



**Cleveland Heights – University Heights  
City School District**

# **Automotive Technology**

**COURSE OF STUDY**

**July, 2008**

**Deborah S. Delisle  
Superintendent of Schools**

## **STATEMENT OF APPROVAL**

THIS COURSE OF STUDY HAS BEEN EXAMINED BY THE CLEVELAND HEIGHTS-UNIVERSITY HEIGHTS BOARD OF EDUCATION.

THE DOCUMENT WAS FORMALLY APPROVED FOR ADOPTION BY THE BOARD OF EDUCATION ON JULY 15, 2008.

**RESOLUTION #08-07-092**

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**Automotive Technology**  
Career Field Technical Content  
Standards Document

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**AUTOMOTIVE TECHNOLOGY**  
**CLEVELAND HEIGHTS – UNIVERSITY HEIGHTS**  
**SCHOOL DISTRICT**

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- Rich Rindfliesch, East Automotive Parts Company
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- Larry Vagner, Quality Automotive
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**RECOMMENDATION BY AUTOMOTIVE TECHNOLOGY  
COMMITTEE**

**Cleveland Heights-University Heights School District**

The Career and Technical Advisory Committee of the Auto Technology Program, Cleveland Heights-University Heights School District, has reviewed this course of study and recommends it for use as the foundation for instruction in classroom, laboratory, and cooperative occupational experiences.

The developers of the course of study have considered local labor market needs and the school district's ability to offer specialized programs. The competencies found on the Integrated, Technical & Academic Competencies (ITAC) for this program have been reviewed, modified and accepted as being congruent with our school district's philosophy and student outcome measures. Additional competencies related to the Work and Family Life Program have been incorporated into the course of study.

We believe that this course of study adequately and correctly focuses upon the development of technical competencies, attitudes, values and appreciation's critical to success in Work and Family Life.

The Work and Family Life Advisors Advisory Committee recommended this course of study on 12-11-07  
(date)

Kern Block  
Committee Member

James Lawrence  
Committee Member

John Biggs  
Committee Member

## **DISTRICT PHILOSOPHY**

### PHILOSOPHY OF EDUCATION

The educational organization, administration, development and programs within our school system are to be guided by the following premises:

1. All children are entitled to a public education that will encourage the fullest development of their individual talents.
2. Learning is essential to individual independence and the general welfare of the changing American society.
3. Effective learning develops both intellectual and emotional qualities and is for action; its proper evaluation lies in the quality of resultant activity, not mere response.
4. Organized education, a deployment of human and material resources as means toward learning, implies learning for all -  
- students, teachers, administrators -- at different levels of understanding and maturity.
5. Organized education is at its best when graced with experimental attitudes and dedicated to the proposition that all issues between organization and learning shall be resolved in favor of learning.
6. All rewards and penalties adopted in the organization of education become legitimate only insofar as they assist learning.
7. For purposes of learning and growth, internal motivations are more valuable than the external, such as, grades and competition.

The primary people in our school system are first, the students, and next, the teachers. Accordingly, they will be given primary consideration in any action taken by the Board of Education.

Our school system will provide training in the basic skills.

Our school system should provide a framework in which basic problem-solving and personal adjustment methods can be learned in an orderly, phased, and wholly accessible manner.

Our school system should educate toward both responsibility and responsiveness. It should provide greatly enriched conditions for individual growth in self-awareness, in a larger social awareness, and in controlled and meaningful response both to inner and outer influences. It should strive to heighten the developing student's appreciation of the cultural and individual diversity within the human family, and improve his/her skill in working harmoniously and creatively with that diversity, since this is a rich resource for innovative and successful growth.

A major effort of the teaching-learning process should be the early development of positive self-assurance and the continuing development of individual potential to deal with a changing society, to think rationally and creatively, to be independent and productive, and to choose rewarding life activities. Thinking, creativity, independence, productivity, and activity are also characterized by individual differences. Yet they must meet external requirements, and these change with the changing society.

\*Ohio Administrative Code 3301-35-02

Approved by Board of Education February 9, 1970

Revised by Board of Education January 31, 1977

Re-adopted by Board of Education January 3, 1978; March 14, 1983;

December 11, 1989

# Key to Profile Codes

## Importance of Competencies

All of the competencies in this document represent the minimum requirements for a College Tech Prep program. It is the responsibility of the local consortia to further define and/or expand, as needed, the descriptors for each competency. Each competency must be taught at the Proficient level (P) by the completion of the College Tech Prep program, which is an Associate Degree (AD). A minimal number of competencies have been identified as Introduce (I) at the Associate Degree level. These may require further higher education.

**This document integrates college prep academics with technical skill. Technical skills are a required component.**

- I** = **Introduce** (Learner will demonstrate knowledge and comprehension of the competency.)
- P** = **Proficient** (Learner will demonstrate ability to apply knowledge of and/or perform the competency.)
- R** = **Reinforced** (Competencies marked proficient at the secondary level are to be reinforced at the associate degree level.)

- Grade Level: 10** = by the end of grade 10
- 12** = by the end of grade 12
- AD** = by the end of the Associate Degree

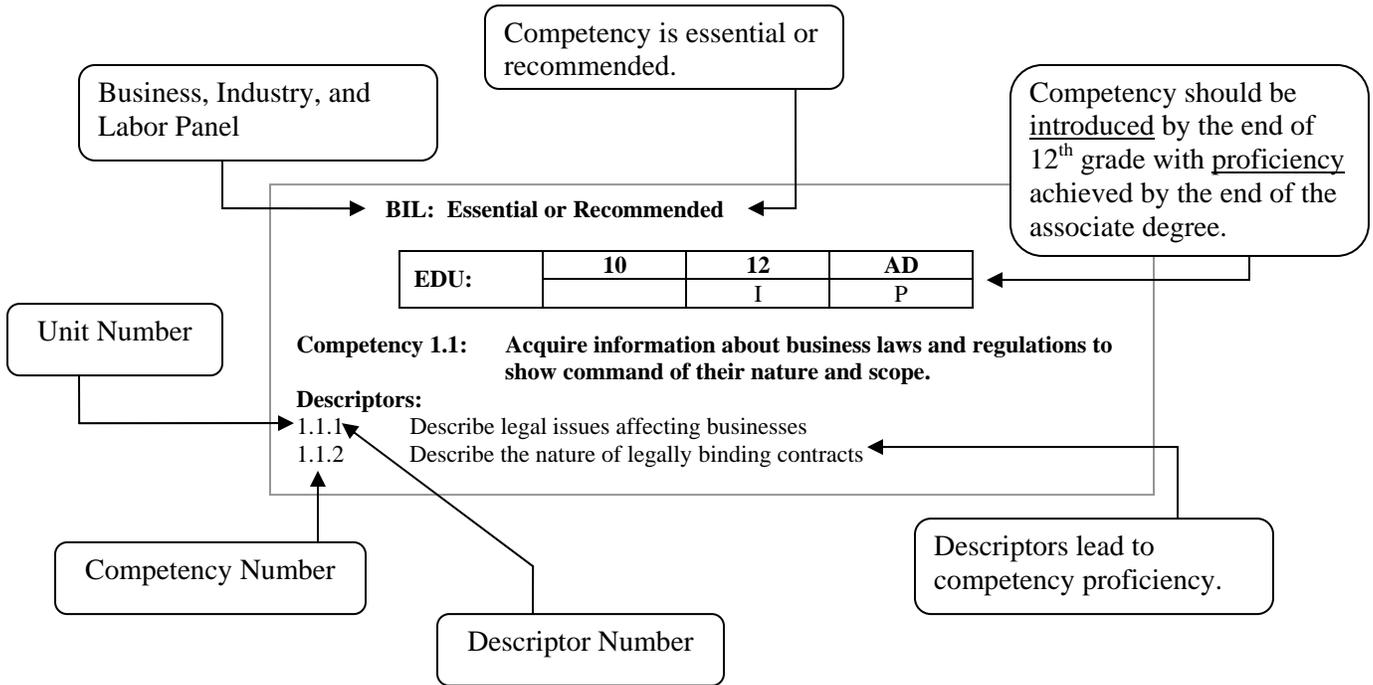
### Academic Connection:

As rigorous programs of study, College Tech Prep and Career-Technical programs required academics to be taught at a college preparatory level, and contextually within the technical content. State academic mathematics and language arts benchmarks are embedded within the Career Field Technical Content Standards Document (CFS).

### Additional Profile Codes:

- BIL:** Business Industry Leaders
- TPO:** Terminal Performance Objective
- TCP:** Technical Competence Profile
- CITAC:** Correlated Integrated Technical Academic Content
- ITAC:** Integrated Technical Academic Content

# Example of Profile Codes



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**TRANSPORTATION  
SYSTEMS CORE BODY OF  
KNOWLEDGE**

**UNITS 1-10**

# Transportation Systems Core

## Unit 1: Career Exploration and Development

**BIL:** Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 1.1:** Explore career pathways in transportation systems.

*TPO:* Given students knowledge about internet usage, explore career pathways in transportation systems, with 90% accuracy.

### Descriptors:

- 1.1.1 Identify current and future career options for a person interested in transportation systems.
- 1.1.2 Research the historical evolution of the various careers in transportation systems.
- 1.1.3 Experience specific transportation interests (e.g., shadowing, professional readings, community service, and internship).
- 1.1.4 Analyze the interrelationships between the transportation industry and other industries (e.g., business, agriculture, energy, travel and tourism).
- 1.1.5 Identify the education and licensing requirements needed for a career in transportation systems.

### Correlated English Language Arts Academic Content Benchmarks

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Formulate open-ended research questions suitable for investigation and adjust questions as necessary while research is conducted.* (Research A, 8-10)
- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted.* (Research A, 11-12)
- *Evaluate the usefulness and credibility of data and sources.* (Research B, 8-10)
- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

### Correlated Science Academic Content Benchmarks

- *Recognize that scientific literacy is part of being a knowledgeable citizen.* (Scientific Ways of Knowing D, 9-10)
- *Explain how societal issues and considerations affect the progress of science and technology.* (Scientific Ways of Knowing C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 1.2: Explore professional development and career advancement opportunities for transportation professional.**

*TPO: Given an article, explore professional development and career advancement opportunities for transportation professional; list 5 key points of the article.*

**Descriptors:**

- 1.2.1 Identify advancement opportunities in transportation systems (e.g., internal and external).
- 1.2.2 Describe the importance of professional organizations, associations, seminars and professional relationships with transportation professionals.
- 1.2.3 Remain current on changes in the transportation systems profession.
- 1.2.4 Demonstrate quality work as measured by performance evaluations.
- 1.2.5 Develop a résumé, list of references and a portfolio.

**Correlated English Language Arts Academic Content Benchmarks**

- *Produce letters (e.g., business, letters to the editor, job applications) that follow the conventional style appropriate to the text, include appropriate details and exclude extraneous details and inconsistencies. (Writing Applications C, 8-10)*
- *Compile, organize and evaluate information, take notes and summarize findings. (Research B, 11-12)*
- *Evaluate the usefulness and credibility of data and sources and synthesize information from multiple sources. (Research C, 11-12)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 1.3: Demonstrate positive work behaviors and personal qualities.**

*TPO: On all lectures and lab work, demonstrate positive work behaviors and personal qualities for all note-taking, and lab work at 90% accuracy.*

**Descriptors:**

- 1.3.1 Conform to company and departmental policies (e.g., attendance, punctuality, time management).
- 1.3.2 Demonstrate professionalism, self-discipline, self worth, positive attitude and integrity in a work situation.
- 1.3.3 Demonstrate flexibility and willingness to learn.
- 1.3.4 Exhibit a commitment to the organization.
- 1.3.5 Explain how individuals impact performance in the transportation industry.
- 1.3.6 Describe the expectations for individuals in terms of performance.

- 1.3.7 Identify impact areas of individual performance (e.g., quality, profit, customer relations).1.3.8 Discuss the importance of having all employees understand the core business processes of transportation organizations.
- 1.3.9 Demonstrate positive co-worker and employee/employer relationships.
- 1.3.10 Explain the importance of demonstrating appropriate workplace behaviors and the consequences and negative impacts (e.g. personal and company success) of workplace harassment.

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 1.4: Develop personal career goals and the objectives to meet those career goals.**

*TPO: Upon completion of the lesson, develop personal career goals and the objectives to meet those career goals at 90% accuracy.*

**Descriptors:**

- 1.4.1 Identify personal goals and objectives in concert with transportation organization goals.
- 1.4.2 Demonstrate the ability to seek and apply for employment.
- 1.4.3 Research employers and companies and the applicability of personal skill sets.
- 1.4.4 Prepare and interview for employment.
- 1.4.5 Demonstrate the ability to evaluate and compare employment opportunities.
- 1.4.6 Identify the motivations and personal rewards of effective career goals.

**Correlated English Language Arts Academic Content Benchmarks**

- *Produce letters (e.g., business, letters to the editor, job applications) that follow the conventional style appropriate to the text, include appropriate details and exclude extraneous details and inconsistencies.* (Writing Applications C, 8-10)
- *Evaluate the usefulness and credibility of data and sources.* (Research B, 8-10)
- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)
- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)

**Unit 2: Business Foundations**

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.1: Analyze the roles and major functions of transportation systems.**

*TPO: From a workbook assignments, analyze the roles and major functions of transportation*

systems at 80% accuracy.

**Descriptors:**

- 2.1.1 Identify types of transportation organizations and their functions.
- 2.1.2 Describe and explain the mission of transportation organizations.
- 2.1.3 Use organizational charts to analyze workplace operations.
- 2.1.4 Describe and explain the major internal functions and structures of transportation organizations.
- 2.1.5 Define and explain the critical customers, suppliers, and stakeholders for transportation organizations.
- 2.1.6 Explain the major competitive challenges faced by organizations in the transportation industry.

**Correlated Mathematics Academic Content Benchmarks**

- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.* (Patterns, Functions and Algebra C, 8-10)
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatter plots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.2: Develop a business process model for a transportation organization.**

*TPO: Given an assignment, develop a business process model for a transportation organization, with 80% accuracy.*

**Descriptors:**

- 2.2.1 Define business processes.
- 2.2.2 Identify and explain the core business operations in a transportation organization.
- 2.2.3 Prepare a diagram, chart and/or model that illustrate the organization.
- 2.2.4 Prepare a diagram, chart and/or model that illustrate the workflow through a transportation organization.
- 2.2.5 Demonstrate the fundamentals of systems thinking (e.g. integrate supply chain).

**Correlated English Language Arts Academic Content Benchmarks**

- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)
- *Communicate findings, reporting on the substance and processes orally, visually and in writing or through multimedia.* (Research E, 8-10; Research E, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.* (Patterns, Functions and Algebra C, 8-10)
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatter plots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.3: Explain the impact of economic, social and technological changes on a transportation organization.**

*TPO: Using information from a lesson on industry trends, explain the impact of economic, social and technological changes on a transportation organization, meeting program standards.*

**Descriptors:**

- 2.3.1 Explain the impact of economic changes, including economic income growth and decline, consumer confidence, interest rates, labor, and fuel and material costs.
- 2.3.2 Explain the impact of social changes, including consumer attitudes and preferences, demographics, and population shifts.
- 2.3.3 Explain quality assurance systems and how they contribute to effective work organizations.
- 2.3.4 Describe productivity issues related to transportation (e.g., employee productivity, quality).
- 2.3.5 Explain the impact of technological changes, including transportation and information technology.
- 2.3.6 Explain the major competitive challenges faced by transportation businesses.
- 2.3.7 Describe historical influences on transportation (e.g., labor movement, high-performance, quality).

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.* (Patterns, Functions and Algebra C, 8-10)
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.* (Data Analysis and Probability A, 8-10)

- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**BIL:**                    **Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.4:**            **Explain how planning and budgeting are used to accomplish organizational goals and objectives.**

*TPO:* *Given an article, explain how planning and budgeting are used to accomplish organizational goals and objectives, write a paragraph about the key points of the article.*

**Descriptors:**

- 2.4.1 Explain how work plans and budgets are used to allocate people and resources.
- 2.4.2 Identify reports used to track performance and resources, and explain how they are used.
- 2.4.3 Explain how plans and budgets are revised to meet goals and objectives.
- 2.4.4 Explain the impact of long term goals and planning on organization performance.
- 2.4.5 Identify and describe the most critical performance problems that transportation businesses typically face.
- 2.4.6 Describe how improvements are identified and modifications are implemented.

**Correlated English Language Arts Academic Content Benchmarks**

- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Evaluate the usefulness and credibility of data and sources.* (Research B, 8-10)

**Correlated Mathematics Academic Content Benchmarks**

- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.* (Patterns, Functions and Algebra D, 8-10)
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**BIL:**                    **Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.5:**            **Explain material control and product inventories necessary to meet customer and business requirements.**

*TPO: Given a supply room, explain material control and product inventories necessary to meet customer and business requirements, by performing a complete inventory with 95% accuracy.*

**Descriptors:**

- 2.5.1 Analyze the relationship of quality control to supply of materials.
- 2.5.2 Identify inventory control systems and system reliability used in business (e.g., just-in-time) and its relationship to transportation costs and risks.
- 2.5.3 Analyze the impact of inventory control systems on productivity and profit or loss.

**Correlated English Language Arts Academic Content Benchmarks**

- *Evaluate the usefulness and credibility of data and sources.* (Research B, 8-10)
- *Organize information from various resources and select appropriate sources to support central ideas, concepts and themes.* (Research C, 8-10)

**Correlated Mathematics Academic Content Benchmarks**

- *Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.* (Data Analysis and Probability E, 8-10)
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	<b>I</b>	<b>P</b>

**Competency 2.6: Maintain compliance with organizational policies and government laws and regulations.**

*TPO: Using information from a lesson on ethics, Maintain compliance with organizational policies and government laws and regulations, meeting industry standards.*

**Descriptors:**

- 2.6.1 Identify and explain relevant organizational policies and regulations for general functions that are driven by government laws and regulations.
- 2.6.2 Identify and explain relevant government laws and regulations for specific functions within transportation organizations.
- 2.6.3 Examine the governmental roles in managing the infrastructure of transportation operations.
- 2.6.4 Explain the governmental roles in health, safety and environment management.

