
16.3 Remove, inspect and install front suspension.	I	P	E
16.4 Remove, inspect and install rear suspension.	I	P	E
16.5 Perform miscellaneous service.	I	P	E
16.6 Perform wheel alignment diagnosis, adjustment and repair.	I	P	E
16.7 Perform wheel and tire diagnosis and repair.	I	P	E
Unit 17: Brakes			
17.1 Perform general brake systems diagnosis.	I	P	E
17.2 Perform hydraulic system diagnosis and repair.	I	P	E
17.3 Perform drum brake diagnosis and repair.	I	P	E
17.4 Perform disc brake diagnosis and repair.	I	P	E
17.5 Perform power assist unit diagnosis and repair.	I	P	E
17.6 Perform miscellaneous diagnosis and repair. including wheel bearings, parking brakes and electrical.	I	P	E
17.7 Diagnose antilock brake and traction control systems.	I	P	E
Unit 18: Electrical and Electronic Systems			
18.1 Perform general electric system diagnosis.	I	P	E
18.2 Remove and replace terminal end from connector.	I	P	E
18.3 Perform battery diagnosis and service.	I	P	E
18.4 Perform starting system diagnosis and repair.	I	P	E
18.5 Perform charging system diagnosis and repair.	I	P	E

Competency	12	AD	BIL
18.6 Perform lighting systems diagnosis and repair.	I	P	E
18.7 Perform gauges, warning devices and driver information systems diagnosis and repair.	I	P	E
18.8 Perform horn and windshield wiper/washer diagnosis and repair.	I	P	E
18.9 Perform accessories diagnosis and repair.	I	P	E
Unit 19: Heating and Air Conditioning (A/C)			
19.1 Perform A/C system diagnosis and repair.	I	P	E
19.2 Perform refrigeration system component diagnosis and repair, including compressor and clutch.	I	P	E
19.3 Remove and inspect evaporator, condenser and related components.	I	P	E
19.4 Perform heating, ventilation and engine cooling systems diagnosis and repair.	I	P	E
19.5 Perform diagnosis and repair of operation systems and related controls.	I	P	E
19.6 Perform refrigerant recovery, recycling and handling.	I	P	E
Unit 20: Engine Performance			
20.1 Perform general engine diagnosis.	I	P	E
20.2 Perform diagnosis and repair of computerized engine controls.	I	P	E
20.3 Perform ignition system diagnosis and repair.	I	P	E
20.4 Perform fuel, air induction and exhaust systems diagnosis and repair.	I	P	E

Unit 21: Emissions Control Systems Diagnosis and Repair			
21.1 Diagnose positive crankcase ventilation system.	I	P	E
21.2 Evaluate exhaust gas recirculation system.	I	P	E
21.3 Evaluate exhaust gas treatment system.	I	P	E
21.4 Diagnose evaporative emissions controls system.	I	P	E
21.5 Perform engine-related service.	I	P	E
Collision Repair Technician			
Unit 22: Orientation to the Collision Repair Industry			
22.1 Analyze and explain the scope, trends and issues in the collision repair industry.	P	R	E
22.2 Determine the skills needed to work in the collision repair industry.	P	R	E
Unit 23: Tools and Equipment			
23.1 Identify basic tools and equipment appropriate to the collision repair industry.	P	R	E
23.2 Demonstrate the appropriate use of basic hand tools to complete work functions.	P	R	E
23.3 Operate power tools and stationary equipment.	P	R	E
23.4 Maintain hand and power tools appropriate to the collision repair industry.	P	R	E
23.5 Use appropriate personal protective equipment (PPE).	P	R	E
Unit 24: Collision Repair Basics			
24.1 Access needed information using available references and resources.	I	P	E
24.2 Perform basic collision-related mechanical skills.	I	P	E

Competency	12	AD	BIL
24.3 Prepare and explain estimates.	I	P	E
24.4 Identify and acquire parts.	I	P	E
Unit 25: Structural Analysis and Damage Repair			
