CAREER AND TECHNOLOGY STUDIES

A. PROGRAM RATIONALE AND PHILOSOPHY

Through Career and Technology Studies (CTS), secondary education in Alberta is responding to the many challenges of modern society, helping young people develop daily living skills and nurturing a flexible, well-qualified work force.

In Canada's information society, characterized by rapid change in the social and economic environment, students must be confident in their ability to respond to change and successfully meet the challenges they face in their own personal and work lives. In particular, they make decisions about what they will do when they finish high school. Many students will enter the work force, others will continue their education. All students face the challenges of growing independence and responsibility, and of entering post-secondary programs and/or the highly competitive workplace.

Secondary schools also face challenges. They must deliver, on a consistent basis, high quality, cost-effective programs that students, parents and the community find credible and relevant.

CTS helps schools and students meet these challenges. Schools can respond more efficiently and effectively to student and community needs and expectations by taking advantage of the opportunities in the CTS curriculum to design courses and access school, community and distance learning resources. Students can develop the confidence they need as they move into adult roles by assuming increased responsibility for their learning; cultivating their individual talents, interests and abilities; and by defining and acting on their goals.

As an important component of education in Alberta secondary schools, CTS promotes student achievement by setting clear expectations and recognizing student success. Students in CTS develop competencies—the knowledge, skills and attitudes they are expected to demonstrate, that is, what they know and what they are able to do.

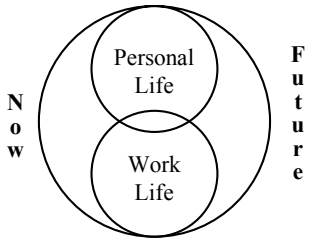
Acquired competencies can be applied now and in the future as students make a smooth transition into adult roles in the family, community, workplace and/or further education. To facilitate this transition, clearly stated expectations and standards have been defined in cooperation with teachers, business and industry representatives and post-secondary educators.

CTS offers all students important learning opportunities. Regardless of the particular area of study chosen, *students* in CTS *will*:

- develop skills that can be applied in their daily lives, now and in the future
- refine career-planning skills
- develop technology-related skills
- enhance employability skills
- apply and reinforce learnings developed in other subject areas.

In CTS, students build skills they can apply in their everyday lives. For example, in the CTS program, particularly at the introductory levels, students have the opportunity to improve their ability to make sound consumer decisions and to appreciate environmental and safety precautions.

CAREERS



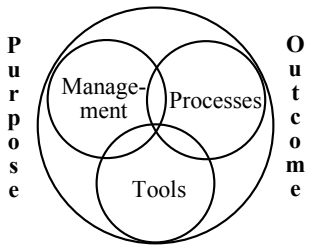
A career encompasses more than activities just related to a person's job or occupation; it involves one's personal life in both local and global contexts; e.g., as a family member, a friend, a community volunteer, a citizen of the world.

The integration of careers throughout the CTS program helps students to make effective career decisions and to target their efforts. CTS students will have the opportunity to expand their knowledge about careers, occupations and job opportunities, as well as the education and/or training requirements involved. Also, students come to recognize the need for lifelong learning.

Students in CTS have the opportunity to use and apply technology and systems effectively and efficiently. This involves:

- a decision regarding which processes and procedures best suit the task at hand
- the appropriate selection and skilled use of the tools and/or resources available
- an assessment of and management of the impact the use of the technology may have on themselves, on others and on the environment.

TECHNOLOGY



Integrated throughout CTS are employability skills, those basic competencies that help students develop their personal management and social skills. Personal management skills are improved as students take increased responsibility for their learning, design innovative solutions to problems and challenges, and manage resources effectively and efficiently. Social skills improve through learning experiences that require students to work effectively with others, demonstrate teamwork and leadership, and maintain high standards in safety and accountability.

As well as honing employability skills, CTS reinforces and enhances learnings developed in core and other optional courses. The curriculum emphasizes, as appropriate, the effective application of communication and numeracy skills.

In addition to the common outcomes described above, students focusing on a particular area of study will develop career-specific competencies that support entry into the workplace and/or related post-secondary programs. Career-specific competencies can involve understanding and applying appropriate terminology, processes and technologies related to a specific career, occupation or job.

PROGRAM OUTCOMES

The program outcomes describe the basic competencies integrated throughout the CTS program.

Within an applied context relevant to personal goals, aptitudes and abilities; *the student* in CTS *will*:

- demonstrate the basic knowledge, skills and attitudes necessary for achievement and fulfillment in personal life

- develop an action plan that relates personal interests, abilities and aptitudes to career opportunities and requirements

- use technology effectively to link and apply appropriate tools, management and processes to produce a desired outcome

- develop basic competencies (employability skills), by:
  - selecting relevant, goal-related activities, ranking them in order of importance, allocating necessary time, and preparing and following schedules (managing learning)
  - linking theory and practice, using resources, tools, technology and processes responsibly and efficiently (managing resources)
  - applying effective and innovative decision-making and problem-solving strategies in the design, production, marketing and consumption of goods and services (problem solving and innovation)
  - demonstrating appropriate written and verbal skills, such as composition, summarization and presentation (communicating effectively)
  - participating as a team member by working cooperatively with others and contributing to the group with ideas, suggestions and effort (working with others)
  - maintaining high standards of ethics, diligence, attendance and punctuality, following safe procedures consistently, and recognizing and eliminating potential hazards (demonstrating responsibility).

PROGRAM ORGANIZATION

CURRICULUM STRUCTURE

Career and Technology Studies is organized into **strands** and **courses**.

Strands in CTS define competencies that help students:

- build daily living skills
- investigate career options
- use technology (managing, processes, tools) effectively and efficiently
- prepare for entry into the workplace and/or related post-secondary programs.