**Correlated English Language Arts Academic Content Benchmarks**

- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)

### Correlated Mathematics Academic Content Benchmarks

- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	<b>I</b>	<b>P</b>

### Competency 2.7:        **Explain how transportation businesses manage customer relationships.**

*TPO:*    *Given a repair order with customer information and needs, explain how transportation businesses manage customer relationships, with 100% compliance.*

#### **Descriptors:**

- 2.7.1        Conduct in-depth investigation to identify internal and external customer needs.
- 2.7.2        Maintain a liaison with customer contacts.
- 2.7.3        Maintain customer satisfaction and address customer problems and complaints efficiently.
- 2.7.4        Communicate with internal and/or external customers to ensure products or services meet customer requirements.

### Correlated English Language Arts Academic Content Benchmarks

- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted.* (Research A, 11-12)
- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communication A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)

### Correlated Mathematics Academic Content Benchmarks

- *Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.* (Data Analysis and Probability E, 8-10)
- *Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions.* (Data Analysis and Probability C, 11-12)
- *Connect statistical techniques to applications in workplace and consumer situations.* (Data Analysis and Probability D, 11-12)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.8: Describe a management plan for business.**

*TPO: Given a group activity to complete in a given time, describe a management plan for business, with 80% accuracy.*

**Descriptors:**

- 2.8.1 Describe strategies to achieve company goals and objectives.
- 2.8.2 Design an organizational chart with job and activity descriptions.
- 2.8.3 Identify market segments and perspective clients.
- 2.8.4 Describe a business development plan.
- 2.8.5 Define and explain the role of research and development.

**Correlated English Language Arts Academic Content Benchmarks**

- *Compile, organize and evaluate information, take notes and summarize findings. (Research B, 11-12)*

**Correlated Mathematics Academic Content Benchmarks**

- *Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis and Probability F, 8-10)*
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators. (Data Analysis and Probability A, 11-12)*
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)*

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	R

**Competency 2.9: Identify basic procedures in the accounting cycle.**

*TPO: Given a repair order with parts and labor prices, identify basic procedures in the accounting cycle, with 100% compliance.*

**Descriptors:**

- 2.9.1 Describe the basic application of internal and external accounting.
- 2.9.2 Describe the essential nature of profitability and value.
- 2.9.3 Describe job costing with direct and indirect costs.
- 2.9.4 Explain basic economic concepts (e.g., supply, demand, price, cost, profit, value, cash flow).
- 2.9.5 Recognize accounting as part of the organizational team.

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.* (Number, Number Sense and Operations G, 8-10)
- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.* (Patterns, Functions and Algebra C, 8-10)
- *Analyze and compare functions and their graphs using attributes, such as rates of change, intercepts and zeros.* (Patterns, Functions and Algebra E, 8-10)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.10: Define and explain the major measures a transportation organization uses to manage and improve performance.**

*TPO: Using ones notes, define and explain the major measures a transportation organization uses to manage and improve performance, with 80% accuracy according to industry.*

**Descriptors:**

- 2.10.1 Define and explain the measures for financial performance (e.g. profitability, cost reduction, asset utilization).
- 2.10.2 Define and explain the measures for market performance (e.g., customer and sales and/or service growth).
- 2.10.3 Define and explain the operational measures for service and internal operations performance (e.g., customer satisfaction, service quality, cycle time, on-time delivery, claims-free handling).
- 2.10.4 Define and explain the measures for organizational compliance and health, safety and environmental performance (e.g., audit findings, emissions, lost time accidents).
- 2.10.5 Describe benchmark performances against competitors and the general industry.
- 2.10.6 Describe the continuous improvement process.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Solve increasingly complex non-routine measurement problems and check for reasonableness of results.* (Measurement A, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 2.11: Explain the role of risk management in reducing risks and improving performance.**

*TPO: Given the automotive shop safety standards, explain the role of risk management in reducing risks and improving performance, with 100% accuracy for safety.*

**Descriptors:**

- 2.11.1 Explain the concept of risk management programs.
- 2.11.2 Describe the major types of loss exposures for a transportation organization, including property, liability, personnel and net income.
- 2.11.3 Describe the approaches for managing organizational risks.
- 2.11.4 Describe the employees' role in risk management.

**Correlated Mathematics Academic Content Benchmarks**

- *Connect statistical techniques to applications in workplace and consumer situations.* (Data Analysis and Probability D, 11-12)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	R

**Competency 2.12: Examine entrepreneurship.**

*TPO: Presented with a group activity, examine entrepreneurship, with 90%.*

**Descriptors:**

- 2.12.1 Compare personal interests and skills with those needed by an entrepreneur.
- 2.12.2 Examine the abilities and aptitudes needed to become a successful entrepreneur.
- 2.12.3 Determine motives for becoming an entrepreneur.
- 2.12.4 Examine characteristics of entrepreneurs.
- 2.12.5 Compare business ownership to working for others.
- 2.12.6 Explain the risks and rewards of business ownership.
- 2.12.7 Examine the relationship of small business to the state, national and global economies.
- 2.12.8 Explain how an entrepreneurial mindset can affect a company.

**Correlated English Language Arts Academic Content Benchmarks**

- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

### Correlated Mathematics Academic Content Benchmarks

- *Connect statistical techniques to applications in workplace and consumer situations.* (Data Analysis and Probability D, 11-12)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**BIL:**                    **Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	R

**Competency 2.13:**      **Explain the role of small business in the economy.**

*TPO: Presented with a lecture, explain the role of small business in the economy, with 80% accuracy.*

#### **Descriptors:**

- 2.13.1      Explain the need for entrepreneurial discovery.
- 2.13.2      Determine opportunities for venture creation.
- 2.13.3      Assess opportunities for venture creation.
- 2.13.4      Describe idea-generation methods.
- 2.13.5      Generate venture ideas.
- 2.13.6      Determine the feasibility of ideas.

### Correlated English Language Arts Academic Content Benchmarks

- *Formulate open-ended research questions suitable for investigation and adjust questions as necessary while research is conducted.* (Research A, 8-10)
- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted.* (Research A, 11-12)
- *Organize information from various resources and select appropriate sources to support central ideas, concepts and themes.* (Research C, 8-10)

### Correlated Mathematics Academic Content Benchmarks

- *Connect statistical techniques to applications in workplace and consumer situations.* (Data Analysis and Probability D, 11-12)
- *Apply mathematical knowledge and skills routinely in other content areas and practical situations.* (Mathematical Processes B, 8-10)

### **Unit 3:      Communications**

**BIL:**                    **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.1:**      **Utilize reading strategies to interpret transportation systems data, information and analysis.**

*TPO: Presented with a reading activity, utilize reading strategies to interpret transportation systems data, information and analysis, with 80% accuracy.*

**Descriptors:**

- 3.1.1 Skim, read for detail, read for meaning and for critical analysis, to determine the purpose of a text.
- 3.1.2 Describe the content, technical concepts and vocabulary to analyze information and follow directions.
- 3.1.3 Interpret, transcribe and communicate information, data and observations to apply information learned from reading to actual practice.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Apply reading comprehension strategies to understand grade-appropriate text.* (Reading Process A, 8-10; Reading Process A, 11-12)
- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.2: Locate, organize and reference written transportation systems information from various sources.**

*TPO: Using a given repair on a vehicle, locate, organize and reference written transportation systems information from various sources, with 80% accuracy.*

**Descriptors:**

- 3.2.1 Locate written information to communicate with co-workers, clients and participants.
- 3.2.2 Organize information to use in written and oral communications.
- 3.2.3 Document the source and proper reference for written information.

**Correlated English Language Arts Academic Content Benchmarks**

- *Evaluate the usefulness and credibility of data and sources and synthesize information from multiple sources.* (Research C, 11-12)
- *Use style guides to produce oral and written reports that give proper credit for sources (e.g., words, ideas, images and information) and include an acceptable format for source acknowledgement.* (Research D, 8-10; Research D, 11-12)
- *Communicate findings, reporting on the substance and processes orally, visually and in writing or through multimedia.* (Research E, 8-10; Research E, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function. (Patterns, Functions and Algebra C, 8-10)*
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability. (Data Analysis and Probability A, 8-10)*
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner. (Mathematical Processes H, 8-10)*
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.3: Write and utilize coherent and focused technical communications that support a defined perspective for transportation systems.**

*TPO: Provided with forms and a customer, write and utilize coherent and focused technical communications that support a defined perspective for transportation systems, with 80% accuracy in accordance with industry standards.*

**Descriptors:**

- 3.3.1 Use various note-taking techniques to summarize main ideas.
- 3.3.2 Structure ideas and arguments in an organized manner and that are supported by relevant documentation and/or examples.
- 3.3.3 Write messages using language that is appropriate for the intended audience and purpose.
- 3.3.4 Use correct spelling, grammar, capitalization and punctuation.
- 3.3.5 Identify positions from relevant research and resources.
- 3.3.6 Calculate and interpret descriptive statistics to communicate and support predictions and conclusions.
- 3.3.7 Utilize tables, charts and graphs to clarify textual explanations and support arguments.

**Correlated English Language Arts Academic Content Benchmarks**

- *Formulate writing ideas, and identify a topic appropriate to the purpose and audience. (Writing Process A, 8-10; Writing Process A, 11-12)*
- *Prepare writing for publication that is legible, follows an appropriate format and uses techniques such as electronic resources and graphics. (Writing Process F, 8-10)*
- *Prepare writing for publication that follows an appropriate format and uses a variety of techniques to enhance the final product. (Writing Process F, 11-12)*
- *Edit to improve sentence fluency, grammar and usage. (Writing Process D, 8-10)*
- *Produce functional documents that report, organize and convey information and ideas accurately, foresee readers’ problems or misunderstandings and that include formatting techniques that are user friendly. (Writing Applications C, 11-12)*
- *Organize information from various resources and select appropriate sources to support central ideas, concepts and themes. (Research C, 8-10)*

**Correlated Mathematics Academic Content Benchmarks**

- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose.* (Data Analysis and Probability B, 8-10)
- *Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data.* (Data Analysis and Probability D, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)
- *Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.* (Data Analysis and Probability B, 11-12)
- *Write clearly and coherently about mathematical thinking and ideas.* (Mathematical Processes G, 8-10)

**Correlated Science Academic Content Benchmarks**

- *Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations.* (Scientific Inquiry A, 9-10)
- *Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.* (Scientific Inquiry A, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.4: Deliver formal and informal presentations that demonstrate organization and delivery skill.**

*TPO: Upon completion of the lesson, deliver formal and informal presentations that demonstrate organization and delivery skill at 90% accuracy.*

**Descriptors:**

- 3.4.1 Demonstrate appropriate usage of grammar, diction and sentence structure.
- 3.4.2 Communicate main ideas and supporting facts to achieve the purpose of communication.
- 3.4.3 Use appropriate technology to enhance the clarity and persuasiveness.
- 3.4.4 Use proper organization and structure to achieve coherence.
- 3.4.5 Use technical terms, references and quoted material properly.
- 3.4.6 Engage an audience using appropriate vocal variety and gestures.

**Correlated English Language Arts Academic Content Benchmarks**

- *Demonstrate an understanding of effective speaking strategies by selecting appropriate language and adjusting presentation techniques.* (Communications: Oral and Visual D, 8-10)

- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)
- *Give presentations using a variety of delivery methods, visual displays and technology.* (Communications: Oral and Visual G, 8-10; Communications: Oral and Visual F, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.5: Listen and speak effectively to contribute to group discussions and meetings.**

*TPO: On all classroom presentations, listen and speak effectively to contribute to group discussions and meetings, and lab work at 90% accuracy.*

**Descriptors:**

- 3.5.1 Conduct meetings in a timely, organized and professional manner.
- 3.5.2 Clarify the purpose and goals of a discussion or meeting.
- 3.5.3 Demonstrate respect for diverse cultures.
- 3.5.4 Give and receive feedback appropriately.
- 3.5.5 Stay on subject and task.
- 3.5.6 Summarize the results of the meeting, including agreements and disagreements.
- 3.5.7 Speak succinctly and clearly to convey information.
- 3.5.8 Correctly utilize transportation terminology.
- 3.5.9 Discuss slang and jargon related to different trades.
- 3.5.10 Communicate with non-English-speaking populations.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)
- *Demonstrate an understanding of effective speaking strategies by selecting appropriate language and adjusting presentation techniques.* (Communications: Oral and Visual D, 8-10)
- *Give informational presentations that present ideas in a logical sequence, include relevant facts and details from multiple sources and use a consistent organizational structure.* (Communications: Oral and Visual E, 8-10)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.6: Apply active listening skills to obtain and clarify information provided in oral communications.**

*TPO: On all lectures and lab work, apply active listening skills to obtain and clarify information provided in oral communications, and lab work at 90% accuracy.*

**Descriptors:**

- 3.6.1 Identify and apply active listening techniques one-to-one and in team or group meetings.
- 3.6.2 Interpret verbal cues and behaviors to enhance communication.
- 3.6.3 Interpret nonverbal cues and behaviors to enhance communication.
- 3.6.4 Paraphrase and repeat information to confirm understanding.
- 3.6.5 Record and summarize information in written notes.
- 3.6.6 Ask questions to seek or confirm understanding.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 3.7: Utilize written documents to direct the transportation systems operations.**

*TPO: Given industry forms and reports, utilize written documents to direct the transportation systems operations, and lab work at 90% accuracy.*

**Descriptors:**

- 3.7.1 Identify types of reports (e.g. quality assurance, shift turnover, schedules, preventive maintenance).
- 3.7.2 Generate work orders, including change order requests.
- 3.7.3 Calculate job cost and prepare billing documents.
- 3.7.4 Complete reports in accordance with established standards.
- 3.7.5 Apply concepts of tolerances and equivalency to specifications.
- 3.7.6 Identify the components of contract documents.
- 3.7.7 File reports with the appropriate personnel.
- 3.7.8 Disseminate written information from various sources to co-workers and clients.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Apply editing strategies to eliminate slang and improve conventions.* (Writing Process D, 11-12)
- *Produce functional documents that report, organize and convey information and ideas accurately, foresee readers’ problems or misunderstandings and that include formatting techniques that are user friendly.* (Writing Applications C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Compare, order and determine equivalent forms of real numbers.* (Number, Number Sense and Operations E, 8-10)
- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.* (Number, Number Sense and Operations G, 8-10)
- *Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions.* (Measurement F, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 3.8:        Research and respond to customer needs.**

*TPO:    Provided with a customer research and respond to customer needs, and lab work at 90% accuracy.*

**Descriptors:**

- 3.8.1            Recognize the importance of all customers to business.
- 3.8.2            Describe the relationship between meeting customer needs and profitability.
- 3.8.3            Interact with customers and vendors in a professional manner.
- 3.8.4            Demonstrate professional phone etiquette when dealing with customers, vendors and the general public.
- 3.8.5            Follow through on commitments made to customers and vendors in a timely manner.
- 3.8.6            Maintain customer satisfaction and address customer problems and complaints efficiently.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Connect statistical techniques to applications in workplace and consumer situations.* (Data Analysis and Probability D, 11-12)

**Unit 4: Problem Solving and Critical Thinking**

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 4.1:      Employ critical thinking and problem solving skills independently and in teams to formulate solutions to problems.**

*TPO:   Given an assignment, employ critical thinking and problem solving skills independently and in teams to formulate solutions to problems, with 80% accuracy.*

**Descriptors:**

- 4.1.1           Define problem-solving methods accepted in the transportation industry.
- 4.1.2           State the problem completely and precisely.
- 4.1.3           Assemble and examine pertinent information.
- 4.1.4           Brainstorm potential solutions.
- 4.1.5           Identify constraints and parameters to solutions as they relate to budgets, scope and schedules.
- 4.1.6           Compare and contrast consequences, and discuss underlying assumptions.
- 4.1.7           Identify the best solution based on risks, costs, ethics, laws, benefits, conflicting concerns and points of view.
- 4.1.8           Apply the best solution to the problem.
- 4.1.9           Evaluate the solution.
- 4.1.10          Evaluate resources and timelines.

**Correlated English Language Arts Academic Content Benchmarks**

- *Formulate open-ended research questions suitable for investigation and adjust questions as necessary while research is conducted. (Research A, 8-10)*
- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted. (Research A, 11-12)*
- *Compile, organize and evaluate information, take notes and summarize findings. (Research B, 11-12)*
- *Organize information from various resources and select appropriate sources to support central ideas, concepts and themes. (Research C, 8-10)*
- *Evaluate the usefulness and credibility of data and sources, and synthesize information from multiple sources. (Research C, 11-12)*
- *Communicate findings, reporting on the substance and processes orally, visually and in writing or through multimedia. (Research E, 8-10; Research E, 11-12)*

**Correlated Mathematics Academic Content Benchmarks**

- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Patterns, Functions and Algebra D, 8-10)*
- *Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis and Probability F, 8-10)*
- *Formulate a problem or mathematical model in response to a specific need or situation, determine information required to solve the problem, choose method for obtaining this information, and set limits for acceptable solution. (Mathematical Processes A, 8-10)*
- *Use precise mathematical language and notations to represent problem situations and mathematical ideas. (Mathematical Processes F, 8-10)*
- *Present complete and convincing arguments and justifications, using inductive and deductive reasoning, adapted to be effective for various audiences. (Mathematical Processes F, 11-12)*

- *Apply mathematical modeling to workplace and consumer situations, including problem formulation, identification of a mathematical model, interpretation of solution within the model, and validation to original problem situation. (Mathematical Processes J, 11-12)*

**Correlated Science Academic Content Benchmarks**

- *Explain the ways in which the processes of technological design respond to the needs of society. (Science and Technology A, 9-10)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	<b>I</b>	<b>P</b>

**Competency 4.2: Apply problem solving and critical thinking techniques to the conflict between available resources, requirements of the project, and timelines.**

*TPO: Given a group activity to complete in a given time, apply problem solving and critical thinking techniques to the conflict between available resources, requirements of the project, and timelines, with 80% accuracy.*

**Descriptors:**

- 4.2.1 Identify alternative solutions for a specific resources and/or materials problem.
- 4.2.2 Calculate the potential waste of resources and materials.
- 4.2.3 Examine the feasibility of each alternative suggestion.
- 4.2.4 Implement the appropriate alternative.
- 4.2.5 Use available resources and materials efficiently to complete the project.
- 4.2.6 Discuss strategies to avoid the problem in the future.