25.1 Inspect, diagnose and repair full frame vehicles.	I	P	E
25.2 Inspect, diagnose, measure and repair unibody vehicles.	I	P	E
25.3 Perform fixed glass repair.	I	P	E
25.4 Weld and cut materials for collision repair.	P	R	E
Unit 26: Non-Structural Analysis and Damage Repair			
26.1 Organize repair preparation.	P	R	E
26.2 Perform outer body panel repairs, replacements and adjustments.	I	P	E
26.3 Perform metal finishing and body filling.	P	R	E
26.4 Repair moveable glass and hardware.	I	P	E
26.5 Perform metal welding and cutting.	P	R	E
26.6 Repair plastics and adhesives.	I	P	E
Unit 27: Mechanical and Electrical Components			
27.1 Inspect, diagnose and repair suspension and steering.	I	P	E
27.2 Diagnose and perform electrical repairs.	I	P	E
27.3 Diagnose and perform repairs to brake systems.	I	P	E
27.4 Diagnose and repair heating and air conditioning (A/C) systems.	I	P	E
27.5 Diagnose and repair cooling systems.	I	P	E
27.6 Diagnose and repair drive train.	I	P	E
27.7 Diagnose and repair fuel, intake and exhaust systems.	I	P	E
27.8 Diagnose and repair restraint systems.	I	P	E
Unit 28: Painting and Refinishing			
28.1 Demonstrate safety precautions.	P	R	E
28.2 Prepare surface for refinishing.	P	R	E
28.3 Properly operate spray gun and related equipment.	P	R	E
28.4 Mix, match and apply paint.	I	P	E
28.5 Identify and correct paint defects.	I	P	E
28.6 Perform final detailing.	P	R	E
Medium and Heavy Transportation Equipment Technology			
Unit 29: Orientation to the Medium and Heavy Transportation Industry			
29.1 Analyze the scope, trends, and issues in the medium and heavy transportation industry.	I	P	E
29.2 Determine the skills needed to work in the medium and heavy transportation industry.	I	P	E
Unit 30: Tools and Equipment			
30.1 Identify basic tools and equipment appropriate to the medium/heavy transportation industry.	P	R	E
30.2 Demonstrate appropriate use of basic hand tools to complete work functions.	P	R	E
30.3 Operate power tools and stationary equipment.	I	P	E
30.4 Maintain hand and power tools appropriate to the medium/heavy transportation industry.	P	R	E
30.5 Use appropriate personal protective equipment (PPE).	P	R	E
Unit 31: Medium and Heavy Transportation Basics			
31.1 Perform basic mechanical skills.	I	P	E

Competency	12	AD	BIL
31.2 Perform basic welding and cutting tasks.	I	P	E
Unit 32: Diesel Engines			
32.1 Perform general engine diagnosis and determine needed action.	I	P	E
32.2 Diagnose and repair cylinder head and valve train.	I	P	E
32.3 Diagnose and repair engine block.	I	P	E
32.4 Diagnose and repair lubrication system.	I	P	E
32.5 Diagnose and repair cooling system.	I	P	E
32.6 Diagnose and repair air induction and exhaust systems.	I	P	E
32.7 Diagnose and repair fuel system.	I	P	E
32.8 Diagnose and repair mechanical fuel injection.	I	P	E
32.9 Diagnose and repair electronic fuel management system.	I	P	E
32.10 Inspect and adjust engine brakes.	I	P	E
Unit 33: Drive Train			
33.1 Diagnose and repair clutch.	I	P	E
33.2 Diagnose and repair transmission.	I	P	E
33.3 Diagnose and repair driveshaft and universal joint.	I	P	E
33.4 Diagnose and repair drive axle.	I	P	E
Unit 34: Brakes			
34.1 Diagnose and repair air brakes.	I	P	E
34.2 Diagnose and repair mechanical and foundation brakes.	I	P	E
34.3 Diagnose and repair parking brakes.	I	P	E
Unit 35: Hydraulic Brakes			
35.1 Diagnose and repair hydraulic brakes.	I	P	E
35.2 Diagnose and repair mechanical and foundation brakes.	I	P	E
35.3 Diagnose and repair power assist units.	I	P	E