In general, strands relate to selected industry sectors offering positive occupational opportunities for students. Some occupational opportunities require further education after high school, and some allow direct entry into the workplace. Industry sectors encompass goods-producing industries, such as agriculture, manufacturing and construction; and service-producing industries, such as business, health, finance and insurance.

Courses are the building blocks for each strand. They define what a student is expected to know and be able to do (exit-level *competencies*). Courses also specify prerequisites. Recommendations for course parameters, such as instructional qualifications, facilities and equipment can be found in the guides to implementation.

The competencies a student must demonstrate to achieve success in a course are defined through *general outcomes.* Senior high school students who can demonstrate the general outcomes defined for a CTS course; i.e., who have the designated competencies, will qualify for 1 credit toward their high school diploma.

Specific outcomes provide a more detailed framework for instruction. Within the context of the general outcomes, the specific outcomes further define the knowledge, skills and attitudes the student should acquire.

The following chart shows the 22 strands that comprise the CTS program and the number of 1-credit courses available in each strand.

Strand	No. of Courses
1. Agriculture	33
2. Career Transitions	30
3. Communication Technology	33
4. Community Health	31
5. Construction Technologies	46
6. Cosmetology Studies	58
7. Design Studies	31
8. Electro-Technologies	47
9. Energy and Mines	26
10. Enterprise and Innovation	8
11. Fabrication Studies	44
12. Fashion Studies	29
13. Financial Management	16
14. Foods	37
15. Forestry	21
16. Information Processing	53
17. Legal Studies	13
18. Logistics	12
19. Management and Marketing	23
20. Mechanics	54
21. Tourism Studies	24
22. Wildlife	17

LEVELS OF ACHIEVEMENT

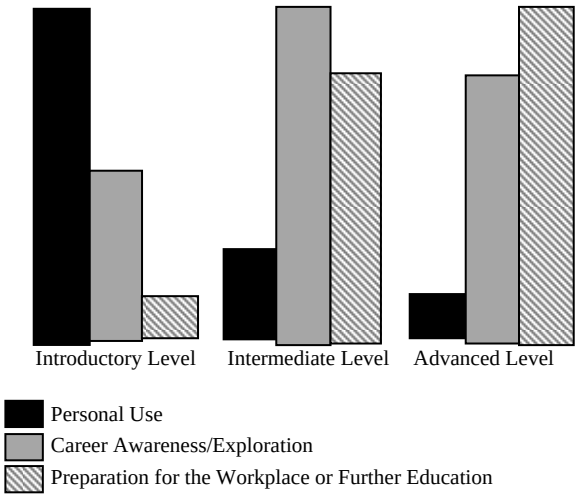
Courses are organized into three levels of achievement: **introductory**, **intermediate** and **advanced**. As students progress through the levels, they will be expected to meet higher standards and demonstrate an increased degree of competence, in both the program outcomes and the general outcomes defined for individual courses.

Introductory level courses help students build daily living skills and form the basis for further learning. Introductory courses are for students who have no previous experience in the strand.

Intermediate level courses build on the competencies developed at the introductory level. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the strand.

Advanced level courses refine expertise and help prepare students for entry into the workplace or a related post-secondary program.

The graph below illustrates the relative emphasis on the aspects of career planning at each of the levels.



CURRICULUM AND ASSESSMENT STANDARDS

Curriculum standards in CTS define what students must know and be able to do. Curriculum standards are expressed through the program outcomes for CTS, and through general and specific outcomes defined for individual courses within each strand.

Assessment standards define how student performance is to be judged. In CTS, each assessment standard defines the conditions and criteria to be used for assessing the competencies associated with each general outcome. To receive credit for a course, students must demonstrate competency at the level specified by the conditions and criteria defined for each general outcome.

Students throughout the province receive a fair and reliable assessment as they use the standards to guide their efforts, thus ensuring they participate more effectively and successfully in the learning and assessment process. Standards at advanced levels are, as much as possible, linked to workplace and post-secondary entry-level requirements.

TYPES OF COMPETENCIES

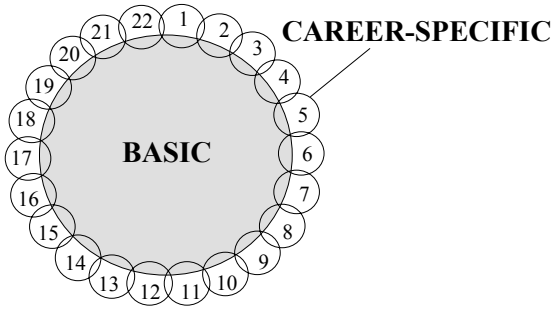
Two types of competencies are defined within the CTS program: basic and career-specific.

Basic competencies are generic to any career area and are developed within each course. Basic competencies include:

- personal management; e.g., managing learning, being innovative, ethics, managing resources
- social; e.g., communication, teamwork, leadership and service, demonstrating responsibility (safety and accountability).

Career-specific competencies relate to a particular strand. These competencies build daily living skills at the introductory levels and support the smooth transition to the workplace and/or post-secondary programs at the intermediate and advanced levels.

The model below shows the relationship of the two types of competencies within the 22 strands of the CTS program.



BASIC COMPETENCIES REFERENCE GUIDE

The chart below outlines basic competencies that students endeavour to develop and enhance in each of the CTS strands and courses. Students' basic competencies should be assessed through observations involving the student, teacher(s), peers and others as they complete the requirements for each course. In general, there is a progression of task complexity and student initiative as outlined in the Developmental Framework★. **As students progress through Stages 1, 2, 3 and 4 of this reference guide, they build on the competencies gained in earlier stages**. Students leaving high school should set themselves a goal of being able to demonstrate Stage 3 performance.