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number, Number Sense and Operations G, 8-10)*
- *Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions. (Measurement F, 8-10)*
- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Patterns, Functions and Algebra D, 8-10)*
- *Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis and Probability F, 8-10)*
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner. (Mathematical Processes H, 8-10)*
- *Present complete and convincing arguments and justifications, using inductive and deductive reasoning, adapted to be effective for various audiences. (Mathematical Processes F, 11-12)*
- *Apply mathematical modeling to workplace and consumer situations, including problem formulation, identification of a mathematical model, interpretation of solution within the model, and validation to original problem situation. (Mathematical Processes J, 11-12)*

**Correlated Science Academic Content Benchmarks**

- Explain the ways in which the processes of technological design respond to the needs of society. (Science and Technology A, 9-10)

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 4.3:        Combine critical thinking and team-building skills to solve problems.**

*TPO: Presented with a group activity, combine critical thinking and team-building skills to solve problems, with 90%.*

**Descriptors:**

- 4.3.1        Work with others to define problems.
- 4.3.2        Share ideas, facts, information and/or data with others.
- 4.3.3        State personal positions clearly, and respect conflicting positions.
- 4.3.4        Accept and support group decisions even when different from a personal solution, within the bounds of ethical, safety, legal or similar concerns.

**Correlated English Language Arts Academic Content Benchmarks**

- Communicate findings, reporting on the substance and processes orally, visually and in writing or through multimedia. (Research E, 8-10; Research E, 11-12)
- Use a variety of strategies to enhance listening comprehension. (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- Select and use effective speaking strategies for a variety of audiences, situations and purposes. (Communications: Oral and Visual C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis and Probability F, 8-10)
- Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner. (Mathematical Processes H, 8-10)
- Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)

**BIL:**  
Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 4.4:        Evaluate and adjust plans and schedules to respond to unexpected events and conditions.**

*TPO: Given a situation, evaluate and adjust plans and schedules to respond to unexpected events and conditions, with 80% accuracy in accordance with safety.*

**Descriptors:**

- 4.4.1 Identify potential events and conditions that disrupt the completion of a job.
- 4.4.2 Incorporate potential job disruptions into planning timelines.
- 4.4.3 Solve situational problems involved with unexpected events and conditions.
- 4.4.4 Identify and assess critical situations, and implement an appropriate response.
- 4.4.5 Adjust plans and schedules to reflect an unexpected change.
- 4.4.6 Provide a project update to track change.

**Correlated English Language Arts Academic Content Benchmarks**

- *Formulate open-ended research questions suitable for investigation and adjust questions as necessary while research is conducted. (Research A, 8-10)*
- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted. (Research A, 11-12)*
- *Evaluate the usefulness and credibility of data and sources and synthesize information from multiple sources. (Research C, 11-12)*

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number, Number Sense and Operations G, 8-10)*
- *Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions. (Measurement F, 8-10)*
- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Patterns, Functions and Algebra D, 8-10)*
- *Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis and Probability F, 8-10)*
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 4.5: Apply mathematical principles and formulas to transportation systems problems.**

*TPO: Using a given repair order a vehicle; apply mathematical principles and formulas to transportation systems problems, with 90% accuracy.*

**Descriptors:**

- 4.5.1 Utilize statistical probability to address problems.
- 4.5.2 Apply statistical process control to operational problems.

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number, Number Sense and Operations G, 8-10)*

- Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions. (Measurement F, 8-10)
- Use counting techniques, such as permutations and combinations, to determine the total number of options and possible outcomes. (Data Analysis and Probability H, 8-10)
- Design an experiment to test a theoretical probability, and record and explain results. (Data Analysis and Probability I, 8-10)
- Compute probabilities of compound events, independent events, and simple dependent events. (Data Analysis and Probability J, 8-10)
- Make predictions based on theoretical probabilities and experimental results. (Data Analysis and Probability K, 8-10)
- Connect statistical techniques to applications in workplace and consumer situations. (Data Analysis and Probability D, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 4.6: Apply scientific theory and applications to transportation systems problems.**

*TPO: Using a given repair on a vehicle, apply scientific theory and applications to transportation systems problems, with 90% accuracy.*

**Descriptors:**

- 4.6.1 Identify situations that require scientific theory and application.
- 4.6.2 Utilize physical sciences and applications to address problems.

**Correlated Science Academic Content Benchmarks**

- Explain that scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world. (Scientific Ways of Knowing A, 9-10)
- Explain the ways in which the processes of technological design respond to the needs of society. (Science and Technology A, 9-10)
- Explain the movement of objects by applying Newton’s three laws of motion. (Physical Sciences D, 9-10)
- Apply principles of forces and motion to mathematically analyze, describe and predict the net effects on objects or systems. (Physical Sciences D, 11-12)

**Unit 5: Leadership and Teamwork**

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 5.1: Summarize the interpersonal skills that contribute to positive leadership and teamwork.**

*TPO: Given a lecture on work ethics, summarize the interpersonal skills that contribute to positive leadership and teamwork, working in a group developing a list of concerns and resolutions.*

**Descriptors:**

- 5.1.1 Identify and explain basic interpersonal skills most closely associated with a positive work environment (e.g., empathy, listening, respect, unconditional positive regard).
- 5.1.2 Discuss the importance of relating to the culture and climate of an organization.
- 5.1.3 Identify the variety of cultural diversity in the workplace (e.g., race, religion, nationality, gender).
- 5.1.4 Discuss cultural diversity issues related to business.

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 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.**

*TPO: Given a lab with assigned positions that relate to automotive, demonstrate the ability to work on a team and recognize the importance of teamwork and its impact on business in a transportation environment, with 90% based on industry standards.*

**Descriptors:**

- 5.2.1 Define teamwork and team goals and objectives.
- 5.2.2 Identify types of teams (e.g. cross-functional, cross-trained).
- 5.2.3 Describe the role of effective teams in high-performance workplaces.
- 5.2.4 Examine unique issues associated with working on teams.
- 5.2.5 Apply team problem-solving and conflict-resolution practices.
- 5.2.6 Explain the roles and responsibilities of the individual as part of the team.
- 5.2.7 Identify attitudes and behaviors that promote positive interaction between members of the work team (e.g., punctuality, attendance, preparedness).

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 5.3: Perform responsibly as a team member.**

*TPO: Given a lab with assigned positions that relate to automotive, perform responsibly as a team member, with 90% based on industry standards.*

**Descriptors:**

- 5.3.1 Organize and schedule dependent team assignments.
- 5.3.2 Demonstrate an organized team approach to accomplishing tasks.
- 5.3.3 Assist other members of the work team.
- 5.3.4 Discuss typical safety situations encountered where teamwork is essential.
- 5.3.5 Describe the importance of accountability for roles and responsibilities.
- 5.3.6 Identify the basic psychological needs that motivate behavior (e.g., belonging, power, freedom).
- 5.3.7 Discuss the role that different values play in generating conflict.
- 5.3.8 Identify how the effects of substance abuse, mental health and disabilities impact conflict.

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 5.4: Use motivational techniques to enhance performance in others.**

*TPO: Upon completion of the lesson, Use motivational techniques to enhance performance in others, at 90% accuracy.*

**Descriptors:**

- 5.4.1 Describe the induction process new employees experience when they enter a new work group.
- 5.4.2 Discuss communication barriers new employees may encounter.
- 5.4.3 Use reward and incentive systems.
- 5.4.4 Coach associates to expand their role within the transportation organization.
- 5.4.5 Use coaching skills to inspire others to achieve.
- 5.4.6 Explain the importance of progressive disciplinary action to improve performance.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 5.5: Examine the different responses to conflict as they relate to results.**

*TPO: Provided with an automotive shop and given situations, examine the different responses to conflict as they relate to results, with 100% accuracy to safety standards.*

**Descriptors:**

- 5.5.1 Describe the soft response approach (e.g. avoidance, compromise and accommodation) and the typical reasons for using that approach.
- 5.5.2 Describe the hard response approach (e.g. force, threats, aggression and anger) and the typical reasons for using that approach.

5.5.3 Describe the principled response approach (e.g. good communication skills, problem solving skills, and the ability to see the problem from more than one perspective) and the typical reasons for using that approach.

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 5.6:        Resolve conflicts to maintain a smooth workflow.**

*TPO:    Given a company policy, resolve conflicts to maintain a smooth workflow, list procedures in correct order.*

**Descriptors:**

- 5.6.1        Use conflict resolution skills.
- 5.6.2        Work collaboratively and cooperatively.
- 5.6.3        Give and receive criticism in a diplomatic and constructive manner.
- 5.6.4        Use diplomatic and constructive statements and responses.
- 5.6.5        Manage stress and control emotions.
- 5.6.6        Convey honesty and integrity when providing feedback to associates.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use a variety of strategies to enhance listening comprehension.* (Communications: Oral and Visual A, 8-10; Communications: Oral and Visual A, 11-12)
- *Select and use effective speaking strategies for a variety of audiences, situations and purposes.* (Communications: Oral and Visual C, 11-12)

**Unit 6:        Legal and Ethical Aspects**

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 6.1:        Differentiate between legal and ethical issues.**

*TPO:    Using information from a lesson on ethics, differentiate between legal and ethical issues, meeting program and legal ethical business standards.*

**Descriptors:**

- 6.1.1        Define “legal” and “ethical” issues.
- 6.1.2        Translate legal and ethical issues to the transportation industry.
- 6.1.3        Define and distinguish between company and departmental policies.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 6.2: Complete work-related duties within an ethical framework.**

*TPO: Using information from a lesson on ethics, complete work-related duties within an ethical framework, meeting program standards.*

**Descriptors:**

- 6.2.1 Identify codes of ethics within the professions.
- 6.2.2 Develop an individual ethical framework.
- 6.2.3 Demonstrate ethical behavior when interacting with colleagues both internal and external to the profession.
- 6.2.4 Describe the ethical impact of positive cultural sensitivity in a transportation organization.

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 6.3: Assess the implications of ethical and unethical behavior.**

*TPO: Using information from a case study on ethics, assess the implications of ethical and unethical behavior, meeting program and legal ethical business standards.*

**Descriptors:**

- 6.3.1 Compare and contrast personal, professional and organizational ethics.
- 6.3.2 Demonstrate respect for the property of customers, other professions and coworkers.
- 6.3.3 Resolve issues relating to any potential conflicts of interest between personal and organizational ethics.
- 6.3.4 Identify strategies for responding to the unethical actions of individuals and organizations.
- 6.3.5 Identify the ramifications of unethical actions.

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 6.4: Perform duties according to laws, regulations, contract provisions and policies.**

*TPO: Given repair order with customer information, perform duties according to laws, regulations, contract provisions and policies, with 100% compliance.*

**Descriptors:**

- 6.4.1 Describe the legal responsibilities, limitations and implications of actions.
- 6.4.2 Comply with the legal responsibilities specified by state practice act(s) and other pertinent legislation.
- 6.4.3 Compare and contrast the roles of various regulatory agencies (e.g. content of laws and regulation of jurisdictions).
- 6.4.4 Identify the types of contracts and describe their roles in the transportation industry.
- 6.4.5 Illustrate how work activities relate to health and safety issues.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.* (Number, Number Sense and Operations G, 8-10)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 6.5: Comply with applicable governmental regulations and codes.**

*TPO: Provided with books computers and internet access, comply with applicable governmental regulations and codes, with 100% accuracy in compliance.*

**Descriptors:**

- 6.5.1 Identify governmental regulations and codes.
- 6.5.2 Describe mandated standards for workplace safety, harassment, labor and employment laws.
- 6.5.3 Identify personal and organizational ramifications for failure to comply with government laws and regulations.
- 6.5.4 Describe the interrelationships between local and national codes.
- 6.5.5 Identify legal responsibilities specified by state practice act(s) and other pertinent legislation (e.g., substance abuse, harassment, discrimination).
- 6.5.6 Identify legal responsibilities specified by state practice act(s), other pertinent legislation and regulatory agencies as it relates to union and/or non-union practices.
- 6.5.7 Apply regulations and codes according to guidelines.
- 6.5.8 Complete job inspections and adhere to all regulations and codes.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)

- Apply reading comprehension strategies to understand grade-appropriate texts. (Reading Process A, 8-10; Reading Process A, 11-12)
- Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions. (Number, Number Sense and Operations G, 8-10)
- Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators. (Data Analysis and Probability A, 11-12)
- Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability. (Data Analysis and Probability B, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 6.6: Explain employee and employer liability (e.g., monetary and personal).**

*TPO: Upon completion of the lesson, explain employee and employer liability (e.g., monetary and personal) to show understanding at 100% accuracy.*

**Descriptors:**

- 6.6.1 Define liability and negligence.
- 6.6.2 Discuss protections against liability.
- 6.6.3 Explain the role of the Bureau of Workers’ Compensation in workplace injuries.
- 6.6.4 Discuss the concept of transferring risk.
- 6.6.5 Describe the “multi-employer” responsibility under Department of Transportation (DOT), Federal Motor Carrier Safety Administration (FMCSA) and OSHA.

**Correlated English Language Arts Academic Content Benchmarks**

- Use context clues and text structures to determine the meaning of new vocabulary. (Acquisition of Vocabulary A, 8-10)
- Use multiple resources to enhance comprehension of vocabulary. (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)

**Unit 7: Information Technology Applications**

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 7.1: Use computer-based technology.**

*TPO: Provided with books computers and internet access, use computer-based technology, with*

*100% accuracy in compliance.*

**Descriptors:**

- 7.1.1 Access a Web site using the Internet.
- 7.1.2 Use e-mail to send and receive messages.
- 7.1.3 Collect data from the environment, people or instruments.
- 7.1.4 Use electronic sources to determine the quality, relevance or usefulness of a product.
- 7.1.5 Use electronic sources to generate and access client or customer information for evaluation.
- 7.1.6 Use a database to summarize, compare and contrast information.
- 7.1.7 Represent existing client, product, service or topical information in a different form.
- 7.1.8 Interpret client or product information to determine appropriate action.

**Correlated English Language Arts Academic Content Benchmarks**

- *Evaluate the usefulness and credibility of data and sources and synthesize information from multiple sources.* (Research C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.* (Patterns, Functions and Algebra C, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)
- *Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.* (Data Analysis and Probability B, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	<b>I</b>	<b>P</b>

**Competency 7.2: Employ information technology applications.**

*TPO: Provided with books computers and internet access, employ information technology applications, with 90% accuracy in compliance.*

**Descriptors:**

- 7.2.1 Identify organizational policies and ethics regarding the use of communications tools.
- 7.2.2 Use personal information management (PIM) productivity applications (e.g., schedules, contacts, memos).
- 7.2.3 Communicate using electronic equipment (e.g. e-mail, fax, phone).
- 7.2.4 Utilize Internet applications.
- 7.2.5 Utilize writing and publishing applications.
- 7.2.6 Prepare reports and other business communications integrating graphics and other non-text elements.
- 7.2.7 Demonstrate presentation applications.
- 7.2.8 Utilize spreadsheets and database applications.

- 7.2.9           Employ collaborative and groupware applications.
- 7.2.10          Examine computer-driven equipment and machines, and access support as needed.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Produce functional documents that report, organize and convey information and ideas accurately, foresee readers’ problems or misunderstandings and that include formatting techniques that are user friendly.* (Writing Applications C, 11-12)
- *Give presentations using a variety of delivery methods, visual displays and technology.* (Communications: Oral and Visual G, 8-10; Communications: Oral and Visual F, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)
- *Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.* (Data Analysis and Probability B, 11-12)
- *Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions.* (Data Analysis and Probability C, 11-12)

**BIL:           Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 7.3:       Use geographic information systems.**

*TPO:   Provided with books computers and internet access, use geographic information systems, with 95% accuracy in compliance.*

**Descriptors:**

- 7.3.1           Represent data on maps using Global Positioning System and Geographic Information Systems (GPS and GIS) software.
- 7.3.2           Locate physical addresses on maps using GPS and GIS software.
- 7.3.3           Estimate distances and travel times between two or more locations.
- 7.3.4           Utilize GPS and GIS software to produce and print maps.

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.* (Number, Number Sense and Operations G, 8-10)
- *Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions.* (Measurement F, 8-10)

## Unit 8: Safety, Health and Environmental Aspects

**BIL:** Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 8.1:** Maintain general safety in accordance with government regulations, health standards, company policy, procedure and practices.

*TPO:* Given a lab setting, maintain general safety in accordance with government regulations, health standards, company policy, procedure and practices by walking around the shop to identify and differentiate between safe and unsafe conditions.

### Descriptors:

- 8.1.1 Wear personal protective equipment (PPE) as appropriate (e.g., dust mask, hearing protection, respirators, eye protection).
- 8.1.2 Check and correct potential hazards (e.g., hair, jewelry, clothing).
- 8.1.3 Maintain personal protective equipment (e.g., inspect, clean, replace).
- 8.1.4 Follow established procedures for the use of safety apparatus and equipment, including fall protection.
- 8.1.5 Conduct routine building safety inspections.
- 8.1.6 Check power sources for potential hazards, and confirm proper grounding.
- 8.1.7 Shut down power equipment in dangerous situations using disconnect switches and established lock-out/tag-out (LO/TO) procedures.
- 8.1.8 Identify the location of emergency flush showers, eye wash fountains, fire alarms and exits.
- 8.1.9 Maintain work areas in accordance with standards for cleanliness and safety.
- 8.1.10 Describe how to operate fire extinguishers, and identify classes of fires.
- 8.1.11 Inspect air and exhaust systems, including intake filters, fans and other mechanical components.
- 8.1.12 Explain the value of an emergency response plan.