35.4 Diagnose and service air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC).	I	P	E
Unit 36: Suspension and Steering			
36.1 Diagnose and repair steering column.	I	P	E
36.2 Diagnose and repair steering units.	I	P	E
36.3 Diagnose and repair steering linkage.	I	P	E
36.4 Diagnose and repair suspension systems.	I	P	E
36.5 Diagnose, adjust and repair wheel alignment.	I	P	E
36.6 Diagnose and repair wheels and tires.	I	P	E
36.7 Diagnose and repair frame.	I	P	E
Unit 37: Electrical and Electronic Systems			
37.1 Diagnose general electrical systems.	I	P	E
37.2 Diagnose and repair battery.	I	P	E
37.3 Diagnose and repair starting system.	I	P	E
37.4 Diagnose and repair charging system.	I	P	E
37.5 Diagnose and repair lighting system.	I	P	E
37.6 Diagnose and repair gauges and warning devices.	I	P	E
37.7 Diagnose and repair related electrical systems.	I	P	E
Unit 38: Heating, Ventilation and Air Conditioning (HVAC)			
38.1 Diagnose, service and repair HVAC systems.	I	P	E
38.2 Diagnose, service and repair air conditioning (A/C) system and components.	I	P	E
38.3 Diagnose, service and repair heating and engine cooling systems.	I	P	E

Competency	12	AD	BIL
38.4 Diagnose, service and repair operating systems and related electrical controls.	I	P	E
38.5 Diagnose, service and repair operating systems and related air, vacuum and mechanical controls.	I	P	E
38.6 Recover, recycle and handle refrigerant.	I	P	E
Unit 39: Preventive Maintenance Inspection			
39.1 Perform preventative engine system maintenance.	I	P	E
39.2 Perform preventative fuel system maintenance.	I	P	E
39.3 Perform preventative air induction and exhaust system maintenance.	I	P	E
39.4 Perform preventative cooling system maintenance.	I	P	E
39.5 Perform preventative lubrication system maintenance.	I	P	E
39.6 Perform preventative instruments and controls maintenance.	I	P	E
39.7 Perform preventative safety equipment maintenance.	I	P	E
39.8 Perform preventative hardware maintenance.	I	P	E
39.9 Perform preventative heating, ventilation and air conditioning (HVAC) maintenance.	I	P	E
39.10 Perform preventative battery and starting systems maintenance.	I	P	E
39.11 Perform preventative charging system maintenance.	I	P	E
39.12 Perform preventative lighting system maintenance.	I	P	E
39.13 Perform preventative air brakes maintenance.	I	P	E
39.14 Perform preventative hydraulic brakes maintenance.	I	P	E
39.15 Perform preventative drive train maintenance.	I	P	E
39.16 Perform preventative suspension and steering systems maintenance.	I	P	E
39.17 Perform preventative tires and wheels maintenance.	I	P	E
39.18 Perform preventative frame and fifth wheel maintenance.	I	P	E
Unit 40: Hydraulics			
40.1 Perform general system operations.	I	R	R
40.2 Diagnose and repair pumps.	I	R	R
40.3 Diagnose and repair filtration system and reservoirs (tanks).	I	R	R
40.4 Diagnose and replace hoses, fittings and connections.	I	R	R
40.5 Diagnose and repair control valves.	I	R	R
40.6 Diagnose and repair actuators.	I	R	R
Power Equipment Technology			
Unit 41: Power Equipment Overview			
41.1 Analyze the scope, trends and issues in the power equipment industry.	P	R	E
41.2 Determine the skills needed to work in the power equipment industry.	P	R	E
Unit 42: Tools and Equipment			
42.1 Identify basic tools and equipment appropriate to power technology.	P	R	E
42.2 Utilize test equipment in service operations.	P	R	E
42.3 Demonstrate the appropriate use of basic hand tools to complete work functions.	P	R	E
42.4 Operate power tools and stationary equipment.	P	R	E