Suggested strategies for classroom use include:

- having students rate themselves and each other
- using in reflective conversation between teacher and student
- highlighting areas of strength
- tracking growth in various CTS strands
- highlighting areas upon which to focus
- maintaining a student portfolio.

Stage 1— *The student:*	**Stage 2**— *The student:*	**Stage 3**— *The student:*	**Stage 4**— *The student:*
Managing Learning			
☐ comes to class prepared for learning	☐ →	☐ →	☐ →
☐ follows basic instructions, as directed	☐ follows instructions, with limited direction	☐ follows detailed instructions on an independent basis	☐ →
	☐ sets goals and establishes steps to achieve them, with direction	☐ sets clear goals and establishes steps to achieve them	☐ demonstrates self-direction in learning, goal setting and goal achievement
☐ acquires specialized knowledge, skills and attitudes	☐ applies specialized knowledge, skills and attitudes in practical situations	☐ transfers and applies specialized knowledge, skills and attitudes in a variety of situations	☐ transfers and applies learning in new situations; demonstrates commitment to lifelong learning
☐ identifies criteria for evaluating choices and making decisions	☐ identifies and applies a range of effective strategies for solving problems and making decisions	☐ uses a range of critical thinking skills to evaluate situations, solve problems and make decisions	☐ thinks critically and acts logically to evaluate situations, solve problems and make decisions
☐ uses a variety of learning strategies	☐ explores and uses a variety of learning strategies, with limited direction	☐ selects and uses effective learning strategies	☐ →
		☐ cooperates with others in the effective use of learning strategies	☐ provides leadership in the effective use of learning strategies
Managing Resources			
☐ adheres to established timelines; uses time/schedules/planners effectively	☐ creates and adheres to timelines, with limited direction; uses time/schedules/planners effectively	☐ creates and adheres to detailed timelines on an independent basis; prioritizes task; uses time/schedules/planners effectively	☐ creates and adheres to detailed timelines; uses time/schedules/planners effectively; prioritizes tasks on a consistent basis
☐ uses information (material and human resources), as directed	☐ accesses and uses a range of relevant information (material and human resources), with limited direction	☐ accesses a range of information (material and human resources), and recognizes when additional resources are required	☐ uses a wide range of information (material and human resources) in order to support and enhance the basic requirement
☐ uses technology (facilities, equipment, supplies), as directed, to perform a task or provide a service	☐ uses technology (facilities, equipment, supplies), as appropriate, to perform a task or provide a service, with minimal assistance and supervision	☐ selects and uses appropriate technology (facilities, equipment, supplies) to perform a task or provide a service on an independent basis	☐ recognizes the monetary and intrinsic value of managing technology (facilities, equipment, supplies)
☐ maintains, stores and/or disposes of equipment and materials, as directed	☐ maintains, stores and/or disposes of equipment and materials, with limited assistance	☐ maintains, stores and/or disposes of equipment and materials on an independent basis	☐ demonstrates effective techniques for managing facilities, equipment and supplies
Problem Solving and Innovation			
☐ participates in problem solving as a process	☐ identifies the problem and selects an appropriate problem-solving approach, responding appropriately to specified goals and constraints	☐ thinks critically and acts logically in the context of problem solving	☐ identifies and resolves problems efficiently and effectively
☐ learns a range of problem-solving skills and approaches			
☐ practices problem-solving skills by responding appropriately to a clearly defined problem, specified goals and constraints, by: – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action	☐ applies problem-solving skills to a directed or a self-directed activity, by: – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action	☐ transfers problem-solving skills to real-life situations, by generating new possibilities ☐ prepares implementation plans ☐ recognizes risks	☐ identifies and suggests new ideas to get the job done creatively, by: – combining ideas or information in new ways – making connections among seemingly unrelated ideas – seeking out opportunities in an active manner

Stage 1— *The student:*	**Stage 2**— *The student:*	**Stage 3**— *The student:*	**Stage 4**— *The student:*
Communicating Effectively ☐ uses communication skills; e.g., reading, writing, illustrating, speaking ☐ uses language in appropriate context ☐ listens to understand and learn ☐ demonstrates positive interpersonal skills in selected contexts	☐ communicates thoughts, feelings and ideas to justify or challenge a position, using written, oral and/or visual means ☐ uses technical language appropriately ☐ listens and responds to understand and learn ☐ demonstrates positive interpersonal skills in many contexts	☐ prepares and effectively presents accurate, concise, written, visual and/or oral reports providing reasoned arguments ☐ encourages, persuades, convinces or otherwise motivates individuals ☐ listens and responds to understand, learn and teach ☐ demonstrates positive interpersonal skills in most contexts	☐ negotiates effectively, by working toward an agreement that may involve exchanging specific resources or resolving divergent interests ☐ negotiates and works toward a consensus ☐ listens and responds to understand, learn, teach and evaluate ☐ promotes positive interpersonal skills among others
Working with Others ☐ fulfills responsibility in a group project ☐ works collaboratively in structured situations with peer members ☐ acknowledges the opinions and contributions of others in the group	☐ → ☐ cooperates to achieve group results ☐ maintains a balance between speaking, listening and responding in group discussions ☐ respects the feelings and views of others	☐ seeks a team approach, as appropriate, based on group needs and benefits; e.g., idea potential, variety of strengths, sharing of workload ☐ works in a team or group: – encourages and supports team members – helps others in a positive manner – provides leadership/ followership as required – negotiates and works toward consensus as required	☐ leads, where appropriate, mobilizing the group for high performance ☐ understands and works within the context of the group ☐ prepares, validates and implements plans that reveal new possibilities
Demonstrating Responsibility **Attendance** ☐ demonstrates responsibility in attendance, punctuality and task completion **Safety** ☐ follows personal and environmental health and safety procedures ☐ identifies immediate hazards and their impact on self, others and the environment ☐ follows appropriate/emergency response procedures **Ethics** ☐ makes personal judgements about whether or not certain behaviours/actions are right or wrong	☐ → ☐ recognizes and follows personal and environmental health and safety procedures ☐ identifies immediate and potential hazards and their impact on self, others and the environment ☐ → ☐ assesses how personal judgements affect other peer members and/or family; e.g., home and school	☐ → ☐ establishes and follows personal and environmental health and safety procedures ☐ → ☐ → ☐ assesses the implications of personal/group actions within the broader community; e.g., workplace	☐ → ☐ transfers and applies personal and environmental health and safety procedures to a variety of environments and situations ☐ → ☐ → ☐ demonstrates accountability for actions taken to address immediate and potential hazards ☐ analyzes the implications of personal/group actions within the global context ☐ states and defends a personal code of ethics as required
★**Developmental Framework** • *Simple task* • *Structured environment* • *Directed learning*	• *Task with limited variables* • *Less structured environment* • *Limited direction*	• *Task with multiple variables* • *Flexible environment* • *Self-directed learning, seeking assistance as required*	• *Complex task* • *Open environment* • *Self-directed/self-motivated*