### Correlated English Language Arts Academic Content Benchmarks

- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

### Correlated Mathematics Academic Content Benchmarks

- *Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision.* (Measurement E, 8-10)
- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)

### Correlated Science Academic Content Benchmarks

- *Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations. (Scientific Inquiry A, 9-10)*
- *Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (Scientific Inquiry A, 11-12)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 8.2: Evaluate the human and ergonomic factors associated with the transportation industry.**

*TPO: Upon completion of lesson, evaluate the human and ergonomic factors associated with the transportation industry, with 90% accuracy.*

**Descriptors:**

- 8.2.1 Wear personal protective equipment (PPE) in accordance with the ergonomic process.
- 8.2.2 Define ergonomics.
- 8.2.3 Describe ergonomic factors of the workplace.
- 8.2.4 Identify work associated with repetitive motion, as well as lifting or moving heavy objects.
- 8.2.5 Demonstrate appropriate body mechanics in lifting and moving heavy objects.
- 8.2.6 Describe the ergonomic importance of properly operating various types of tools and equipment.

**Correlated English Language Arts Academic Content Benchmarks**

- *Apply knowledge of roots, affixes and phrases to aid understanding of content area vocabulary. (Acquisition of Vocabulary D, 11-12)*

**Correlated Mathematics Academic Content Benchmarks**

- *Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)*
- *Describe sampling methods and analyze the effects of method chosen on how well the resulting sample represents the population. (Data Analysis and Probability G, 8-10)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 8.3: Identify state, federal, and local worker safety, health and environmental regulations.**

*TPO: Upon completion of lesson, identify state, federal, and local worker safety, health and environmental regulations, with 90% accuracy.*

**Descriptors:**

- 8.3.1 Examine the Occupational Safety and Health Administration (OSHA) and Federal Aviation Administration (FAA) regulations.
- 8.3.2 Examine the state Bureau of Workers' Compensation (BWC).
- 8.3.3 Explain workers' compensation cost as it relates to transportation.
- 8.3.4 Describe the purpose of the National Institute for Occupational Safety and Health (NIOSH).
- 8.3.5 Identify safety documentation.
- 8.3.6 Discuss applicable international regulations that impact transportation operations.
- 8.3.7 Discuss the Ohio and Federal Environmental Protection Agency (EPA) regulations.
- 8.3.8 Describe the industry-specific governmental regulatory agencies (e.g., Department of Transportation [DOT]).
- 8.3.9 Interpret personal safety rights according to employee's right-to-know plans and hazardous communications.
- 8.3.10 Interpret material safety data sheets (MSDS), and use materials accordingly.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use context clues and text structures to determine the meaning of new vocabulary.* (Acquisition of Vocabulary A, 8-10)
- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)
- *Evaluate how features and characteristics make information accessible and usable and how structures help authors achieve their purposes.* (Reading: Informational, Technical and Persuasive Text A, 8-10)

**Correlated Mathematics Academic Content Benchmarks**

- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.* (Patterns, Functions and Algebra D, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)

**Correlated Science Academic Content Benchmarks**

- *Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations.* (Scientific Inquiry A, 9-10)
- *Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.* (Scientific Inquiry A, 11-12)

**BIL:**           **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 8.4:       Demonstrate practices that contribute to a safe workplace environment.**

*TPO:   Provided with a automotive shop and given situations, demonstrate practices that contribute to a safe workplace environment, with 100% accuracy to safety standards.*

**Descriptors:**

- 8.4.1       Identify unsafe operations of a process.
- 8.4.2       Establish safety training meetings with relevant topics.
- 8.4.3       Explain the concept of “engineering out” as a personal protection strategy.
- 8.4.4       Conduct and participate in accident and other incident investigations.
- 8.4.5       Perform a job safety analysis (JSA).
- 8.4.6       Inform and correct unsafe activities committed by coworkers.
- 8.4.7       Examine access and egress procedures.
- 8.4.8       Employ ergonomic concepts in daily work activities.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)

**Correlated Science Academic Content Benchmarks**

- *Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations.* (Scientific Inquiry A, 9-10)
- *Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.* (Scientific Inquiry A, 11-12)

**BIL:**           **Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	R

**Competency 8.5:       Complete the requirements for first aid and CPR certification.**

*TPO:   Given a company policy, complete the requirements for first aid and CPR certification, in accordance with the local certifying agency.*

**Descriptors:**

- 8.5.1 Complete first aid training and certification.
- 8.5.2 Complete cardiopulmonary resuscitation (CPR) training and certification.

**Correlated English Language Arts Academic Content Benchmarks**

- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 8.6: Complete and apply operations and safety training on pertinent equipment.**

*TPO: Given a lab setting and individual equipment, complete and apply operations and safety training on pertinent equipment to satisfy a 100% score on each assessment.*

**Descriptors:**

- 8.6.1 Complete orientation to pertinent equipment before operating.
- 8.6.2 Review all important information regarding equipment safety.
- 8.6.3 Utilize the correct tools to do the job during training.
- 8.6.4 Conduct a post-training evaluation to assure the equipment is operated safely.
- 8.6.5 Document the quality and effectiveness of the training.
- 8.6.6 Fulfill safety and health requirements for maintenance.
- 8.6.7 Monitor and operate equipment in compliance with both company and national regulations.

**Correlated English Language Arts Academic Content Benchmarks**

- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 8.7: Identify practices that contribute to a healthy environment.**

*TPO: Upon completion of lesson, identify practices that contribute to a healthy environment, with 100% accuracy.*

**Descriptors:**

- 8.7.1 Discuss symptoms of exposure to health-threatening environments (e.g., temperature; chemicals; noise, vibrations, harshness [NVH]; biological hazards).

- 8.7.2 Describe the effects of hazardous activities (e.g., welding).
- 8.7.3 Describe precautions required when using toxic or flammable materials.
- 8.7.4 Discuss the inspection of air and exhaust systems, including intake filters, fans and other mechanical components.
- 8.7.5 Describe the interactions of incompatible substances.
- 8.7.6 Describe basic health and hygiene principles.

**BIL:** Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	P	R

**Competency 8.8: Handle hazardous materials in accordance with government regulations and health standards.**

*TPO: Upon completion of lesson and demonstration, handle hazardous materials in accordance with government regulations and health standards, with 100% accuracy.*

**Descriptors:**

- 8.8.1 Identify types of hazardous materials (e.g., chemical, biological).
- 8.8.2 Interpret container label precautions.
- 8.8.3 Identify hazardous storage procedures in compliance with government regulations.
- 8.8.4 Dispose of hazardous materials in accordance with government regulations.
- 8.8.5 Examine a hazardous materials safety plan.

**Correlated English Language Arts Academic Content Benchmarks**

- *Apply reading comprehension strategies to understand grade-appropriate texts.* (Reading Process A, 8-10; Reading Process A, 11-12)

**Correlated Science Academic Content Benchmarks**

- *Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations.* (Scientific Inquiry A, 9-10)
- *Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.* (Scientific Inquiry A, 11-12)

**BIL:** Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 8.9: Analyze regulations for transporting hazardous materials.**

*TPO: Upon completion of lesson and demonstration, analyze regulations for transporting hazardous materials, with 100% accuracy.*

**Descriptors:**

- 8.9.1 Describe the United Nations (UN) and North American (NA) shipping documents.
- 8.9.2 Explain the function of placards and labeling.
- 8.9.3 Describe the manifest and explain its function.
- 8.9.4 Discuss handling and loading procedures.
- 8.9.5 Describe the procedures for emergency response and cleanup.
- 8.9.6 Identify and explain the security regulations and precautions.
- 8.9.7 Identify potential transportation threats and the appropriate reporting authorities.

**Correlated English Language Arts Academic Content Benchmarks**

- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Evaluate how features and characteristics make information accessible and usable and how structures help authors achieve their purposes.* (Reading: Informational, Technical and Persuasive Text A, 8-10)

**Unit 9: Transportation Fuels**

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 9.1 Discuss the historical and economic impact of the petroleum industry.**

*TPO: Upon completion of the lesson, discuss the historical and economic impact of the petroleum industry with an 85% understanding and accuracy.*

**Descriptors:**

- 9.1.1 Discuss historical and current events related to the petroleum industry.
- 9.1.2 Discuss the impact of the petroleum industry on environmental factors.
- 9.1.3 Discuss the economic impact of the petroleum industry.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**Correlated Science Academic Content Benchmarks**

- *Describe the finite nature of Earth’s resources and those human activities that can conserve or deplete Earth’s resources.* (Earth and Space Sciences D, 9-10)

- Explain that humans are an integral part of the Earth’s system and the choices humans make today impact natural systems in the future. (Earth and Space Sciences C, 11-12)
- Describe how human activities can impact the status of natural systems. (Life Sciences G, 9-10)
- Explain how human choices today will affect the quality and quantity of life on earth. (Life Sciences F, 11-12)
- Describe how atoms and molecules can gain or lose energy only in discrete amounts. (Physical Sciences C, 11-12)
- Explain that science and technology are interdependent; each drives the other. (Science and Technology B, 9-10)
- Predict how human choices today will determine the quality and quantity of life on Earth. (Science and Technology A, 11-12)

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	<b>I</b>	<b>P</b>

**Competency 9.2: Discuss the alternative vehicular fuel industry.**

*TPO: Upon completion of the lesson, discuss the alternative vehicular fuel industry with an 85% understanding and accuracy.*

**Descriptors:**

- 9.2.1 Discuss the history of the alternative fuel industry.
- 9.2.2 Identify driving forces in the move to alternative fuel solutions.
- 9.2.3 Discuss local, state and national legislation related to alternative vehicular fuels.

**Correlated English Language Arts Academic Content Benchmarks**

- Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
- Compile, organize and evaluate information, take notes and summarize findings. (Research B, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators. (Data Analysis and Probability A, 11-12)
- Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)

**Correlated Science Academic Content Benchmarks**

- Predict how human choices today will determine the quality and quantity of life on Earth. (Science and Technology A, 11-12)
- Explain how societal issues and considerations affect the progress of science and technology. (Scientific Ways of Knowing C, 11-12)

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 9.3 Compare and contrast viable fuels.**

*TPO: Using information gathered through lecture and internet research, compare and contrast viable fuels, by creating a chart listing at least five advantages and five disadvantages.*

**Descriptors:**

- 9.3.1 Discuss the concept of well-to-wheel.
- 9.3.2 Identify various viable fuels.
- 9.3.3 Discuss the environmental impact of each fuel source.
- 9.3.4 Discuss emission characteristics of each fuel source.
- 9.3.5 Compare the economic viability of each fuel source depending on the application life cycle.
- 9.3.6 Calculate costs and benefits of various alternative fuels.

**Correlated Mathematics Academic Content Benchmarks**

- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations. (Patterns, Functions and Algebra D, 8-10)*
- *Construct convincing arguments based on analysis of data and interpretation of graphs. (Data Analysis and Probability F, 8-10)*
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators. (Data Analysis and Probability A, 11-12)*
- *Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability. (Data Analysis and Probability B, 11-12)*
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner. (Mathematical Processes H, 8-10)*
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)*

**Correlated Science Academic Content Benchmarks**

- *Predict how human choices today will determine the quality and quantity of life on Earth. (Science and Technology A, 11-12)*

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 9.4 Discuss engine modification related to the use of alternative fuels.**

*TPO: Given an article, discuss engine modification related to the use of alternative fuels, list 5 key points of the article.*

**Descriptors:**

- 9.4.1 Identify the modifications to current vehicles that are required for burning alternative fuels.
- 9.4.2 Discuss idle reduction technology.
- 9.4.3 Discuss safety issues related to various vehicular fuels.

**Correlated Mathematics Academic Content Benchmarks**

- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

**Correlated Science Academic Content Benchmarks**

- *Explain the ways in which the processes of technological design respond to the needs of society.* (Science and Technology A, 9-10)

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 9.5 Discuss future vehicular fuel sources.**

*TPO: Given an article, discuss future vehicular fuel sources, list 3 fuel sources from the article.*

**Descriptor:**

- 9.5.1 Discuss current research in future vehicular fuel sources.
- 9.5.2 Identify costs, benefits and the environmental impact of future vehicular fuel sources.

**Correlated English Language Arts Academic Content Benchmarks**

- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.* (Patterns, Functions and Algebra D, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.* (Data Analysis and Probability A, 11-12)
- *Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.* (Data Analysis and Probability B, 11-12)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)

- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience. (Mathematical Processes I, 11-12)*

**Correlated Science Academic Content Benchmarks**

- *Explain that science and technology are interdependent; each drives the other. (Science and Technology B, 9-10)*
- *Predict how human choices today will determine the quality and quantity of life on Earth. (Science and Technology A, 11-12)*

**Unit 10: Transportation Systems Technical Skills Sets**

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 10.1: Explore the performance skills of an automotive technician.**

*TPO: After textbook and internet research of NATEF skill listings, explore the performance skills of an automotive technician, by choosing at least two skills involving career choices.*

**Descriptors:**

- 10.1.1 Identify the role and function of an automotive technician.
- 10.1.2 Identify the areas of specialization and related occupations.
- 10.1.3 Explore the types of work techniques, processes and procedures a typical automotive technician might be called upon to perform.
- 10.1.4 Describe the education, training and certification required to work as an automotive technician.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)*

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 10.2: Explore the performance skills of a medium and heavy transportation technician.**

*TPO: After internet research of the ASE web site, explore the performance skills of a medium and heavy transportation technician, by listing at least six skills involving medium and heavy transportation technician.*

**Descriptors:**

- 10.2.1 Identify the role and function of a medium and heavy transportation technician.

- 10.2.2 Identify the areas of specialization and related occupations.
- 10.2.3 Explore the types of work techniques, processes and procedures a typical medium and heavy transportation technician might be called upon to perform.
- 10.2.4 Describe the education, training and certification required to work as a medium and heavy transportation technician.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 10.3: Explore the performance skills of a collision repair technician.**

*TPO: After textbook and internet research of I-CAR skill listings, explore the performance skills of a collision repair technician, by choosing at least four skills involving career choices.*

**Descriptors:**

- 10.3.1 Identify the role and function of a collision repair technician.
- 10.3.2 Identify the areas of specialization and related occupations.
- 10.3.3 Explore the types of work techniques, processes and procedures a typical collision repair technician might be called upon to perform.
- 10.3.4 Describe the education, training and certification required to work as a collision repair technician.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 10.4: Explore the performance skills of an aviation maintenance technician.**

*TPO: After internet research of the FAA web site, explore the performance skills of an aviation maintenance technician and list requirements needed for technician licensure.*

**Descriptors:**

- 10.4.1 Identify the role and function of an aviation maintenance technician.
- 10.4.2 Identify the areas of specialization and related occupations.
- 10.4.3 Explore the types of work techniques, processes and procedures a typical aviation maintenance technician might be called upon to perform.

10.4.4 Describe the education, training and certification required to work as an aviation maintenance technician.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 10.5: Explore the performance skills of an aviation technology employee.**

*TPO: Given students knowledge about internet usage, explore the performance skills of an aviation technology employee, with 80% accuracy.*

**Descriptors:**

- 10.5.1 Identify the role and function of an aviation technology employee.
- 10.5.2 Identify the areas of specialization and related occupations.
- 10.5.4 Describe the education, training and certification required to work as an aviation technology employee.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**BIL: Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>
	I	P

**Competency 10.7: Explore the performance skills of a power equipment technician.**

*TPO: Given students knowledge about internet usage, explore the performance skills of a power equipment technician, with 80% accuracy.*

**Descriptors:**

- 10.7.1 Identify the role and function of a power equipment technician.
- 10.7.2 Identify the areas of specialization and related occupations.
- 10.7.3 Explore the types of work techniques, processes and procedures a typical power equipment technician might be called upon to perform.
- 10.7.4 Describe the education, training and certification required to work as a power equipment technician.