42.5 Maintain hand and power tools appropriate to power technology.	I	P	E

Competency	12	AD	BIL
42.6 Use appropriate personal protective equipment (PPE).	P	R	E
Unit 43: Service Operations			
43.1 Locate, interpret and utilize parts and service information.	P	R	E
43.2 Remove and install engines to manufacturer's technical manual.	I	P	E
43.3 Explain four-cycle engine theory.	P	R	E
43.4 Explain two-cycle engine theory.	P	R	E
43.5 Disassembly, inspect, service and reassemble two-cycle and four-cycle engines to manufacturer's technical manual.	P	R	E
43.6 Explain basic electrical theory.	I	P	E
43.7 Explain basic ignition system theory.	I	P	E
43.8 Inspect and service ignition systems.	P	R	E
43.9 Explain carburetion theory.	P	R	E
43.10 Explain fuel injection theory.	P	R	E
43.11 Explain the composition and inspection of fuels.	I	P	E
43.12 Inspect and service fuel systems.	P	R	E
43.13 Diagnose and repair fuel system.	I	P	E
43.14 Diagnose and repair mechanical fuel injection.	I	P	E
43.15 Explain alternative fuel systems.	I	P	E
43.16 Explain turbocharged induction.	P	R	E
43.17 Explain supercharged induction.	P	R	E
43.18 Inspect and service governor systems.	I	P	E
43.19 Explain the composition of the various oils used for lubrication.	P	R	E
43.20 Inspect and service lubrication systems to manufacturer's specifications.	P	R	E
43.21 Describe the function and operation of the cooling system.	P	R	E
43.22 Inspect and service cooling systems.	P	R	E
43.23 Inspect and service lighting, accessory, and charging systems.	I	P	E
43.24 Inspect and service batteries.	P	R	E
43.25 Perform gas and diesel engine tune-up.	P	R	E
43.26 Analyze the various power takeoff (PTO) accessories.	I	P	E
43.27 Inspect and adjust power takeoff (PTO) accessories.	P	R	E
43.28 Analyze the operational features of motion drive systems.	P	R	E
43.29 Inspect and service motion drive systems.	I	P	E
43.30 Analyze the operational features of frame, suspension and steering systems.	I	P	E
43.31 Inspect and service frame, suspension and steering systems.	I	P	E
43.32 Inspect and service tires, wheels and brakes.	P	R	E
43.33 Service multi-cylinder engines to manufacturer's specifications.	P	R	E
43.34 Perform equipment maintenance and storage to manufacturer's specifications.	P	R	E
43.35 Demonstrate welding, soldering and heat-treating operations.	I	P	R
AIR TRANSPORTATION PATHWAY			
Aviation Maintenance Technician			
Unit 44: Orientation to Aviation Maintenance			
44.1 Analyze the scope, trends and issues in the aviation industry.	I	P	E
44.2 Determine the skills needed to work in the aviation industry.	I	P	R
Unit 45: General Aviation			
45.1 Assess basic electricity concepts.	I	P	E

Competency	12	AD	BIL
45.2 Utilize aircraft drawings.	I	P	E
45.3 Assess weight and balance.	I	P	E
45.4 Fabricate fluid lines and fittings.	I	P	E
45.5 Evaluate materials and perform processes.	I	P	E
45.6 Demonstrate ground operation and servicing.	I	P	E
45.7 Demonstrate cleaning and corrosion control.	I	P	E
45.8 Integrate mathematics.	P	R	E
45.9 Complete maintenance forms and records.	I	P	E
45.10 Utilize basic physics.	I	P	E
45.11 Utilize maintenance publications.	I	P	E
45.12 Exercise mechanics' privileges and limitations.	I	P	E
Unit 46: Airframe Structures			
46.1 Perform wood structure maintenance.	I	P	E
46.2 Perform aircraft covering maintenance.	I	P	E
46.3 Apply aircraft finishes.	I	P	E
46.4 Evaluate and repair sheet metal and non-metallic structures.	I	P	E
46.5 Demonstrate welding operations.	I	P	E
46.6 Demonstrate assembly and rigging operations.	I	P	E