MECHANICS

B. STRAND RATIONALE AND PHILOSOPHY

The movement of people and goods from one place to another has always been important to human existence. Over the last century, significant advances in modes of transportation have dramatically altered the way we live and make our living. However, the quick and convenient movement of people and goods is not risk free. The ever-increasing use of motor vehicles throughout the world and their reliance on fossil fuels has created major personal safety and environmental concerns. Because the transportation industry is large and diverse, there are many opportunities for rewarding careers, whether it is to design and build safer and more efficient vehicles or to service the ones that are already in use.

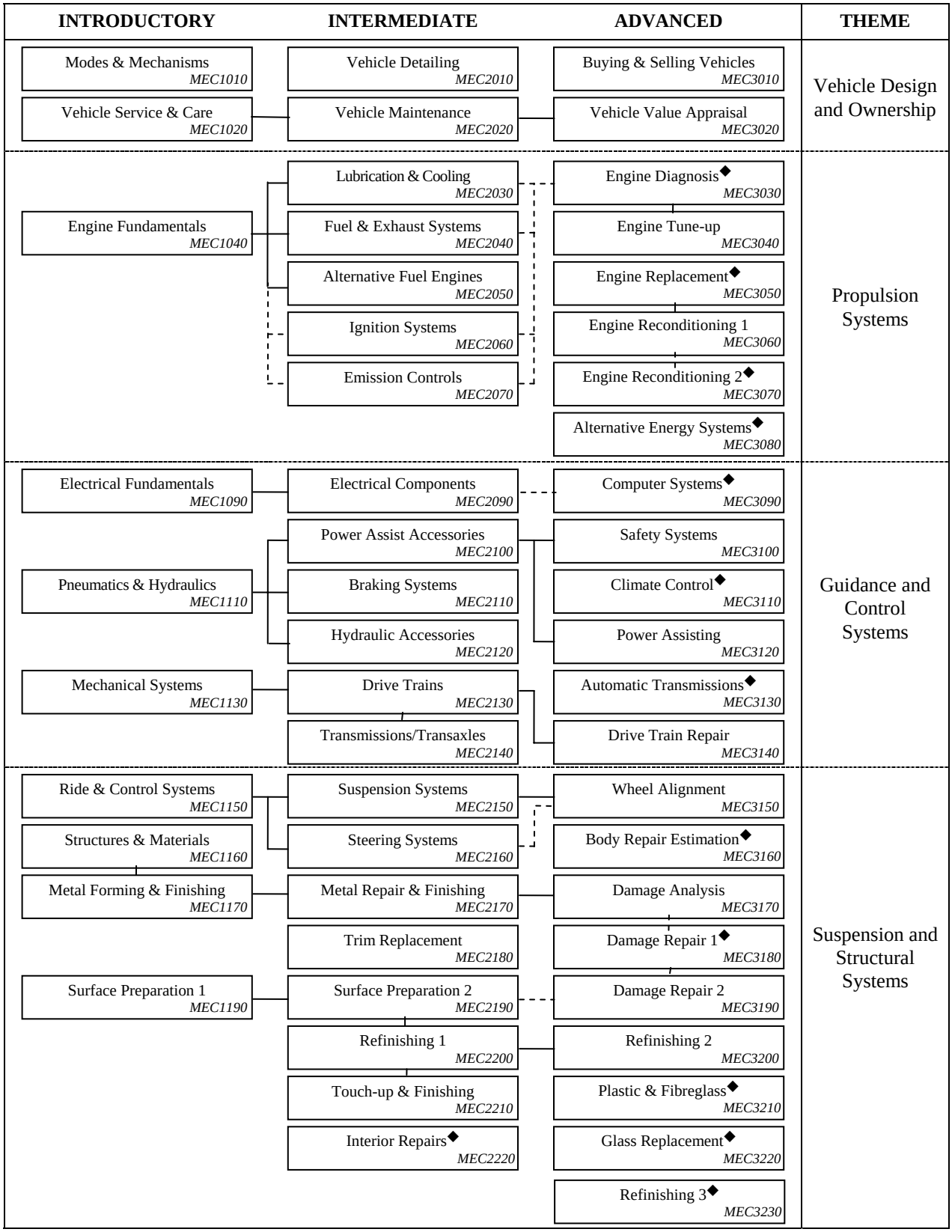
In Mechanics, a strand of Career and Technology Studies, students, through hands-on experiences, have the opportunity to increase their knowledge and skills related to the design and maintenance of transportation vehicles, and the impact they have on the environment and on their economic and social well-being. Whether a student plans to prepare for a work-related role in the industry or simply wants to be an informed owner/operator of a vehicle, the Mechanics strand should be viewed as an educational opportunity for all secondary students.