**Correlated English Language Arts Academic Content Benchmarks**

*Use appropriate self-monitoring strategies for comprehension.* (Reading Process C, 8-10; Reading Process C, 11-12)

**JUNIOR YEAR  
SCOPE AND SEQUENCE  
AUTOMOTIVE TECHNOLOGY  
CLEVELAND HEIGHTS – UNIVERSITY HEIGHTS  
SCHOOL DISTRICT**

**Orientation to the Automotive Industry**

**CITAC 5.2: Investigate career options**

*TPO: Given students knowledge about internet usage, investigate career options, with 80% accuracy.*

**Key Indicator:**

- 5.2.1 Identify career options, including self-employment and nontraditional careers
- 5.2.2 Identify the range of available career information sources
- 5.2.3 Research knowledge, abilities, and skills needed in each occupation using a variety of resources(e.g., handbooks, career materials, labor market information, computerized career-information delivery systems, and role models/mentors)
- 5.2.4 Select careers that best match interests and aptitudes

**CITAC 5.5: Demonstrate job-keeping skills**

*TPO: Given an assignment, demonstrate job-keeping skills, with 80% accuracy.*

**Key Indicator:**

- 5.5.1 Demonstrate strong communication skills orally, in writing, or via computer
- 5.5.2 Apply basic arithmetic and mathematics skills to job tasks
- 5.5.3 Apply thinking skills to job tasks (including creative thinking, decision making, reasoning, problem solving, and interpretation of information)
- 5.5.4 Apply interpersonal skills in relating to others on the job
- 5.5.5 Identify an awareness of employer expectations for the job
- 5.5.6 Carryout job tasks in accordance with employer expectations
- 5.5.7 Display positive work ethic

**CITAC: 2.1: Competency: Apply basic communication skills**

*TPO: From workbook assignments apply basic communication skills at 80% accuracy.*

**Key Indicators:**

- 2.1.1 Guide communication activities using established rules for grammar, word usage, spelling, and sentence construction.
- 2.1.2 Select communication style appropriate to audience and situation
- 2.1.3 Present messages in a form that assists recipient's understanding (e.g., speak and write clearly and concisely, write legibly)
- 2.1.4 Locate needed information using communications reference tools (e.g., dictionary, thesaurus, style manual, word division guide)
- 2.1.5 Interpret oral, written, and nonverbal messages
- 2.1.6 Follow written and oral instructions
- 2.1.7 Clarify messages received (e.g., through paraphrasing, questioning)

**CITAC: 2.2: Competency: Apply oral communication skills**

*TPO: Given workbook assignments and class grade, apply oral communication skills while grading homework at 80% accuracy.*

**Key indicators:**

- 2.2.1 Apply basic communication skills in communicating orally
- 2.2.2 Use nonverbal techniques to reinforce the intended verbal message
- 2.2.3 Support oral communication with creative attention-getters, analogies, examples, and verbal illustrations, etc.
- 2.2.4 Supplement oral communication with other forms of communication (including graphic, written, artistic)
- 2.2.5 Demonstrate sensitivity to cultural diversity (e.g., accepted variations in distances between speakers, use of eye contact, meaning of gestures; bias-free language)
- 2.2.6 Adjust delivery according to perceived reception

**CITAC: 2.5: Apply listening skills**

*TPO: On all lectures and lab work, apply listening skills for all note-taking, and lab work at 90% accuracy.*

**Key Indicators:**

- 2.5.1 Identify major points of a message (including key information, directions, and specific details)
- 2.5.2 Determine real needs or goals by attending to both verbal and non-verbal messages
- 2.5.3 Differentiate between facts, opinions, and feelings
- 2.5.4 Document message using standard note-taking techniques
- 2.5.5 Overcome communication barriers
- 2.5.6 Clarify communication by rephrasing statements, asking questions, showing empathy, and interpreting both verbal and non-verbal information

### **TCP: 1.1: Define the industry**

*TPO: Using ones notes, define the industry, with 80% accuracy according to industry.*

#### **Key Indicators:**

- 1.1.1 Present an overview of the automotive industry P-1
- 1.1.2 Identify the professional and/or trade associations related to the automotive industry P-1
- 1.1.3 Identify areas of specialization and related occupations within the automotive industry P-1
- 1.1.4 Identify the employment opportunities in the automotive industry P-1

### **CITAC 1.1: Solve problems and make decisions in work-related situations**

*TPO: Given a group activity to complete in a given time, solve problems and make decisions in work-related situations, with 80% accuracy.*

#### **Key Indicator:**

- 1.1.1 Identify factors that influence problem solving and decision making
- 1.1.2 Analyze the source of the problem or the situation requiring a decision
- 1.1.3 Generate possible alternatives

### **CITAC 1.2: Read for information and understanding**

*TPO: Given an article, read for information and understanding, list 5 key points of the article.*

#### **Key Indicator:**

- 1.2.1 Locate needed information in written materials using formatting cues, skimming, and scanning
- 1.2.2 Interpret written information, including manuals, graphs, and schedules
- 1.2.3 Unlock the meaning of unknown or technical vocabulary using standard strategies (e.g. context clues, prefixes, suffixes)
- 1.2.4 Locate key points, main ideas, relevant details, facts, and specifications in written materials
- 1.2.5 Judge the accuracy, appropriateness, style, and plausibility of information, proposals or theories in materials read

### **CITAC 4.5: Competency: Comply with the confidentiality requirements of workplace policies and procedures**

*TPO: Given a repair order with customer information, comply with the confidentiality requirements of workplace policies and procedures, with 100% compliance.*

**Key Indicator:**

- 4.5.1 Identify types of confidential information (including mail and information about personnel, customers, company)
- 4.5.2 Maintain records on the distribution of information using established format and procedures
- 4.5.3 Provide information only to authorized personnel, whether transmitted physically or via technology
- 4.5.4 Inspect returned materials for completeness
- 4.5.5 Identify the consequences of a breach of confidentiality

**CITAC 3.1: Demonstrate technological literacy**

*TPO: Before allowing to operate class room computers, demonstrate technological literacy, with 90% accuracy.*

**Key Indicator:**

- 3.1.1 Demonstrate knowledge of the basic technology systems currently available (e.g., manufacturing technology, organizing and accessing information for technology)
- 3.1.2 Analyze the interplay of technology with social issues, gender issues, ethics, law, and government
- 3.1.3 Identify the uses of technology in industry, education, the political arena, and day-to-day consumer affairs
- 3.1.4 Analyze the benefits and costs of new developments in technology
- 3.1.5 Make decisions about the use of technology that improve performance in the workplace, in school, and in the home

**TCP: 1.2: Determine skills needed to work in the automotive industry**

*TPO: Given a list of skills, determine skills needed to work in the automotive industry, with a 90% identification according to class handout.*

**Key Indicators:**

- 1.2.1 Match automotive occupational job titles with qualifications and responsibilities P-1
- 1.2.2 Identify education and training required to work in the various automotive careers P-1
- 1.2.3 Describe the kinds of work techniques, processes and procedures a typical automotive worker might be called on to perform P-1

**ITAC 4.2: Contribute to teamwork**

*TPO: Presented with a group activity, contribute to teamwork, with 90%.*

**Key Indicators:**

- 4.2.1 Demonstrate sensitivity to cultural, gender, and generational differences (in communication, interpersonal skills, and learning preferences)
- 4.2.2 Demonstrate concern for each team member and for team goals (e.g., provide encouragement, maintain a can-do attitude and common focus)
- 4.2.3 Complete aspects of assigned tasks according to team-established procedures and within specific timelines
- 4.2.4 Employ group process techniques to solve problems, make decisions, build consensus, resolve or manage conflicts, construct compromises, support self-expression, and bring forth new ideas and opinions
- 4.2.5 Evaluate the team's efforts

**CITAC 6.6: Support the provision of first aid in accordance with company policy and procedures**

*TPO: Given a company policy, support the provisions of first aid in accordance with company policy and procedures, list procedures in correct order.*

**Key Indicators:**

- 6.6.1 Identify supplies and equipment needed in emergency situations
- 6.6.2 Locate supplies and equipment needed in emergency situations
- 6.6.3 Follow established procedure for the administration of first aid until official help arrives
- 6.6.4 Analyze the impact of stress throughout an emergency
- 6.6.5 Practice universal precautions during first aid procedures (including those related to blood-borne pathogens, confined spaces, emergency egress, fire safety, and hearing conservation)

**CITAC 6.5: Implement safety procedures and programs**

*TPO: Given a lab setting, implement safety procedures of programs, demonstrating the knowledge of safety rules by walking around the shop to point out unsafe conditions.*

**Key Indicators:**

- 6.5.1 Identify safety requirements
- 6.5.2 Demonstrate knowledge of safety rules and guidelines
- 6.5.3 Interpret safety signs and symbols
- 6.5.4 Demonstrate desirable safety attitudes and habits
- 6.5.5 Use safety equipment in accordance with established procedures
- 6.5.6 Document results of safety procedures and programs

**TCP: 2.1: Use personal safety equipment**

*TPO: Given a display of safety items and supplies students will demonstrate proper application. Use personal safety equipment, with 100% accuracy according to OSHA.*

**Key Indicators:**

- |       |   |     |
|-------|---|-----|
| 2.1.1 | Wear eye and ear protection in accordance with Occupational Safety and Health Administration (OSHA) standards | P-1 |
| 2.1.2 | Wear prescribed foot and hand protection  | P-1 |
| 2.1.3 | Wear clothing in accordance with OSHA standards   | P-1 |
| 2.1.4 | Remove jewelry in accordance with shop policy   | P-1 |
| 2.1.5 | Secure long hair  | P-1 |
| 2.1.6 | Practice established lifting techniques   | P-1 |
| 2.1.7 | Maintain personal protective equipment  | P-1 |

**TCP: 2.2: Respond to fire situations**

*TPO: Given a fire situation, respond to fire situations, with 100% accuracy in accordance with safety.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 2.2.1 | Locate fire exits and alarms   | P-1 |
| 2.2.2 | Follow established evacuation procedures   | P-1 |
| 2.2.3 | Locate fire blankets and first-aid kits  | P-1 |
| 2.2.4 | Identify types of fires  | P-1 |
| 2.2.5 | Demonstrate use of fire extinguishers in accordance with established procedures      | P-1 |
| 2.2.6 | Maintain operability of fire extinguishers in accordance with established procedures | P-1 |
| 2.2.7 | Follow established reporting procedures  | P-1 |

**CITAC 4.3: Choose ethical courses of action in all work assignments and personal interactions**

*TPO: Using information from a lesson on ethics develop a code of ethics; choose ethical courses of action in all work assignments and personal interactions, meeting program standards.*

**Key Indicator:**

- |       |   |
|-------|---|
| 4.3.1 | Establish a personal code of ethics   |
| 4.3.2 | Ensure that personal code of ethics is consistent with the professional code of ethics of the chosen profession |

- 4.3.3 Identify strategies that strengthen desirable character traits (including honesty, integrity, compassion, empathy, justice)
- 4.3.4 Identify consequences of unethical conduct
- 4.3.5 Recognize conflict between personal/professional ethics and the ethics of others
- 4.3.6 Demonstrate awareness of legal responsibilities (e.g., copyright laws, harassment, equity)
- 4.3.7 Identify strategies for responding to the unethical actions of individuals and organizations

**TCP: 2.3: Demonstrate general safety practices**

*TPO: Given the automotive shop safety standards, demonstrate general safety practices, with 100% accuracy for safety.*

**Key Indicators:**

- 2.3.1 Interpret shop safety policies and procedures P-1
- 2.3.2 Comply with shop safety plan P-1
- 2.3.3 Respond to emergencies and injuries in accordance with facility requirements (cardiopulmonary resuscitation, apply basic first aid, etc.) P-1
- 2.3.4 Report injuries to supervisor P-1
- 2.3.5 Complete written safety and injury reports P-1

**CITAC 4.4: Demonstrate the work ethic**

*TPO: Given a lab with assigned positions that relate to automotive, demonstrate the work ethic, with 90% based on industry standards.*

**Key indicator:**

- 4.4.1 Exhibit desirable personal and professional attitudes and behaviors (including positive view of self and work, awareness of impact on others, responsibility, and pride)
- 4.4.2 Exhibit desirable personal and professional work habits and behaviors (including punctuality, regular attendance, quality performance, meeting or exceeding of job expectations, self-motivation, and honesty)
- 4.4.3 Determine own role within the company's mission
- 4.4.4 Participate in required and voluntary professional development to benefit employer and self
- 4.4.5 Improve performance for the benefit of employer and self
- 4.4.6 Display a sense of personal responsibility for the welfare of the company and colleagues (including health, safety, and environmental concerns)

**TCP: 2.4: Maintain safe work environment**

*TPO: Given an automotive shop and supporting references, maintain safe work environment, with 100% accuracy in accordance with safety.*

**Key Indicators:**

2.4.1	Maintain clean work environment	P-1
2.4.2	Follow Environmental Protection Agency (EPA) regulations for air filtering and ventilation of the work environment	P-1
2.4.3	Identify sources of contamination and other hazards	P-1
2.4.4	Contain sources of air-borne contamination and other hazards (e.g., asbestos)	P-1
2.4.5	Follow established safety procedures for the draining, removal and storage of gasoline tanks	P-1
2.4.6	Follow safety rules for handling flammable liquids	P-1
2.4.7	Follow EPA regulations for the storage, use, recycling and disposal of hazardous materials	P-1
2.4.8	Analyze liability associated with hazardous material disposal	P-1
2.4.9	Respond to hazardous chemical spills	P-1
2.4.10	Report unsafe practices and conditions	P-1
2.4.11	Correct unsafe practices and conditions	P-1
2.4.12	Interpret OSHA Right-to-Know law	P-1
2.4.13	Interpret Material Safety Data Sheets (MSDS)	P-1
2.4.14	Identify resources for determining employee's rights to information	P-1

**CITAC 4.2: Contribute to teamwork**

*TPO: Given a lab situation with unsafe conditions, Contribute to teamwork, working in a group developing a list of concerns and resolutions.*

**Key Indicators:**

4.2.2	Demonstrate concern for each team member and for team goals (e.g., provide encouragement, maintain a can-do attitude and common focus)
4.2.3	Complete aspects of assigned tasks according to team-established procedures and within specific timelines
4.2.4	Employ group process techniques to solve problems, make decisions, build consensus, resolve or manage conflicts, construct compromises, support self-expression, and bring forth new ideas

**TCP: 2.5: Protect workers from ergonomic injuries**

*TPO: Recalling from memory and handouts, protect workers from ergonomic injuries, pass a test with 90% accuracy.*

**Key Indicators:**

2.5.1	Identify cause and effect of work practices to prevent ergonomic (operator fatigue, discomfort) injuries	P-1
2.5.2	Identify repetitive motion activities that might cause injuries	P-1

**TCP: 2.6: Access needed information using available references and resources**

*TPO: Provided with books computers and internet, access needed information using available references and resources, with 85% accuracy in compliance with industry.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 2.6.1 | Identify available resources (manufacturers' specifications, videos, computer programs, service bulletins, service manuals, parts manuals, company procedure manuals, manufacturer's toll-free numbers, worldwide web sites and estimating guides) | P-1 |
| 2.6.2 | Identify reference materials and resources appropriate for given task  | P-1 |
| 2.6.3 | Locate needed information within given references and resources  | P-1 |
| 2.6.4 | Interpret reference materials and resources, including text, charts, graphs, schematics, illustrations and tables  | P-1 |

**TCP: 2.8: Provide customer service**

*TPO: Provided with forms and a customer, provide customer service, with 80% accuracy in accordance with industry standards.*

**Key Indicators:**

- |       |   |     |
|-------|---|-----|
| 2.8.1 | Prepare service orders with customer input  | P-1 |
| 2.8.2 | Communicate solutions to customers  | P-1 |
| 2.8.3 | Interpret Vehicle Identification Number (VIN) codes   | P-1 |
| 2.8.4 | Complete service or work orders   | P-1 |
| 2.8.5 | Document services recommended and/or performed  | P-1 |
| 2.8.6 | Ensure readability of documentation (legible writing, accurate spelling, etc.)  | P-1 |
| 2.8.7 | Identify consumer rights resources  | P-1 |
| 2.8.8 | Utilize appropriate vehicle repair protective coverings (i.e., floor mats, fender covers, seat covers, and steering wheel covers) | P-1 |

**CITAC: 2.1: Competency: Apply basic communication skills**

*TPO: Upon completion of the lesson, apply basic communication skills at 90% accuracy.*

**Key Indicators:**

- |        |  |  |
|--------|--|--|
| 2.1.1  | Guide communication activities using established rules for grammar, word usage, spelling, and sentence construction                |  |
| 2.1.8  | Select communication style appropriate to audience and situation   |  |
| 2.1.9  | Present messages in a form that assists recipient's understanding (e.g., speak and write clearly and concisely, and write legibly) |  |
| 2.1.10 | Locate needed information using communications reference tools (e.g.,  |  |

dictionary, thesaurus, style manual, and word division guide)

2.1.11 Interpret oral, written, and nonverbal messages

2.1.12 Follow written and oral instructions

2.1.13 Clarify messages received (e.g., through paraphrasing, and questioning)

**TCP 2.9: Acquire parts**

*TPO: Given a vehicle and a list of parts, acquire parts, with 90% accuracy in accordance with to NATEF guidelines.*

**Key Indicators**

- |       |  |     |
|-------|--|-----|
| 2.9.1 | Collect necessary information (make, model year, and VIN option codes) | P-2 |
| 2.9.2 | Convey information to parts person                                     | P-2 |
| 2.9.3 | Check for price  | P-2 |
| 2.9.4 | Check for availability   | P-2 |
| 2.9.5 | Confirm that the part received is correct                              | P-2 |

**TCP 2.3: Demonstrate general safety**

*TPO: Provided with a automotive shop and given situations, demonstrate general safety, with 100% accuracy to safety standards.*

**Key Indicators**

- |        |  |     |
|--------|--|-----|
| 2.3.6  | Practice established procedures for jacking, lifting, moving and blocking vehicles and shop equipment                                      | P-1 |
| 2.3.7  | Check brakes before moving vehicular equipment   | P-1 |
| 2.3.8  | Demonstrate safe driving practices according to shop procedures  | P-1 |
| 2.3.9  | Practice established safety procedures for using chains and straps   | P-1 |
| 2.3.10 | Maintain hand tools in safe operating condition  | P-1 |
| 2.3.11 | Maintain shop equipment in safe operating condition in accordance with manufacturers'/OSHA specifications                                  | P-1 |
| 2.3.12 | Comply with lock-out/tag-out procedures for defective equipment  | P-1 |
| 2.3.13 | Identify offenses that could result in unsafe working conditions leading to disciplinary actions (horseplay, substance abuse, theft, etc.) | P-1 |

**TCP 3.1: Review vehicle maintenance schedules**

*TPO: Provided with a vehicle and reference material, review vehicle maintenance schedules, with 80% accuracy in accordance with to NATEF guidelines.*

**Key Indicators:**

- |       |                             |     |
|-------|-----------------------------|-----|
| 3.1.1 | Verify mileage              | P-2 |
| 3.1.2 | Verify previous maintenance | P-2 |

3.1.3	Verify maintenance needs	P-2
3.1.4	Prepare estimates	P-2
3.1.5	Communicate to customers the need for and importance of preventive maintenance	P-2

**TCP 2.7: Demonstrate use of basic academic knowledge and tools**

*TPO: Given a set of tools, demonstrate use of basic academic knowledge and tools, with 90% accuracy in accordance with NATF.*

**Key Indicators:**

2.7.1	Perform basic math functions (addition, subtraction, multiplication and division of whole numbers, fractions and decimals)	P-1
2.7.2	Identify tools and their uses	P-1
2.7.3	Select tools appropriate for given task	P-1
2.7.4	Apply metric and English measurement skills	P-1
2.7.5	Measure inside/outside diameters, lift, end-play, run-out and backlash	P-1

**CITAC 6.9: Ensure the quality of products and services**

*TPO: Following directions of a given task, ensure the quality of products and services, with 80% accuracy.*

**Key Indicator:**

- 6.9.1 Identify the importance of individual and organizational productivity in the workplace and how it affects the profitability of the business
- 6.9.2 Determine the quality- and quantity-control standards and procedures required to produce a specific product or provide a specific service
- 6.9.3 Inspect the production of the product or provision of the service to assure quality levels
- 6.9.4 Monitor production of products and provision of services
- 6.9.5 Select equipment and raw materials that will support quality in the process of producing a product or providing a service
- 6.9.6 Interpret quantitative and qualitative records to identify problems and provide a basis for making decisions about the production of products and provision of services
- 6.9.7 Provide appropriate documentation regarding the quality of products and services
- 6.9.8 Identify corrective actions needed to improve the quality of products and services
- 6.9.9 Create new methods for improving the quality of products and services