46.7 Complete airframe inspection.	I	P	E
Unit 47: Airframe Systems and Components			
47.1 Evaluate and repair aircraft landing gear systems.	I	P	E
47.2 Evaluate and repair hydraulic and pneumatic power systems.	I	P	E
47.3 Evaluate and service cabin atmosphere control systems.	I	P	E
47.4 Troubleshoot and repair aircraft instrument systems.	I	P	E
47.5 Evaluate and repair communication and navigation systems.	I	P	E
47.6 Evaluate and service aircraft fuel systems.	I	P	E
47.7 Evaluate and service aircraft electrical systems.	I	P	E
47.8 Evaluate and service position and warning systems.	I	P	E
47.9 Evaluate and service ice and rain control systems.	I	P	E
47.10 Evaluate and service fire protection systems.	I	P	E
47.11 Describe avionics systems.	I	P	E
Unit 48: Powerplant Theory and Maintenance			
48.1 Evaluate and service reciprocating engines.	I	P	E
48.2 Evaluate and service turbine engines.	I	P	E
48.3 Complete engine inspection.	I	P	E
Unit 49: Powerplant Systems and Components			
49.1 Evaluate and service engine instrument systems.	I	P	E
49.2 Evaluate and service engine fire protection systems.	I	P	E
49.3 Evaluate and service engine electrical systems.	I	P	E
49.4 Evaluate and service lubrication systems.	I	P	E
49.5 Evaluate and service ignition and starting systems.	I	P	E
49.6 Evaluate and service fuel metering systems.	I	P	E
49.7 Evaluate and service engine fuel systems.	I	P	E
49.8 Evaluate and service induction and engine airflow systems.	I	P	E
49.9 Evaluate and service engine cooling systems.	I	P	E
49.10 Evaluate and service engine exhaust and reverser systems.	I	P	E
49.11 Evaluate and service propellers.	I	P	E
49.12 Inspect and troubleshoot unducted fan systems and components.	I	P	E

Competency	12	AD	BIL
49.13 Assess auxiliary power unit.	I	P	E
Aviation Technology			
Unit 50: Overview			
50.1 Explain the historical evolution of air transportation.	I	R	R
50.2 Explain the structure of the air transportation industry.	I	P	E
50.3 Explain the numerous careers and respective training for the air transportation industry.	I	P	E
50.4 Identify the various aerospace organizations.	I	P	E
50.5 Examine the regulatory framework of aviation.	I	R	R
Unit 51: Types of Aviation			
51.1 Examine the aspects of general aviation.	I	P	R
51.2 Identify the aspects of commercial aviation.	I	P	R
51.3 Examine the aspects of military aviation.	I	P	R
51.4 Identify fixed base operators and their role in general aviation.	I	P	R
51.5 Explain business and commercial aviation.	I	P	R
51.6 Explain the use of helicopters.	I	P	R
51.7 Explain the evolution of jet transportation.	I	P	R
Unit 52: Aircraft Systems and Technology			
52.1 Describe the powerplant and related systems.	I	P	E
52.2 Examine the aircraft instruments.	I	P	E
Unit 53: Airport Environment			
53.1 Examine the national airport network.	I	P	E
53.2 Explain airport design.	I	P	E
Unit 54: Air Traffic Control and Communication			
54.1 Explore sources for air traffic control (ATC) information.	I	P	E
54.2 Analyze radar and ATC services.	I	P	E
54.3 Explain radio procedures.	I	P	E
Unit 55: Meteorology			
55.1 Discuss the atmosphere and atmospheric elements.	I	P	E
55.2 Explain basic weather theory.	I	P	E
55.3 Interpret weather patterns.	I	P	E
55.4 Discuss weather hazards.	I	P	E
55.5 Interpret weather data.	I	P	E
55.6 Describe the printed weather reports and forecasts.	I	P	E
55.7 Describe graphic weather products.	I	P	E
55.8 Identify sources of weather information.	I	P	E
Unit 56: Flight Environment			
56.1 Identify and define the rules of flight.	I	P	E