More specifically, the Mechanics strand will provide students with a broad base of experience and knowledge of systems related to the transportation field. Within the philosophy of Career and Technology Studies, *students* in Mechanics *will*:

- develop the knowledge, skills and attitudes within the context of the school and the community to achieve success in personal and work life
- apply effective and responsible decision-making strategies to the design, service and repair of transportation vehicles
- link the knowledge, skills and attitudes developed in other courses in meaningful and practical ways to the field of mechanics
- demonstrate flexibility, cooperative work behaviours and effective communication and leadership skills
- link theory and practice, using available resources, tools and materials responsibly, safely and efficiently
- develop estimating and reporting skills
- become better informed consumers

- develop manual and technological skills
- exercise safe work and environmental practices
- expand personal knowledge and appreciation of further education and career options, and opportunities related to the transportation industry
- determine the economic significance of the transportation industry in the local, national and global community.

SCOPE AND SEQUENCE



Prerequisite Recommended sequence

◆Refer to specific courses for additional prerequisites.

MODULE LEARNER EXPECTATIONS: INTRODUCTORY LEVEL

MODULE MEC1010: MODES & MECHANISMS

Level: Introductory

Theme: Vehicle Design and Ownership

Prerequisite: None

Module Description: Students research, design, build and test a model of a transportation vehicle, using a simple power source, common materials and tools.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools, and follow established lab procedures
- list and describe operating systems and structures common to all modes of transportation
- research, design, build and test a concept vehicle
- demonstrate basic competencies.

MODULE MEC1020: VEHICLE SERVICE & CARE

Level: Introductory

Theme: Vehicle Design and Ownership

Prerequisite: None

Module Description: Students develop knowledge, skills and attitudes to care for and service a motor vehicle.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools, and follow established lab procedures
- develop a preventive maintenance service schedule for a vehicle
- inspect and service a vehicle according to the vehicle service schedule
- clean and apply a protective coating to the exterior and interior surfaces of a vehicle for use or storage
- demonstrate basic competencies.

MODULE MEC1040: ENGINE FUNDAMENTALS

Level: Introductory

Theme: Propulsion Systems

Prerequisite: None

Module Description: Students investigate and describe operating principles, construction and applications of engines.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools, and follow established lab procedures
- compare operating principles of two- and four-cycle piston engines
- determine the condition of an internal combustion engine
- describe the by-products of combustion and their impact on the environment
- demonstrate basic competencies.

MODULE MEC1090: ELECTRICAL FUNDAMENTALS

Level: Introductory

Theme: Guidance and Control Systems

Prerequisite: None

Module Description: Students identify and describe the operating principles and applications of electricity.

Module Learner Expectations: *The student will:*

- demonstrate safe use of electrical tools and equipment, and follow established lab procedures
- apply electrical principles and concepts to test electrical circuits and components
- demonstrate basic competencies.

MODULE MEC1110: PNEUMATICS & HYDRAULICS

Level: Introductory

Theme: Guidance and Control Systems

Prerequisite: None

Module Description: Students identify and describe the operating principles and applications of pneumatic and hydraulic systems.

Module Learner Expectations: *The student will:*

- demonstrate the safe use of pneumatic and hydraulic tools and equipment, and follow established lab procedures
- compare operating principles of pneumatic and hydraulic systems
- apply principles and concepts of pneumatics and hydraulics to test and operate a pneumatic and/or hydraulic system
- demonstrate basic competencies.

MODULE MEC1130: MECHANICAL SYSTEMS

Level: Introductory

Theme: Guidance and Control Systems

Prerequisite: None

Module Description: Students identify and describe the operating principles and applications of mechanisms used to transmit and control mechanical energy.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools, and follow established lab procedures
- describe principles and concepts related to the use of mechanisms to control and transmit force and motion in a mechanical system
- apply basic principles and concepts of mechanical systems
- demonstrate basic competencies.

MODULE MEC1150: RIDE & CONTROL SYSTEMS

Level: Introductory

Theme: Suspension and Structural Systems

Prerequisite: None

Module Description: Students develop a basic knowledge of ride and control systems associated with vehicles.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools, and follow established lab procedures
- describe the purpose, operation and interdependent nature of ride and control systems
- inspect and service ride and control systems
- demonstrate basic competencies.

MODULE MEC1160: STRUCTURES & MATERIALS

Level: Introductory

Theme: Suspension and Structural Systems

Prerequisite: None

Module Description: Students identify the types of materials and components used in vehicle construction.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools, and follow established lab procedures
- explain the relationship between the function of a vehicle and the materials used in its construction
- examine and identify the basic parts and materials used in vehicle construction
- demonstrate basic competencies.

MODULE MEC1170: METAL FORMING & FINISHING

Level: Introductory

Theme: Suspension and Structural Systems

Prerequisite: MEC1160 Structures & Materials

Module Description: Students repair and re-form damaged metal panels.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when metal forming and finishing, and follow established lab procedures
- describe effects of physical damage caused by distortion and corrosion on sheet metal components
- apply metal forming and finishing skills to repair minor panel damage
- demonstrate basic competencies.

MODULE MEC1190: SURFACE PREPARATION 1

Level: Introductory

Theme: Suspension and Structural Systems

Prerequisite: None

Module Description: Students assess the state of a painted surface, and use appropriate restoration procedures.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices for surface preparation, and follow established lab procedures
- identify products, equipment and procedures associated with surface preparation
- prepare and perform a surface preparation
- demonstrate basic competencies.