**ITAC 6.2: Use reference materials to obtain information appropriate to a given problem, topic, or situation**

*TPO: On completion of lesson, use reference materials to obtain information appropriate to a given problem, topic, or situation, with 90%.*

**Key Indicator:**

- 6.2.1 Obtain needed technological and informational reference materials
- 6.2.2 Collect information from selected references
- 6.2.3 Evaluate the validity and reliability of the information obtained
- 6.2.4 Organize information for use in problem solving, decision making, or communications
- 6.2.5 Apply information to workplace situations

**CITAC 6.8: Determine resources needed to produce a given product or provide a Service**

*TPO: Using a given repair on a vehicle, determine resources needed to produce a given product or provide a service, with 80% accuracy.*

**Key Indicator:**

- 6.8.1 Identify the different types of resources involved in the production of a product or provision of a service (e.g., financial, human, material, and equipment)
- 6.8.2 Create a management plan for the allocation of financial resources to meet financial goals
- 6.8.3 Plan for the appropriate allocation and use of materials and equipment
- 6.8.4 Plan for the allocation and use of human resources
- 6.8.5 Plan for the allocation and use of information and technology needed to make and support decisions
- 6.8.6 Plan for the allocation and use of natural resources
- 6.8.7 Plan for the allocation and use of space so as to make the best use of facilities for goal achievement

**Preventive Maintenance**

**TCP 3.2: Inspect and replace as needed vehicle components and systems**

*TPO: Given a vehicle, inspect and replace as needed vehicle components and systems, with 80% accuracy in accordance with to NATEF guidelines.*

**Key Indicators:**

- 3.2.1 Check and repair vehicle warning lights as needed P-1
- 3.2.2 Change oil and filters and lubricate vehicle P-1
- 3.2.3 Flush system; refill system with recommended coolant; bleed system (follow recommended disposal guidelines) P-1
- 3.2.4 Inspect and repair vehicle tires as needed P-1
- 3.2.5 Rotate tires according to manufacturer's recommendations P-1
- 3.2.6 Examine and repair hoses and belts as needed P-1
- 3.2.7 Inspect and repair exhaust system as needed P-1
- 3.2.8 Examine and repair filters (fuel, air, and oil) as needed P-1
- 3.2.9 Inspect and repair brake system as needed P-1

3.2.10	Inspect and repair steering linkages as needed	P-1
3.2.11	Inspect and repair coolant system as needed	P-1
3.2.12	Inspect and repair fluid condition and levels as needed	P-1
3.2.13	Check and repair the presence of leaks as needed	P-1
3.2.14	Examine and repair exterior lights as needed	P-1
3.2.15	Examine and replace seat belts as needed	P-1
3.2.16	Inspect and repair wipers and washers as needed	P-1
3.2.17	Inspect and repair (checking for body damage; wheel cover condition; and integrity of glass, hinges, locks, and handles) exterior and interior condition of vehicle	P-3

#### **TCP 8.4: Perform lubrication and cooling systems diagnosis and repair**

*TPO: Given a vehicle and necessary tools, perform lubrication and cooling systems diagnosis and repair, with 80% to NATEF guidelines.*

##### **Key Indicators:**

8.4.1	Perform oil pressure tests; determine necessary action	P-1
8.4.2	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action	P-2
8.4.3	Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action	P-1
8.4.4	Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment	P-1
8.4.5	Inspect and replace engine cooling and heater system hoses	P-2
8.4.6	Inspect, test, and replace thermostat and housing	P-2
8.4.7	Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required	P-1
8.4.8	Inspect, test, remove, and replace water pump	P-1
8.4.9	Remove and replace radiator	P-2
8.4.10	Inspect, and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams	P-2
8.4.11	Inspect auxiliary oil coolers; determine necessary action	P-3
8.4.12	Inspect, test, and replace oil temperature and pressure switches and sensors	P-2
8.4.13	Perform oil and filter change	P-1

#### **CITAC 1.2: Read for information and understanding**

*TPO: Presented with a reading activity, read for information and understanding, with 80% accuracy.*

##### **Key Indicator:**

- 1.2.1 **Locate needed information in written materials using formatting cues, skimming, and scanning**
- 1.2.2 Interpret written information, including manuals, graphs, and schedules

- 1.2.3 Unlock the meaning of unknown or technical vocabulary using standard strategies (.g. context clues, prefixes, suffixes)
- 1.2.4 Locate key points, main ideas, relevant details, facts, and specifications in written materials
- 1.2.5 Judge the accuracy, appropriateness, style, and plausibility of information, proposals or theories in materials read

**Suspension and Steering\*\***

**TCP 4.5: Perform wheel and tire diagnosis and repair**

*TPO: Given a tire and wheel assembly, perform wheel and tire diagnosis and repair, with 80% to NATEF guidelines.*

**Key Indicators:**

- |        |   |     |
|--------|---|-----|
| 4.5.1  | Diagnose tire wear patterns; determine necessary action                     | P-1 |
| 4.5.2  | Inspect tires; check and adjust air pressure                                | P-1 |
| 4.5.3  | Diagnose wheel/tire vibration, shimmy and noise; determine necessary action | P-2 |
| 4.5.4  | Rotate tires according to manufacturer’s recommendations                    | P-1 |
| 4.5.5  | Measure wheel, tire, axle and hub run-out; determine necessary action       | P-2 |
| 4.5.6  | Diagnose tire pull (lead) problem; determine necessary action               | P-2 |
| 4.5.7  | Balance wheel and tire assembly (static and dynamic)                        | P-1 |
| 4.5.8  | Dismount, inspect, repair and remount tire on wheel                         | P-2 |
| 4.5.9  | Reinstall wheel; torque lugnuts   | P-1 |
| 4.5.10 | Inspect and repair tire   | P-2 |

**CITAC 6.1: Apply self-management processes in the workplace**

*TPO: Using information obtained, apply self-management processes in the workplace, demonstrating with 80% accuracy.*

**Key Indicator:**

- 6.1.1 Develop a system for organizing work
- 6.1.2 Apply time-management skills
- 6.1.3 Apply anger-management skills
- 6.1.4 Apply stress-management skills
- 6.1.5 Arrange work environment based on the principles of ergonomics
- 6.1.6 Maintain a work area conducive to productivity (e.g., neat, orderly)
- 6.1.7 Manage resources to support achievement of goals

**Brakes\*\***

### **TCP 5.1: Perform general brake system diagnosis**

*TPO: Presented with a vehicle or training aid, perform general brake system diagnosis, with 100% accuracy in accordance with NATEF.*

#### **Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 5.1.1 | Identify and interpret brake system concern; determine necessary action  | P-1 |
| 5.1.2 | Research applicable vehicle and service information such as brake system operation, vehicle service history, service precautions and technical service bulletins | P-1 |
| 5.1.3 | Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals)                                  | P-1 |

### **TCP 5.2: Perform hydraulic system diagnosis and repair**

*TPO: Given a vehicle or training aid, perform hydraulic system diagnosis and repair, with 100% in compliance with safety.*

#### **Key Indicators:**

- |        |  |     |
|--------|--|-----|
| 5.2.1  | Diagnosis pressure concerns in the brake system using hydraulic principles (Pascal's Law)  | P-1 |
| 5.2.2  | Measure and adjust pedal height  | P-2 |
| 5.2.3  | Check master cylinder for internal and external leaks and proper operation; determine necessary action   | P-2 |
| 5.2.4  | Remove, bench bleed and reinstall master cylinder  | P-1 |
| 5.2.5  | Diagnose poor stopping, pulling or dragging concerns caused by problems in the hydraulic system; determine necessary action  | P-1 |
| 5.2.6  | Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, or wear; tighten loose fittings and supports; determine necessary action | P-2 |
| 5.2.7  | Fabricate and install brake lines (double flare and ISO types); replace hoses, fittings and supports as needed   | P-2 |
| 5.2.8  | Select, handle, store and install brake fluids to proper level   | P-1 |
| 5.2.9  | Inspect, test, and replace metering (hold-off), proportioning (balance), pressure differential and combination valves  | P-2 |
| 5.2.10 | Inspect, test, replace and adjust height (load) sensing proportioning valve  | P-3 |
| 5.2.11 | Inspect, test, and replace components of brake warning light system  | P-3 |
| 5.2.12 | Bleed (manual, pressure, vacuum, or surge) brake system  | P-1 |
| 5.2.13 | Flush hydraulic system   | P-3 |

### **TCP 5.3: Perform drum brake diagnosis and repair**

*TPO: Given a training aid or shop car, perform drum brake diagnosis and repair, with 100% in compliance with safety and NATEF.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 5.3.1 | Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action   | P-1 |
| 5.3.2 | Remove, clean (using proper safety procedures), inspect, and measure brake drums; service or replace as needed   | P-1 |
| 5.3.3 | Refinish brake drum  | P-1 |
| 5.3.4 | Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble | P-1 |
| 5.3.5 | Remove, inspect and install wheel cylinders  | P-2 |
| 5.3.6 | Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings   | P-1 |
| 5.3.7 | Install wheel, torque lug nuts and make final checks and adjustments   | P-1 |

**TCP 5.5: Perform power assist unit diagnosis and repair**

*TPO: Given a training aid or shop car, perform power assist unit diagnosis and repair, with 90% accuracy in accordance with NATEF.*

**Key Indicators:**

- |       |   |     |
|-------|---|-----|
| 5.5.1 | Test pedal free travel with and without engine running; check power assist operation  | P-2 |
| 5.5.2 | Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster   | P-2 |
| 5.5.3 | Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action | P-2 |

**TCP 5.4: Perform disc brake diagnosis and repair**

*TPO: Given a training aid or shop vehicle with disc brake system, perform disc brake diagnosis and repair, with 100% accuracy in accordance with NATEF and safety.*

**Key Indicators:**

- |       |   |     |
|-------|---|-----|
| 5.4.1 | Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action            | P-1 |
| 5.4.2 | Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action | P-1 |
| 5.4.3 | Clean and inspect caliper mounting and slides for wear and damage; determine necessary action                                 | P-1 |
| 5.4.4 | Remove, clean and inspect pads and retaining hardware; determine necessary action   | P-1 |

5.4.5	Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring and damage; replace seal, boot and damaged or worn parts	P-2
5.4.6	Reassemble, lubricate and reinstall caliper, pads and related hardware; seat pads and inspect for leaks	P-1
5.4.7	Clean inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace	P-1
5.4.8	Remove and reinstall rotor	P-1
5.4.9	Refinish rotor according to manufacturers' recommendations	P-1
5.4.10	Adjust calipers with integrated parking brake system	P-3
5.4.11	Install wheel, torque lug nuts and make final checks and adjustments	P-1

**CITAC 1.8: Utilize scheduling techniques to ensure that jobs are completed by the stated due date**

*TPO: Following procedure, utilize scheduling techniques to ensure that jobs are completed by the stated due date, with 80% accuracy.*

**Key Indicator:**

- 1.8.1 Develop schedules for equipment maintenance
- 1.8.2 Develop schedules for materials production, handling, and distribution
- 1.8.3 Develop meeting schedules
- 1.8.4 Distribute schedules to all concerned personnel
- 1.8.5 Implement schedules as planned
- 1.8.6 Make changes in schedules as appropriate

**Electrical and Electronic Systems\*\***

**TCP 6.2: Perform battery diagnosis and service**

*TPO: Provided with a battery and test equipment using shop references, perform battery diagnosis and service, with 90% accuracy in accordance with NATEF.*

**Key Indicators:**

6.2.1	Perform battery state-of-charge test; determine needed service	P-1
6.2.2	Perform battery capacity test; confirm proper battery capacity for vehicle application; determine needed service	P-1
6.2.3	Maintain or restore electronic memory functions	P-1
6.2.5	Perform slow/fast battery charge	P-2
6.2.6	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed	P-2
6.2.7	Start a vehicle using jumper cables and a battery or auxiliary power supply	P-1

**TCP 6.1: Diagnose general electrical systems**

*TPO: Providing electrical circuits and test equipment, diagnose general electrical systems, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

6.1.1	Identify and interpret electrical/electronic system concern; determine necessary action	P-1
6.1.2	Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins	P-1
6.1.3	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals)	P-1
6.1.4	Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law)	P-1
6.1.5	Use wiring diagrams during diagnosis of electrical circuit problems	P-1
6.1.6	Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems	P-1
6.1.7	Check electrical circuits with a test light; determine necessary action	P-2
6.1.8	Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action	P-1
6.1.9	Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action	P-1
6.1.10	Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action	P-1
6.1.11	Check electrical circuits using jumper wires; determine necessary action	P-2
6.1.12	Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action	P-1
6.1.13	Measure and diagnose the cause(s) of abnormal key-off battery drain; determine necessary action	P-1
6.1.14	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action	P-1
6.1.15	Inspect and test switches, connectors, relays, and wires of electrical/electronic circuits; perform necessary action	P-1
6.1.16	Repair wiring harnesses and connectors	P-1
6.1.17	Perform solder repair of electrical wiring	P-1

**TCP 6.3: Perform starting system diagnosis and repair**

*TPO: Given a starter circuit and test equipment, perform starting system diagnosis and repair, filling out diagnostic sheet with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

6.3.1	Perform starter current draw tests; determine necessary action	P-1
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6.3.2	Perform starter circuit voltage drop tests; determine necessary action	P-1
6.3.3	Inspect and test starter relays and solenoids; replace as needed	P-2
6.3.4	Remove and install starter in a vehicle	P-1
6.3.5	Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action	P-2
6.3.6	Differentiate between electrical and engine mechanical problems that cause a slow-crank or no crank condition	P-2

**TCP 6.4: Perform charging system diagnosis and repair**

*TPO: Given a vehicle and charging system test equipment, perform charging system diagnosis and repair, filling out a performance sheet with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

6.4.1	Perform charging system output test; determine necessary action	P-1
6.4.2	Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions	P-1
6.4.3	Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment	P-2
6.4.4	Remove, inspect, and install generator (alternator)	P-1
6.4.5	Perform charging circuit voltage drop tests; determine necessary action	P-1

**TCP 6.5: Perform lighting systems diagnosis and repair**

*TPO: Providing a vehicle with lighting problems, perform lighting systems diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

6.5.1	Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action	P-1
6.5.2	Inspect, replace, and aim headlights and bulbs	P-2
6.5.3	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action	P-2

**Brakes\*\***

**TCP 5.6: Perform miscellaneous (i.e., wheel bearings, parking brakes, electrical) diagnosis and repair**

*TPO: Provide with a vehicle and related problems, perform miscellaneous (i.e., wheel bearings, parking brakes, electrical) diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

5.6.1	Diagnose wheel bearing noises, wheel shimmy and vibration concerns; determine necessary action	P-1
5.6.2	Remove, clean, inspect, repack and install wheel bearings and replace seals; install hub and adjust wheel bearings	P-1
5.6.3	Check parking brake cables and components for wear, rusting, binding and corrosion; clean, lubricate and replace as needed	P-2
5.6.4	Check parking brake operation; adjust as needed	P-1
5.6.5	Check operation of parking brake indicator light system	P-3
5.6.6	Check operation of brake stop light system; determine necessary action	P-1
5.6.7	Replace wheel bearing and race	P-1
5.6.8	Inspect and replace wheel studs	P-1
5.6.9	Remove and reinstall sealed wheel bearing assembly	P-2

**TCP 5.7: Repair anti-lock brake systems**

*TPO: Given a training aid or a vehicle, repair anti-lock brake systems, with 90% accuracy in accordance with NATEF.*

**Key Indicators:**

5.7.1	Inspect and test Anti-lock Brake System (ABS) components; determine necessary action	P-1
5.7.2	Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the ABS; determine necessary action	P-2
5.7.3	Diagnose ABS electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action	P-1
5.7.4	Depressurize high-pressure components of the ABS	P-3
5.7.5	Bleed the ABS front and rear hydraulic circuits	P-2
5.7.6	Remove and install ABS electrical/electronic and hydraulic components	P-3
5.7.7	Test, diagnose and service ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (GMM/digital storage oscilloscope (DSO) includes output signal, resistance, short to voltage/ground and frequency data)	P-1
5.7.8	Diagnose ABS braking concerns caused by vehicle modifications (i.e., tire size, curb height, final drive ratio)	P-3
5.7.9	Identify traction control system components	P-3

**Electrical and Electronic Systems\*\*****TCP 6.6: Repair gauges, warning devices, and driver information systems**

*TPO: Given a training aid and test equipment, repair gauges, warning devices, and driver information systems, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

**Diagnosis and Repair**

- |       |  |     |
|-------|--|-----|
| 6.6.1 | Inspect and test gauges and gauge sending units for cause of intermittent, high, low, or no gauge readings; determine necessary action | P-1 |
| 6.6.2 | Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action                           | P-3 |
| 6.6.3 | Diagnose the cause of incorrect operation or warning devices and other driver information systems; determine necessary action          | P-1 |
| 6.6.4 | Inspect and test sensors, connectors, and wires of electronic instrument circuits; determine necessary action                          | P-2 |

**Suspension and Steering\*\***

**TCP 4.1: Perform general suspension and steering systems diagnosis**

*TPO: Provided with a vehicle and shop reference materials, perform general suspension and steering systems diagnosis, listing and sorting concerns with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 4.1.1 | Identify and interpret suspension and steering concern; determine necessary action   | P-1 |
| 4.1.2 | Research applicable vehicle and service information such as suspension and steering system operation, vehicle service history, service precautions and technical bulletins | P-1 |
| 4.1.3 | Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals)  | P-1 |

**TCP 4.2: Perform steering systems diagnosis and repair**

*TPO: Given a vehicle with related problems using shop references, perform steering systems diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 4.2.1 | Disable and enable Supplemental Restraint System (SRS) in accordance with manufacturer's procedures  | P-1 |
| 4.2.3 | Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action   | P-1 |
| 4.2.4 | Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering and fluid leakage concerns; determine necessary action | P-2 |
| 4.2.5 | Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action    | P-2 |