56.2 Explain the grid system used in navigation.	I	P	E
56.3 Explain the pilotage and dead-reckoning methods of navigation.	I	P	E
56.4 Explain the VHF omni-directional range (VOR) navigation system.	I	P	E
56.5 Explain the automatic direction finding (ADF) navigation systems.	I	P	E
56.6 Discuss advanced navigation systems.	I	P	E
56.7 Explain the classification and control of airspace.	I	P	E
Unit 57: Aerodynamics			
57.1 Describe the basics of aeronautics and aerodynamics.	I	P	E
57.2 Describe aerodynamic principles.	I	P	E

Competency	12	AD	BIL
57.3 Explain the aerodynamic principle of stability.	I	P	E
57.4 Explain the aerodynamics of maneuvering flight.	I	P	E
57.5 Explain aircraft performance factors.	I	P	E
57.6 Discuss advances in aeronautics.	I	P	R
Unit 58: Aviation Human Factors			
58.1 Explore aviation physiology.	I	P	E
58.2 Analyze aeronautical decision-making.	I	P	E
Unit 59: Safety			
59.1 Analyze the importance of safety compliance management in accident prevention.	I	P	E
59.2 Distinguish between security and safety.	I	P	E
59.3 Analyze the impact of safety data analysis on aviation safety.	I	P	E
59.4 Explain the nature of the human factor on accidents.	I	P	E
59.5 Explain strategies to manage human error.	I	P	E
59.6 Describe the impact of air traffic systems on safety.	I	P	E
59.7 Explain the role of the National Transportation Safety Board (NTSB) in accident investigations.	I	P	E
59.8 Describe flight standards and rulemaking policies.	I	P	E
Unit 60: Rocket Fundamentals			
60.1 Evaluate the role rockets play in the aviation industry.	I	P	R
60.2 Explain the fundamental concept of chemical propulsion.	I	P	R
60.3 Explore orbits and trajectories.	I	P	R
Unit 61: Space Environment			
61.1 Explore the space environment.	I	P	R
61.2 Examine our solar system.	I	P	R
61.3 Summarize unmanned space exploration.	I	P	R
61.4 Summarize manned space exploration.	I	P	R
Unit 62: Management			
62.1 Summarize the structure and function of aviation-based businesses and services.	I	P	R
62.2 Describe management concepts.	I	P	E
62.3 Manage human resources.	I	P	R
62.4 Perform personnel staffing functions.	I	P	R
62.5 Conduct orientation and training sessions.	I	P	R
62.6 Discuss leadership principles in aviation-based businesses and services.	I	P	E
62.7 Explain how planning and budgeting are used to accomplish organizational goals and objectives.	I	P	R
62.8 Explore budgeting skills to determine staffing levels.	I	P	R
62.9 Explain the nature and scope of finance and controlling functions.	I	P	R
62.10 Explain basic accounting concepts and principles.	I	P	R
62.11 Establish criteria for purchasing products and services.	I	I	R
62.12 Explain material control and product inventories necessary to meet customer and business requirements.	I	I	R
62.13 Manage customer relationships.	I	P	E
62.14 Examine risk management.	I	P	R
62.15 Describe business risks.	I	P	R
62.16 Complete a business plan.	I	P	E

Competency	12	AD	BIL
Unit 63: Marketing Functions			
63.1 Examine marketing and its role in an aviation-based businesses and servicees.	I	P	E
63.2 Complete a marketing plan.	I	P	E
63.3 Describe the promotion function.	I	P	E
63.4 Identify targeted markets.	I	P	E
63.5 Explain the sales cycle.	I	P	R
63.6 Explain the role of customer service as a component of marketing relationships.	I	P	E
63.7 Describe selling processes and techniques.	I	P	E
63.8 Describe sales support activities.	I	P	R
63.9 Manage selling activities.	I	P	R
63.10 Evaluate pricing fundamentals.	I	P	E
63.11 Evaluate pricing strategies.	I	P	E