MODULE LEARNER EXPECTATIONS: INTERMEDIATE LEVEL

MODULE MEC2010: VEHICLE DETAILING

Level: Intermediate

Theme: Vehicle Design and Ownership

Prerequisite: None

Module Description: Students develop the skills required to restore and enhance the exterior finishes of a vehicle.

Module Learner Expectations: *The student will:*

- state personal and environmental hazards associated with the use of cleaning and waxing agents
- identify and describe materials available to enhance the appearance of a vehicle
- demonstrate correct cleaning and treatment of engine parts and exterior finishes, including paint, glass, vinyl and rubber surfaces
- install a trim or accessory part according to standard practice
- demonstrate basic competencies.

MODULE MEC2020: VEHICLE MAINTENANCE

Level: Intermediate

Theme: Vehicle Design and Ownership

Prerequisite: MEC1020 Vehicle Service & Care

Module Description: Students perform the basic service requirements necessary to ensure adequate maintenance of a motor vehicle.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working with vehicles, and follow established lab procedures
- identify vehicle service requirements as per manufacturer's recommendations
- conduct a motor vehicle inspection considering age of vehicle, distance travelled, service conditions and history
- service and repair a motor vehicle according to vehicle condition and service schedule
- demonstrate basic competencies.

MODULE MEC2030: LUBRICATION & COOLING

Level: Intermediate

Theme: Propulsion Systems

Prerequisite: MEC1040 Engine Fundamentals

Module Description: Students diagnose, maintain and service the lubrication and cooling systems of a typical four-cycle gasoline engine.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working with vehicle engine fluids
- identify and describe functions and operations of engine cooling and lubrication system components
- diagnose and correct lubrication and cooling system faults
- demonstrate basic competencies.

MODULE MEC2040: FUEL & EXHAUST SYSTEMS

Level: Intermediate

Theme: Propulsion Systems

Prerequisite: MEC1040 Engine Fundamentals

Module Description: Students diagnose, maintain and service the fuel and exhaust system of a typical four-cycle gasoline engine.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working with volatile liquids and combustion gases
- identify and describe functions and operations of engine fuel and exhaust system components
- diagnose and correct fuel and exhaust system faults
- demonstrate basic competencies.

COURSE MEC2050: ALTERNATIVE FUEL ENGINES

Level: Intermediate

Theme: Propulsion Systems

Prerequisite: None

Description: Students determine alternative fuels used to power motor vehicles.

General Outcomes: *The student will:*

- demonstrate safe work practices when working with alternative fuel vehicles
- determine the type of fuel that is best suited to a particular use and type of vehicle
- service an alternative fuel vehicle, recognizing its unique maintenance requirements
- demonstrate basic competencies.

COURSE MEC2060: IGNITION SYSTEMS

Level: Intermediate

Theme: Propulsion Systems

Prerequisite: None

Description: Students identify the basic components and parts of ignition systems used on internal combustion engines, and service and repair an ignition system.

General Outcomes: *The student will:*

- follow electrical safety guidelines, by accurately interpreting and using instruction manuals
- explain how a timed high voltage spark is achieved in magneto, point and electronic ignition systems
- recognize the drivability symptoms, and use visual and instrument checks to diagnose ignition system faults
- service and repair an ignition system
- demonstrate basic competencies.

COURSE MEC2070: EMISSION CONTROLS

Level: Intermediate

Theme: Propulsion Systems

Prerequisite: None

Description: Students describe the importance of controlling emissions and the technology applied to vehicles to meet prescribed standards.

General Outcomes: *The student will:*

- demonstrate safe work practices when working with emission control systems
- list and describe vehicle pollutants and their effects on the environment
- describe types and characteristics of pre- and post-combustion emission systems
- identify emission control components
- diagnose and service emission control systems
- demonstrate basic competencies.

COURSE MEC2090: ELECTRICAL COMPONENTS

Level: Intermediate

Theme: Guidance and Control Systems

Prerequisite: MEC1090 Electrical Fundamentals

Description: Students identify and describe the basic use and testing of the electrical components of a typical motor vehicle.

General Outcomes: *The student will:*

- demonstrate safe work practices when working with electrical components
- describe the function and operation of a vehicle's electrical systems and components
- identify electrical faults, by using standard diagnostic and testing procedures
- test and service electrical components
- demonstrate basic competencies.

MODULE MEC2100: POWER ASSIST ACCESSORIES

Level: Intermediate

Theme: Guidance and Control Systems

Prerequisite: MEC1110 Pneumatics & Hydraulics

Module Description: Students identify and explain the function of components and parts of power assist accessories.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working on power accessories
- list components and state functions of power assist accessories
- describe and check major components of power accessories
- service and repair power accessories
- demonstrate basic competencies.

MODULE MEC2110: BRAKING SYSTEMS

Level: Intermediate

Theme: Guidance and Control Systems

Prerequisite: MEC1110 Pneumatics & Hydraulics

Module Description: Students develop the necessary knowledge, skills and attitudes to diagnose, service and maintain a braking system according to accepted trade practices.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working on brakes
- identify brake design and components, and emergency brake systems
- inspect and analyze disc and drum brake systems
- interpret parts and service manuals to perform routine brake system service and maintenance
- demonstrate basic competencies.

MODULE MEC2120: HYDRAULIC ACCESSORIES

Level: Intermediate

Theme: Guidance and Control Systems

Prerequisite: MEC1110 Pneumatics & Hydraulics

Module Description: Students develop a basic knowledge of hydraulic components, applications and servicing techniques.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working with hydraulic systems
- describe functions of hydraulic components in a hydraulic system
- interpret parts and service manuals to provide appropriate maintenance and service procedures on a hydraulic system
- service hydraulic components
- demonstrate basic competencies.