4.2.6	Inspect steering shaft universal-joints(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action	P-3
4.2.8	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets	P-2
4.2.9	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots	P-3
4.2.10	Inspect power steering fluid levels and condition	P-1
4.2.11	Flush, fill and bleed power steering system	P-1
4.2.12	Diagnose power steering fluid leakage; determine necessary action	P-1
4.2.13	Remove, inspect, replace and adjust power steering pump belt	P-2
4.2.16	Inspect and replace power steering hoses and fittings	P-2
4.2.17	Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings and steering linkage damper	P-1
4.2.18	Inspect, replace and adjust tie rod ends (sockets), tie rod sleeves and clamps	P-3

**TCP 4.3: Perform suspension systems diagnosis and repair**

*TPO: Given a vehicle with related problems using shop references, perform suspension systems diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

**Front Suspension**

4.3.1	Diagnose short and long arm suspension system noises, body sway and uneven riding height concerns; determine necessary action	P-1
4.3.2	Diagnose strut suspension system noises, body sway and uneven riding height concerns; determine necessary action	P-1
4.3.3	Remove, inspect, and install upper and lower control arms, bushings, shafts and rebound bumpers	P-3
4.3.4	Remove, inspect, install and adjust strut (compression/tension) rods and bushings	P-2
4.3.5	Remove, inspect and install upper and lower ball joints on short and long arm suspension systems	P-2
4.3.6	Remove, inspect and install steering knuckle assemblies	P-2
4.3.7	Remove, inspect, and install short and long arm suspension system coil springs and spring insulators	P-2
4.3.8	Remove, inspect, install and adjust suspension system torsion bars; inspect mounts	P-3
4.3.9	Remove, inspect and install stabilizer bar bushings, brackets and links	P-2
4.3.10	Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulator (silencers) and upper strut bearing mount	P-1
4.3.11	Lubricate suspension and steering systems	P-2

## **Rear Suspension**

- |        |  |     |
|--------|--|-----|
| 4.3.12 | Remove, inspect and install coil springs and spring insulators   | P-2 |
| 4.3.13 | Remove, inspect, and install transverse links, control arms, bushings and mounts                                       | P-2 |
| 4.3.14 | Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings and mounts | P-3 |
| 4.3.15 | Remove, inspect, and install strut cartridge or assembly, strut coil spring and insulators (silencers)                 | P-2 |
| 4.3.16 | Inspect, remove and replace shock absorbers  | P-1 |
| 4.3.17 | Remove, inspect and service or replace front and rear wheel bearings   | P-1 |

## **TCP 4.4: Perform wheel alignment diagnosis, adjustment and repair**

*TPO: Provide with alignment equipment and a vehicle, perform wheel alignment diagnosis, adjustment and repair, printing out results with 80% accuracy in accordance with NATEF.*

### **Key Indicators:**

- |        |   |     |
|--------|---|-----|
| 4.4.1  | Differentiate between steering and suspension concerns using principles of steering geometry (caste, camber, toe, etc.)                               | P-1 |
| 4.4.2  | Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action | P-1 |
| 4.4.3  | Perform prealignment inspection; perform necessary action   | P-1 |
| 4.4.4  | Measure vehicle riding height; determine necessary action   | P-1 |
| 4.4.5  | Check and adjust front and rear wheel camber; perform necessary action  | P-1 |
| 4.4.6  | Check and adjust caster; perform necessary action   | P-1 |
| 4.4.7  | Check and adjust front wheel toe; adjust as needed  | P-1 |
| 4.4.8  | Center steering wheel   | P-1 |
| 4.4.9  | Check toe-out-on-turns (turning radius); determine necessary action   | P-2 |
| 4.4.10 | Check steering axis inclination (SAI) and included angle; determine necessary action  | P-2 |
| 4.4.11 | Check and adjust rear wheel toe   | P-2 |
| 4.4.12 | Check rear wheel thrust angle; determine necessary action   | P-2 |
| 4.4.13 | Check for front wheel setback; determine necessary action   | P-2 |

## **CITAC 5.1: Identify how personal interests, abilities, and skills relate to choosing a career**

*TPO: After completion of the first year in the program, identify how personal interests, abilities, and skills relate to choosing a career, by listing the information about your career choice.*

### **Key Indicator:**

- |       |                                       |
|-------|---------------------------------------|
| 5.1.1 | Determine own interests and aptitudes |
|-------|---------------------------------------|

- 5.1.2 Relate personal interests to academic and occupational skills
- 5.1.3 Identify impact of abilities and skills on career development
- 5.1.4 Identify how self-knowledge relates to making career choices

**CITAC 5.3: Chart career using career-planning skills**

*TPO: Using information gathered, chart career using career-planning skills, by creating a career plan.*

**Key Indicator:**

- 5.3.1 Demonstrate use of career information
- 5.3.2 Identify elements of career planning
- 5.3.3 Summarize the educational requirements of various occupations
- 5.3.4 Identify skills that apply to a variety of occupations
- 5.3.5 Identify challenges that may interfere with individual career plan (e.g., gender issues, misinformation, expectations of others, and conditions of labor market)
- 5.3.6 Identify short-term and long-term goals for achieving career plan
- 5.3.7 Develop a career plan
- 5.3.8 Showcase interests, aptitudes, and skills utilizing a portfolio
- 5.3.8 Annually review/revise the individual career plan

**SENIOR YEAR  
SCOPE AND SEQUENCE  
AUTOMOTIVE TECHNOLOGY  
CLEVELAND HEIGHTS – UNIVERSITY HEIGHTS  
SCHOOL DISTRICT**

**Engine Repair (Optional Unit)**

**TCP 8.1: Perform general engine diagnosis; removal and reinstallation (R&R)**

*TPO: Provided with a late model vehicle, perform general engine diagnosis; removal and reinstallation (R&R), with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

- |        |  |     |
|--------|--|-----|
| 8.1.1  | Identify and interpret engine concern; determine necessary action  | P-1 |
| 8.1.2  | Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions and technical service bulletins   | P-1 |
| 8.1.3  | Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels and calibration decals)                                     | P-1 |
| 8.1.4  | Inspect engine assembly for fuel, oil, coolant and other leaks; determine necessary action   | P-1 |
| 8.1.5  | Diagnose engine noises and vibrations; determine necessary action  | P-2 |
| 8.1.6  | Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action   | P-2 |
| 8.1.7  | Perform engine vacuum tests; determine necessary action  | P-1 |
| 8.1.8  | Perform cylinder power balance tests; determine necessary action   | P-1 |
| 8.1.9  | Perform cylinder compression tests; determine necessary action   | P-1 |
| 8.1.10 | Perform cylinder leakage tests; determine necessary action   | P-1 |
| 8.1.11 | Remove and install engine in a late model front-wheel drive vehicle (OBDDI or newer); reconnect all attaching components and restore the vehicle to running condition  | P-1 |
| 8.1.12 | Remove and reinstall engine in a late model rear-wheel drive vehicle (OBDDI or newer); reconnect all attaching components and restore the vehicle to running condition | P-3 |

**TCP 8.2: Perform cylinder head and valve train diagnosis and repair**

*TPO: Given a cylinder head, perform cylinder head and valve train diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

8.2.1	Remove cylinder head(s); visually inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition	P-2
8.2.2	Install cylinder heads and gaskets; tighten according to manufacturers' specifications and procedures	P-1
8.2.3	Inspect and test valve springs for squareness, pressure, and free height comparison; determine necessary action	P-2
8.2.4	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks, and valve groves; determine necessary action	P-2
8.2.5	Inspect valve guides for wear; check valve and stem-to-guide clearance; determine necessary action	P-3
8.2.6	Inspect valves and valve seats; determine necessary action	P-3
8.2.7	Check valve face-to-seat contact and valve seat concentricity (runout); determine necessary action	P-3
8.2.8	Check valve spring assembled height and valve stem height; determine necessary action	P-3
8.2.9	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action	P-2
8.2.10	Inspect hydraulic or mechanical lifters; determine necessary action	P-2
8.2.11	Adjust valves (mechanical or hydraulic lifters)	P-1
8.2.12	Inspect camshaft drives (including gear wear and backlash, sprocket and chain wear); determine necessary action	P-2
8.2.13	Inspect and replace timing belts (chains), overhead camdrive sprockets, and tensioners; check belt tension; adjust as necessary	P-1
8.2.14	Inspect camshaft for runout, journal wear and lobe wear	P-2
8.2.15	Inspect camshaft-bearing surface for wear, damage, out-of-round and alignment; determine necessary action	P-3
8.2.16	Establish camshaft(s) timing and cam sensor indexing according to manufacturers' specifications and procedures	P-1

**TCP 8.3: Perform engine block assembly diagnosis and repair**

*TPO: Given an engine long block, perform engine block assembly diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

8.3.1	Disassemble engine block; clean and prepare components for inspection and reassembly	P-2
8.3.2	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action	P-2
8.3.3	Inspect internal and external threads; restore as needed (includes installing thread inserts)	P-2

8.3.4	Inspect and measure cylinder walls for damage, wear, and ridges; determine necessary action	P-2
8.3.5	Deglaze and clean cylinder walls	P-2
8.3.6	Inspect and measure camshaft bearing for wear, damage, out-of-round, and alignment; determine necessary action	P-3
8.3.7	Inspect crankshaft for end play, straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition, measure journal wear; check crankshaft sensor reluctor ring (where applicable); determine necessary action	P-2
8.3.8	Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selection of bearings)	P-2
8.3.9	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore problems; inspect rod alignment and bearing bore condition	P-3
8.3.10	Inspect and measure pistons; determine necessary action	
8.3.11	Remove and replace piston pin	P-3
8.3.12	Inspect, measure, and install piston rings	P-1
8.3.13	Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); insp	P-2
	ect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time	
8.3.14	Inspect or replace crankshaft vibration damper (harmonic balancer)	P-3
8.3.15	Assemble the engine using gaskets, seals, and formed-in-place (tube-applied) sealants, thread sealers, etc. according to manufacturer's specifications	P-2

## **Unit 7: Engine Performance\*\***

### **TCP 7.1: Perform general engine diagnosis**

*TPO: Given a running vehicle, perform general engine diagnosis, with 80% accuracy in accordance with NATEF.*

#### **Key Indicators:**

7.1.1	Identify and interpret an engine performance concern; determine necessary action	P-1
7.1.2	Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins	P-1
7.1.3	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals)	P-1
7.1.4	Inspect engine assembly for fuel, oil, coolant and other leaks; determine necessary action	P-2

7.1.5	Diagnose abnormal engine noise or vibration concerns; determine necessary action	P-2
7.1.6	Diagnose unusual exhaust color, odor, and sound; determine necessary action	P-2
7.1.7	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action	P-1
7.1.8	Perform cylinder power balance test; determine necessary action	P-1
7.1.9	Perform cylinder compression test; determine necessary action	P-1
7.1.1	Perform cylinder leakage test; determine necessary action	P-1
7.1.11	Diagnose engine mechanical, electrical, electronic, fuel and ignition concerns with oscilloscope and engine diagnostic equipment; determine necessary action	P-1
7.1.12	Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings and determine necessary action	P-1
7.1.13	Verify engine operating temperature; determine necessary action	P-1
7.1.14	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank and hoses; perform necessary action	P-1
7.1.15	Verify correct camshaft timing	P-2

**TCP 7.2: Perform computerized engine controls diagnosis and repair**

*TPO: Given a computer scan tool and a vehicle, perform computerized engine controls diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

7.2.1	Retrieve and record stored OBD I diagnostic trouble codes; clear codes	P-2
7.2.2	Retrieve and record stored OBD II diagnostic trouble codes; clear codes	P-1
7.2.3	Diagnose the causes of emissions or drivability concerns resulting from failure of computerized engine controls with stored diagnostic trouble codes	P-1
7.2.4	Diagnose emissions or drivability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes; determine necessary action	P-1
7.2.5	Check for module communication errors using a scan tool	P-2
7.2.6	Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action	P-1
7.2.7	Obtain and interpret scan tool data	P-1
7.2.8	Access and use service information to perform step-by-step diagnosis	P-1
7.2.9	Diagnose drivability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, and similar systems); determine necessary action	P-2

### **TCP 7.3: Perform ignition system diagnosis and repair**

*TPO: Given a vehicle with electronic ignition, perform ignition system diagnosis and repair, with 80% accuracy in accordance with NATEF.*

#### **Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 7.3.1 | Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributorless) systems; determine necessary action | P-1 |
| 7.3.2 | Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action             | P-1 |
| 7.3.3 | Inspect and test ignition primary circuit wiring and components; perform necessary action  | P-2 |
| 7.3.4 | Inspect and test distributor; perform necessary action   | P-3 |
| 7.3.5 | Inspect and test ignition system secondary circuit wiring and components; perform necessary action   | P-2 |
| 7.3.6 | Inspect and test ignition coil(s); perform necessary action  | P-1 |
| 7.3.7 | Check and adjust (where applicable) ignition system timing and timing advance/retard   | P-1 |
| 7.3.8 | Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action  | P-2 |

### **TCP 7.4: Perform fuel, air induction and exhaust systems diagnosis and repair**

*TPO: Given a running engine and test equipment, perform fuel, air induction and exhaust systems diagnosis and repair, with 80% accuracy in accordance with NATEF.*

#### **Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 7.4.1 | Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with carburetor-type fuel systems; determine necessary action | P-3 |
| 7.4.2 | Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determine necessary action  | P-1 |
| 7.4.3 | Check fuel for contaminants and quality; determine necessary action  | P-3 |
| 7.4.4 | Inspect and test mechanical and electrical fuel pumps and pump control systems; perform necessary action   | P-2 |
| 7.4.5 | Replace fuel filters   | P-1 |
| 7.4.6 | Inspect and test cold enrichment system and components; perform necessary  | P-3 |

	action	
7.4.7	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air	P-2
7.4.8	Inspect, test, and clean fuel injectors	P-2
7.4.9	Check idle speed and fuel mixture	P-3
7.4.10	Adjust idle speed and fuel mixture	P-3
7.4.11	Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action	P-2
7.4.12	Perform exhaust system back-pressure test; determine necessary action	P-1
7.4.13	Test the operation of turbocharger/supercharger systems; determine necessary action	P-3

**TCP 7.5: Perform emissions control systems diagnosis and repair**

*TPO: Given a shop vehicle, perform emissions control systems diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

**Positive crankcase ventilation**

7.5.1	Diagnose oil leaks, emissions, and drivability problems resulting from failure of the positive crankcase ventilation (PCV) system; determine necessary action	P-2
7.5.2	Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action	P-2

**Exhaust gas recirculation**

7.5.3	Diagnose emissions and drivability problems caused by failure of the exhaust gas recirculation (EGR) system; determine necessary action	P-1
7.5.4	Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action	P-2
7.5.5	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action	P-2

**Exhaust gas treatment**

7.5.6	Diagnose emissions and drivability problems resulting from failure of the secondary air injection and catalytic converter systems; determine necessary action	P-2
7.5.7	Inspect and test mechanical components of secondary air injection systems; perform necessary action	P-3
7.5.8	Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action	P-3

7.5.9 Inspect and test catalytic converter performance P-1

### **Intake air temperature controls**

7.5.10 Diagnose emissions and drivability problems resulting from failure of the intake air temperature control system; determine necessary action P-3

7.5.11 Inspect and test components of intake air temperature control system; perform necessary action P-3

### **Early fuel evaporation (intake manifold temperature) controls**

7.5.12 Diagnose emissions and drivability problems resulting from failure of early fuel evaporation control system; determine necessary action P-3

7.5.13 Inspect and test components of early fuel evaporation control system; perform necessary action P-3

### **Evaporative emissions controls**

7.5.14 Diagnose emissions and drivability problems resulting from failure of evaporative emissions control system; determine necessary action P-1

7.5.15 Inspect and test components and hoses of evaporative emissions control system; perform necessary action P-1

7.5.16 Interpret evaporative emission related diagnostic trouble codes (DTCs); determine necessary action P-1

## **TCP 7.6: Perform engine-related service**

*TPO: Provided with a vehicle, Perform engine-related service, with 80% accuracy in accordance with NATEF.*

### **Key Indicators:**

7.6.1 Adjust valves on engines with mechanical or hydraulic lifters P-1

7.6.2 Remove and replace timing belt; verify correct camshaft timing P-1

7.6.3 Remove and replace thermostat P-2

7.6.4 Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action P-2

## **TCP 6.7: Perform horn and wiper/washer diagnosis and repair**

*TPO: Given an electrical circuit board, perform horn and wiper/washer diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 6.7.1 | Diagnose incorrect horn operation; perform necessary action  | P-2 |
| 6.7.2 | Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action | P-2 |
| 6.7.3 | Diagnose incorrect windshield washer operation; perform necessary action                                     | P-2 |

**TCP 6.8: Perform accessories diagnosis and repair**

*TPO: Given a vehicle and electrical circuits diagrams, perform accessories diagnosis and repair.*

**Key Indicators:**

- |        |  |     |
|--------|--|-----|
| 6.8.1  | Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action  | P-2 |
| 6.8.2  | Diagnose incorrect heated glass operation; determine necessary action  | P-3 |
| 6.8.3  | Diagnose incorrect electric lock operation; determine necessary action   | P-3 |
| 6.8.4  | Diagnose incorrect operation of cruise control systems; repair as needed   | P-3 |
| 6.8.5  | Diagnose supplemental restraint system (SRS) concerns; determine necessary action (Note: Follow manufacturer's safety procedures to prevent accidental deployment) | P-2 |
| 6.8.6  | Disarm and enable the airbag system for vehicle service  | P-1 |
| 6.8.7  | Diagnose radio static and weak, intermittent or no radio reception; determine necessary action   | P-3 |
| 6.8.8  | Remove and reinstall door panel  | P-1 |
| 6.8.9  | Diagnose body electronic system circuits using a scan tool; determine necessary action   | P-2 |
| 6.8.10 | Check for module communication errors using a scan tool  | P-3 |
| 6.8.11 | Diagnose the cause of false, intermittent or no operation of anti-theft system   | P-2 |

**Unit 9: Automatic Transmission and Transaxle (Optional Unit)****TCP 9.1: Perform general transmission and transaxle diagnosis**

*TPO: Given a vehicle with an automatic transmission, perform general transmission and transaxle diagnosis, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

- |       |  |     |
|-------|--|-----|
| 9.1.1 | Identify and interpret transmission concerns; assure proper engine operation using scan tool; determine necessary action               | P-1 |
| 9.1.2 | Research applicable vehicle and service information, such as transmission/transaxle system operation, vehicle service history, service | P-1 |

	precautions and technical service bulletins	
9.1.3	Locate and interpret vehicle and mayor component identification numbers (VIN, vehicle certification labels and calibration decals)	P-1
9.1.4	Diagnose fluid usage, level and condition concerns; determine necessary action	P-1
9.1.5	Perform pressure tests; determine necessary action	P-1
9.1.6	Perform stall test; determine necessary action	P-2
9.1.7	Perform lock-up converter system tests; determine necessary action	P-1
9.1.8	Diagnose electronic, mechanical, hydraulic, vacuum control system concerns; determine necessary action	P-1
9.1.9	Diagnose noise and vibration concerns; determine necessary action	P-2
9.1.10	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven and held member (power flow) principles	P-1

**TCP 9.2: Perform transmission and transaxle maintenance and adjustment**

*TPO: Given a vehicle with an automatic transmission, perform transmission and transaxle maintenance and adjustment, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

9.2.1	Inspect, adjust, or replace throttle (TV) linkages or cables, manual shift linkages or cables; transmission range sensor; check gear select indicator (as applicable)	P-1
9.2.2	Service transmission; perform visual inspection; replace fluids and filters	P-1

**TCP 9.3: Perform in-vehicle transmission and transaxle repair**

*TPO: Given a lab setting and a vehicle with a automatic transmission, perform in-vehicle transmission and transaxle repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

9.3.1	Inspect, adjust, or replace (as applicable) vacuum modulator; inspect and repair or replace lines and hoses	P-3
9.3.2	Inspect, repair, and replace governor assembly	P-3
9.3.3	Inspect and replace external seals and gaskets	P-2
9.3.4	Inspect extension housing, bushings and seals; perform necessary action	P-3
9.3.5	Inspect, leak test, flush, and replace cooler, lines, and fittings	P-2
9.3.6	Inspect and replace speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers	P-2
9.3.7	Diagnose electronic transmission control systems using a scan tool; determine necessary action	P-1
9.3.8	Inspect, replace, and align transmission mounts	P-1
9.3.9	Inspect, replace and align powertrain mounts	P-3

## **TCP 9.4: Perform off-vehicle transmission and transaxle repair**

*TPO: Given a transmission in a lab setting, Perform off-vehicle transmission and transaxle repair, with 80% accuracy in accordance with NATEF.*

### **Key Indicators:**

#### **Removal, disassembly, and reinstallation**

- |       |  |     |
|-------|--|-----|
| 9.4.1 | Remove and reinstall transmission and torque converter (rear-wheel drive)  | P-2 |
| 9.4.2 | Remove and reinstall transaxle and torque converter assembly   | P-1 |
| 9.4.3 | Disassemble, clean, and inspect transmission/transaxle   | P-1 |
| 9.4.4 | Inspect, measure, clean, and replace valve body (includes surfaces and bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets) | P-2 |
| 9.4.5 | Inspect servo bore, piston, seals, pin, spring, and retainers; determine necessary action  | P-3 |
| 9.4.6 | Inspect accumulator bore, piston, seals, spring, and retainer; determine necessary action  | P-3 |
| 9.4.7 | Assemble transmission/transaxle  | P-1 |

#### **Oil pump and converter**

- |        |  |     |
|--------|--|-----|
| 9.4.8  | Inspect converter flex plate, attaching parts, pilot, and pump drive, and seal areas | P-2 |
| 9.4.9  | Measure torque converter endplay and check for interference; check stator clutch     | P-2 |
| 9.4.10 | Inspect, measure, and replace oil pump assembly and components                       | P-3 |
| 9.4.11 | Check torque converter and transmission cooling system for contamination             | P-1 |

#### **Gear train, shafts, bushings and case**

- |        |   |     |
|--------|---|-----|
| 9.4.12 | Measure endplay or preload; determine necessary action  | P-1 |
| 9.4.13 | Inspect oil delivery seal rings, ring grooves, and sealing surface areas  | P-2 |
| 9.4.14 | Inspect oil delivery seal rings, ring grooves, and sealing surface areas  | P-2 |
| 9.4.15 | Inspect bushings; replace as needed   | P-2 |
| 9.4.16 | Inspect and measure planetary gear assembly (includes sun, ring gear, thrust washers, planetary gears, and carrier assembly); replace as needed | P-2 |
| 9.4.17 | Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action  | P-2 |
| 9.4.18 | Inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action  | P-2 |
| 9.4.19 | Inspect, measure, repair, adjust, or replace transaxle final drive components   | P-2 |
| 9.4.20 | Inspect and reinstall parking pawl, shaft, spring, and retainer; determine necessary action   | P-3 |

#### **Friction and reaction units**

- |        |   |     |
|--------|---|-----|
| 9.4.21 | Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; determine necessary action | P-2 |
|--------|---|-----|

9.4.22	Measure clutch pack clearance; determine necessary action	P-1
9.4.23	Air test operation of clutch and servo assemblies	P-1
9.4.24	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; replace as needed	P-1
9.4.25	Inspect bands and drums; adjust or replace as needed	P-3

## Unit 10: Manual Drive Train and Axles (Optional Unit)

### TCP 10.1: Perform general drive train diagnosis

*TPO: Given a training aid or a lab vehicle, perform general drive train diagnosis, with 80% accuracy in accordance with NATEF.*

#### Key Indicators:

10.1.1	Identify and interpret drive train concern; determine necessary action	P-1
10.1.2	Research applicable vehicle and service information, such as drive train system operation, vehicle service history, service precautions, and technical service bulletins	P-1
10.1.3	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals)	P-1
10.1.4	Diagnose fluid usage, level, and condition concerns; determine necessary action	P-1
10.1.5	Drain and fill manual transmission/transaxle and final drive unit	P-2

### TCP 10.2: Perform clutch diagnosis and repair

*TPO: Given a vehicle with a manual transmission, perform clutch diagnosis and repair, with 90% accuracy in accordance with NATEF.*

#### Key Indicators:

10.2.1	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action	P-1
10.2.2	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action	P-1
10.2.3	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; perform necessary action	P-1
10.2.4	Inspect release (throw-out) bearing, lever, and pivot; determine necessary action	P-1
10.2.5	Inspect and replace clutch pressure plate assembly and clutch disc	P-1
10.2.6	Bleed clutch hydraulic system	P-1
10.2.7	Inspect, remove, or replace crankshaft pilot bearing or bushing (as applicable)	P-1
10.2.8	Inspect flywheel and ring gear for wear and cracks, measure runout; determine necessary action	P-1
10.2.9	Inspect engine block, clutch (bell) housing, and transmission/transaxle case	P-3

- 10.2.10 mating surfaces; and alignment dowels; determine necessary action P-3
- 10.2.10 Measure flywheel-to-block runout and crankshaft endplay; determine necessary action P-3

**TCP 10.3: Perform transmission/transaxle diagnosis and repair**

*TPO: Given a vehicle with a manual transmission, perform transmission/transaxle diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

- 10.3.1 Remove and reinstall transmission/transaxle P-1
- 10.3.2 Disassemble, clean, and reassemble transmission/transaxle components P-2
- 10.3.3 Inspect transmission/transaxle case, extension housing, case-mating surfaces, bores, bushings, and vents; perform necessary action P-3
- 10.3.4 Diagnose noise, hard shifting, jumping out of gear, and fluid leakage concerns; determine necessary action P-2
- 10.3.5 Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers P-2
- 10.3.6 Inspect and reinstall powertrain mounts P-3
- 10.3.7 Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces P-2
- 10.3.8 Remove and replace transaxle final drive P-3
- 10.3.9 Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs P-2
- 10.3.10 Measure endplay or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action P-1
- 10.3.11 Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings P-2
- 10.3.12 Inspect and reinstall speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers P-2
- 10.3.13 Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action P-3
- 10.3.14 Remove, inspect, measure adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly P-2
- 10.3.15 Inspect lubrication devices (oil pump or slingers); perform necessary action P-3
- 10.3.16 Inspect, test and replace transmission/transaxle sensors and switches P-1

**TCP 10.4: Repair drive shaft and half shaft, universal and constant-velocity (CV) Joint Diagnosis and Repair**

*TPO: Given training aids, repair drive shaft and half shaft, universal and constant-velocity (CV) Joint Diagnosis and Repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

10.4.1	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action	P-1
10.4.2	Diagnose universal joint noise and vibration concerns; perform necessary action	P-1
10.4.3	Replace front drive (FWD) front wheel bearing	P-2
10.4.4	Inspect, service, and replace shafts, yokes, boots, CV, and universal joints	P-1
10.4.5	Inspect, service, and replace shaft center support bearings	P-3
10.4.6	Check shaft balance; measure shaft runout; measure and adjust driveline angles	P-2

### **TCP 10.5: Perform drive axle diagnosis and repair**

*TPO: Given a vehicle in a lab setting, perform drive axle diagnosis and repair, with 80% accuracy in accordance with NATEF.*

#### **Key Indicators:**

10.5.1	Diagnose noise and vibration concerns; determine necessary action	P-2
10.5.2	Diagnose fluid leakage concerns; determine necessary action	P-2
10.5.3	Inspect and service companion flange and pinion seal; measure companion flange runout	P-2
10.5.4	Inspect ring gear and measure runout; determine necessary action	P-2
10.5.6	Measure and adjust drive pinion depth	P-2
10.5.7	Measure and adjust drive pinion bearing preload	P-1
10.5.8	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types)	P-2
10.5.9	Check ring and pinion tooth contact patterns; perform necessary action	P-1
10.5.10	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case	P-2
10.5.11	Reassemble and reinstall differential case assembly; measure runout; determine necessary action	P-2

#### **Limited Slip Differential**

10.5.12	Diagnose noise, slippage, and chatter concerns; determine necessary action	P-3
10.5.13	Inspect and flush differential housing; refill with correct lubricant	P-2
10.5.14	Inspect and reinstall clutch (cone or plate) components	P-3
10.5.15	Measure rotating torque; determine necessary action	P-3

#### **Repair Drive Axle Shaft**

10.5.16	Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action	P-2
10.5.17	Inspect and replace drive axle shaft wheel studs	P-3
10.5.18	Remove and replace drive axle shafts	P-1
10.5.19	Inspect and replace drive axle shaft seals, bearings, and retainers	P-2
10.5.20	Measure drive axle flange runout and shaft endplay; determine necessary action	P-2

**TCP 10.6: Perform four-wheel drive/all-wheel drive component diagnosis and repair**

*TPO: Provided with a vehicle with four wheel drive, Perform four-wheel drive/all-wheel drive component diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

10.6.1	Diagnose noise, vibration, and unusual steering concerns; determine necessary action	P-3
10.6.2	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets	P-3
10.6.3	Remove and reinstall transfer case	P-3
10.6.4	Disassemble, service, and reassemble transfer case and components	P-3
10.6.5	Inspect front-wheel bearings and locking hubs; perform necessary action	P-3
10.6.6	Check drive assembly seals and vents; check lube level	P-3
10.6.7	Diagnose test, adjust, and replace electrical/electronic components of four-wheel drive system	P-3

**Unit 11: Heating and Air Conditioning (Optional Unit)**

**TCP 11.1: Perform A/C system diagnosis and repair**

*TPO: Provided with a vehicle with air conditioning and necessary equipment, perform A/C system diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

11.1.1	Identify and interpret heating and air conditioning concern; determine necessary action	P-1
11.1.2	Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins	P-1
11.1.3	Locate and interpret vehicle and major component identification number (VIN, vehicle certification labels, calibration decals)	P-1
11.1.4	Perform test A/C system; diagnose A/C system malfunctions using principles of refrigeration	P-1
11.1.5	Diagnose unusual operating noises in the A/C system; determine necessary action	P-2
11.1.6	Identify refrigerants type; conduct a performance test of the A/C system; determine necessary action	P-1
11.1.7	Leak test A/C system; determine necessary action	P-1
11.1.8	Inspect the condition of discharged oil; determine necessary action	P-2
11.1.9	Determine recommended oil for system application	P-1

## **TCP 11.2: Perform refrigeration system component diagnosis and repair**

*TPO: Given a training aid, perform refrigeration system component diagnosis and repair, with 80% accuracy in accordance with NATEF.*

### **Key Indicators:**

#### **Compressor and clutch**

- |        |  |     |
|--------|--|-----|
| 11.2.1 | Diagnose A/C system conditions that cause the protection devices (pressure, thermal and PCM) to interrupt system operation; determine necessary action | P-2 |
| 11.2.2 | Inspect A/C compressor drive belts; determine necessary action   | P-2 |
| 11.2.3 | Inspect, test, and replace A/C compressor or assembly  | P-2 |
| 11.2.4 | Remove and replace A/C compressor and mountings measure oil quantity; determine necessary action   | P-1 |

#### **Evaporator, condenser, and related components**

- |         |  |     |
|---------|--|-----|
| 11.2.5  | Determine need for A/C system filter; perform necessary action   | P-3 |
| 11.2.6  | Remove and inspect A/C system mufflers, hoses, lines, fittings, o-rings, seals, and service valves; perform necessary action | P-2 |
| 11.2.7  | Inspect A/C condenser for airflow restrictions; perform necessary action   | P-1 |
| 11.2.8  | Remove and install receiver/drier or accumulator/drier, measure oil quantity; determine necessary action                     | P-1 |
| 11.2.9  | Remove and install expansion valve or orifice (expansion) tube   | P-2 |
| 11.2.10 | Inspect evaporator housing water drain; perform necessary action   | P-3 |
| 11.2.11 | Remove and reinstall evaporator; measure oil quantity; determine necessary action  | P-3 |
| 11.2.12 | Remove and reinstall condenser; measure oil quantity; determine necessary action   | P-3 |

## **TCP 11.3: Perform heating, ventilation, and engine cooling systems diagnosis and repair**

*TPO: Given a vehicle in a lab setting, perform heating, ventilation, and engine cooling systems diagnosis and repair, with 80% accuracy in accordance with NATEF.*

### **Key Indicators:**

- |        |  |     |
|--------|--|-----|
| 11.3.1 | Diagnose temperature control problems in the heater/ventilation system; determine necessary action                                 | P-2 |
| 11.3.2 | Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action | P-1 |
| 11.3.3 | Inspect engine cooling and heater system hoses and belts; perform necessary action   | P-1 |
| 11.3.4 | Inspect, test, and replace thermostat and housing  | P-1 |
| 11.3.5 | Determine coolant condition; drain and recover coolant   | P-1 |

11.3.6	Flush system; refill system with recommended coolant; bleed system (follow local disposal guidelines)	P-1
11.3.7	Inspect and test fan, fan clutch, fan shroud, and air dams; perform necessary action	P-1
11.3.8	Inspect and test electrical fan control system and circuits; determine necessary action	P-1
11.3.9	Inspect and test heater control valve(s); perform necessary action	P-2
11.3.10	Remove and reinstall heater core	P-3

**TCP 11.4: Perform operating systems and related controls diagnosis and repair**

*TPO: Provided with a vehicle with air conditioning, perform operating systems and related controls diagnosis and repair, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

11.4.1	Diagnose failures in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action	P-1
11.4.2	Inspect and test A/C heater-blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action	P-2
11.4.3	Test and diagnose A/C compressor clutch control systems; determine necessary action	P-1
11.4.4	Diagnose malfunctions in the vacuum and mechanical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action	P-3
11.4.5	Inspect and test A/C heater control panel assembly; determine necessary action	P-3
11.4.6	Inspect and test A/C heater control cables and linkages; perform necessary action	P-3
11.4.7	Inspect and test A/C heater ducts, door, hoses, and outlets; perform necessary action	P-3
11.4.8	Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action	P-3

**TCP 11.5: Repair refrigerant recovery, recycling and handling**

*TPO: Given a vehicle and refrigerant recovery equipment, repair refrigerant recovery, recycling and handling, with 80% accuracy in accordance with NATEF.*

**Key Indicators:**

11.5.1	Perform correct operation and maintenance of refrigerant handling equipment	P-1
11.5.2	Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant	P-1
11.5.3	Recycle refrigerant (in accordance with EPA and OSHA guidelines)	P-1
11.5.4	Label and store refrigerant	P-1
11.5.5	Test recycled and refrigerant for non-condensable gases	P-1

11.5.6 Evacuate and charge A/C system

P-1

**\*\*Required by NATEF for ASE program certification in State of Ohio**

**\*\*\*NATEF/ASE certification requires passing a percentage of competencies in each level (i.e., P-1 95%, P-2 80%, P-3 50%)**

**STUDENT ASSESSMENT POLICY  
AUTOMOTIVE TECHNOLOGY  
CLEVELAND HEIGHTS – UNIVERSITY HEIGHTS  
SCHOOL DISTRICT**

The student shall perform competencies and competency builders in a manner acceptable to the construction industry. The standards set for these competencies are recommended by the advisory committee members and employers in the construction industry and evaluated by the teacher following these guidelines. Competencies will be identified which must be mastered in order to receive credit for the course.

In order to measure the progress of each student in the program and to measure the effectiveness of the total program, the following assessment procedures will be used:

- Pretests
- Post tests
- Teacher observation and evaluations
- Self evaluations
- Class discussions and demonstrations
- Projects Development and Construction
- Oral Tests
- Daily Grades
- Lab and Related Class performance
- Training Plan
- Board Adopted rules and regulations
- Work/field experiences, business partnership evaluations
- Final Exam

Measurement of learning will be an ongoing activity with emphasis on laboratory activities and competency improvement. Assessment will be accomplished through pre-assessment of student skills, frequent formative assessment, both orally and written, and summative assessment to determine mastery of competencies. The number of competencies mastered will be translated into appropriate grades consistent with both the schools grading system and school district policy. When a student, grades nine through twelve, accumulates six unexcused absences or fifteen excused and/or unexcused absences in a class at any time during the semester, the student automatically receives a grade of "FA" to indicate failure due to absence.

100 – 90 = A

89 - 80 = B

79 - 70 = C

69 - 60 = D

59 - 0 = F

At the completion of the program each student will receive a Career Passport indicating competencies in which student is proficient.