MODULE MEC2130: DRIVE TRAINS

Level: Intermediate

Theme: Guidance and Control Systems

Prerequisite: MEC1130 Mechanical Systems

Module Description: Students identify the purpose, describe the operation and perform the servicing of a vehicle drive train.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working with vehicle drive trains
- identify purpose and describe function of the major drive train components
- execute inspection, diagnostic, service and repair procedures on specific drive train components
- identify career opportunities related to drive train repairs
- demonstrate basic competencies.

MODULE MEC2140: TRANSMISSIONS/TRANSAXLES

Level: Intermediate

Theme: Guidance and Control Systems

Prerequisite: MEC2130 Drive Trains

Module Description: Students perform inspection service and repair procedures on manual transmissions, transaxles and clutch assemblies.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working on transmissions and transaxles
- identify parts and trace power flow through a clutch, manual transmission, and differential and manual transaxle assembly
- inspect, diagnose, service and repair clutch, manual transmission or manual transaxle assemblies
- demonstrate basic competencies.

MODULE MEC2150: SUSPENSION SYSTEMS

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC1150 Ride & Control Systems

Module Description: Students develop the knowledge, skills and attitudes necessary to service and maintain vehicle suspension systems.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working on suspension systems
- identify the purpose and function of suspension parts
- identify worn or defective suspension parts
- service a suspension system
- demonstrate basic competencies.

MODULE MEC2160: STEERING SYSTEMS

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC1150 Ride & Control Systems

Module Description: Students develop the knowledge, skills and attitudes necessary to maintain a steering system.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when working on steering systems
- identify different steering system designs and applications
- list driving symptoms that indicate worn or defective steering parts
- service/repair a vehicle steering system
- demonstrate basic competencies.

MODULE MEC2170: METAL REPAIR & FINISHING

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC1170 Metal Forming & Finishing

Module Description: Students analyze and repair metal damage.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices when metal forming and finishing metal damage
- identify different damage conditions and repair procedures for metal damage
- repair metal damage to a vehicle
- demonstrate basic competencies.

MODULE MEC2180: TRIM REPLACEMENT

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: None

Module Description: Students demonstrate the removal and repair of trim parts, with an emphasis on removal and installation without damage.

Module Learner Expectations: *The student will:*

- demonstrate safe use of tools and chemicals for trim replacement
- investigate interior and exterior trim systems used to enhance appearances
- remove and install trim and weather-stripping
- analyze and install enhancement trim
- identify further education and career opportunities related to trim replacement and repair services
- demonstrate basic competencies.

MODULE MEC2190: SURFACE PREPARATION 2

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC1190 Surface Preparation 1

Module Description: Students perform advanced surface preparations.

Module Learner Expectations: *The student will:*

- demonstrate safe practices when performing advanced surface preparation
- explain materials and practices for performing advanced surface preparation
- carry out an advanced surface preparation
- demonstrate basic competencies.

MODULE MEC2200: REFINISHING 1

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC2190 Surface Preparation 2

Module Description: Students demonstrate metal surface refinishing procedures.

Module Learner Expectations: *The student will:*

- demonstrate safe practices and follow all warnings identified by product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety
- identify and describe refinishing products and equipment
- demonstrate proper refinishing application
- demonstrate basic competencies.

MODULE MEC2210: TOUCH-UP & FINISHING

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC2200 Refinishing 1

Module Description: Students determine and use the appropriate materials, tools and processes for minor surface repairs.

Module Learner Expectations: *The student will:*

- practise safe handling, use and disposal of hazardous touch-up and finishing products
- identify the techniques and products required to complete a minor surface repair
- demonstrate the skills required to prepare and refinish a spot repair
- demonstrate basic competencies.

MODULE MEC2220: INTERIOR REPAIRS

Level: Intermediate

Theme: Suspension and Structural Systems

Prerequisite: MEC1160 Structures & Materials

Module Description: Students search for and use the appropriate products and techniques to maintain vehicle interior surface materials.

Module Learner Expectations: *The student will:*

- practise safe handling, use and disposal of hazardous cleaning and repair products
- analyze type of repair or restoration required, and identify the techniques/ products necessary to repair and/or restore an interior surface
- clean and/or repair an interior surface
- demonstrate basic competencies.

MODULE LEARNER EXPECTATIONS: ADVANCED LEVEL

MODULE MEC3010: BUYING & SELLING VEHICLES

Level: Advanced

Theme: Vehicle Design and Ownership

Prerequisite: None

Module Description: Students develop the skills required to make an informed purchase or sale of a vehicle.

Module Learner Expectations: *The student will:*

- investigate and determine the type of vehicle that best meets a defined need
- evaluate and describe the condition of a vehicle
- plan a strategy to sell or buy a vehicle
- recognize the legal rights and responsibilities of both the seller and purchaser
- identify safety concerns and regulations when buying and selling vehicles that have been repaired after an accident
- demonstrate basic competencies.

MODULE MEC3020: VEHICLE VALUE APPRAISAL

Level: Advanced

Theme: Vehicle Design and Ownership

Prerequisite: MEC2020 Vehicle Maintenance

Module Description: Students demonstrate the procedures used by industry to estimate the cost of a repair and the market value of a vehicle.

Module Learner Expectations: *The student will:*

- demonstrate established safety and care procedures when inspecting vehicles
- inspect a vehicle to determine its overall condition and repair requirements
- apply standards used by the vehicle repair industry to appraise the condition and value of a vehicle
- outline the best business practices to follow when situations of uncertainty or conflicting interests occur relative to an appraisal
- demonstrate basic competencies.

MODULE MEC3030: ENGINE DIAGNOSIS

Level: Advanced

Theme: Propulsion Systems

Prerequisite: MEC1040 Engine Fundamentals

Module Description: Students learn to diagnose the condition of an engine for worn or damaged parts and/or improper adjustments.

Module Learner Expectations: *The student will:*

- demonstrate safe working practices while conducting an engine performance diagnosis
- diagnose the condition of an operating engine, using body senses (touch, sight, hearing)
- assess engine conditions, using specialized test equipment and on-board diagnostic systems
- provide a report that describes the condition of an engine
- demonstrate basic competencies.

MODULE MEC3040: ENGINE TUNE-UP

Level: Advanced

Theme: Propulsion Systems

Prerequisite: MEC3030 Engine Diagnosis

Module Description: Students diagnose, service and repair engine, fuel, ignition, charging and starting systems.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices while performing an engine tune-up
- determine the mechanical condition of an engine
- check and service a carburetor and a fuel injection system
- use diagnostic equipment to check, interpret and service ignition, charging, starting, emission control and exhaust systems
- demonstrate basic competencies.

MODULE MEC3050: ENGINE REPLACEMENT

Level: Advanced

Theme: Propulsion Systems

Prerequisite: MEC1040 Engine Fundamentals

Module Description: Students remove and install an engine in a chassis.

Module Learner Expectations: *The student will:*

- use engine lifting equipment and related tools safely
- identify steps involved to prepare a vehicle for engine removal
- apply mechanical skills to remove and replace engine accessories
- apply mechanical skills to remove and install an engine in a chassis
- perform post engine installation start-up and adjustment procedures
- demonstrate basic competencies.

MODULE MEC3060: ENGINE RECONDITIONING 1

Level: Advanced

Theme: Propulsion Systems

Prerequisite: MEC3050 Engine Replacement

Module Description: Students determine the need for service, and perform the required service, on the cylinder head and related components of an engine.

Module Learner Expectations: *The student will:*

- demonstrate safe work procedures related to cylinder head work
- determine the condition of a cylinder head before and after disassembly
- recondition a cylinder head and its related components
- reassemble and install a cylinder head
- demonstrate basic competencies.

MODULE MEC3070: ENGINE RECONDITIONING 2

Level: Advanced

Theme: Propulsion Systems

Prerequisite: MEC3050 Engine Replacement

Module Description: Students determine the need for service, and perform service, on a cylinder block assembly and related components of an engine.

Module Learner Expectations: *The student will:*

- demonstrate safe work procedures while reconditioning a cylinder block
- determine the condition of a cylinder block before and after disassembly
- recondition a cylinder block and its related components
- reassemble a cylinder block assembly
- demonstrate basic competencies.

MODULE MEC3080: ALTERNATIVE ENERGY SYSTEMS

Level: Advanced

Theme: Propulsion Systems

Prerequisite: MEC2050 Alternative Fuel Engines

Module Description: Students describe why vehicle manufacturers continue to build the crank-piston internal combustion gasoline engine. Students also identify and describe future engine designs.

Module Learner Expectations: *The student will:*

- research and describe the historical development of piston engine designs from Nickolous Otto's engine to the present
- describe the use of different fuels and engine designs in modern day vehicles
- identify and describe future developments in fuels and engine designs
- demonstrate basic competencies.

MODULE MEC3090: COMPUTER SYSTEMS

Level: Advanced

Theme: Guidance and Control Systems

Prerequisite: MEC2070 Emission Controls

Module Description: Students provide an overview of the applications of computer management systems used in modern vehicles.

Module Learner Expectations: *The student will:*

- demonstrate established safety and care procedures related to computer management systems
- identify the principles that apply to all computer management systems
- locate the components of selected computer management systems and describe their function
- demonstrate how computer management systems operate
- perform diagnostic analyses of selected computer management systems and make required repairs to or replacement of malfunctioning parts
- demonstrate basic competencies.

MODULE MEC3100: SAFETY SYSTEMS

Level: Advanced

Theme: Guidance and Control Systems

Prerequisite: MEC2100 Power Assist Accessories

Module Description: Students describe how safety systems can be tested, diagnosed, replaced or repaired.

Module Learner Expectations: *The student will:*

- demonstrate established safety and care procedures while working with safety systems
- list and compare safety systems that protect vehicle occupants
- diagnose and service vehicle safety systems
- demonstrate basic competencies.

MODULE MEC3110: CLIMATE CONTROL

Level: Advanced

Theme: Guidance and Control Systems

Prerequisite: MEC2030 Lubrication & Cooling

Module Description: Students expand their knowledge of the purpose, operation and servicing of standard heating and air conditioning systems.

Module Learner Expectations: *The student will:*

- demonstrate established safety and care procedures when working with climate control systems
- identify the purpose and describe the functions of heater and air conditioning system components
- perform inspection, diagnosis, service and repair procedures on heater and air conditioning systems
- identify global concerns about the release of refrigerants into the atmosphere as well as the alternatives to standard refrigerants, and identify the required recycling procedures
- demonstrate basic competencies.

MODULE MEC3120: POWER ASSISTING

Level: Advanced

Theme: Guidance and Control Systems

Prerequisite: MEC2100 Power Assist Accessories

Module Description: Students further develop their knowledge of the purpose, operation, service and repair of pneumatic, hydraulic and electric power assist devices.

Module Learner Expectations: *The student will:*

- demonstrate established safety and care procedures when working with power assists
- identify applications of power assist components to various vehicle systems and determine the rationale for each application
- perform service and repair procedures to pneumatic, hydraulic and electric power assist devices according to manufacturers' recommendations
- demonstrate basic competencies.

MODULE MEC3130: AUTOMATIC TRANSMISSIONS

Level: Advanced

Theme: Guidance and Control Systems

Prerequisite: MEC1110 Pneumatics & Hydraulics

Module Description: Students develop knowledge of automatic transmissions and transaxles, and skills in diagnosing and executing minor automatic transmission and transaxle repair requirements.

Module Learner Expectations: *The student will:*

- demonstrate established safety and care procedures when working with automatic transmissions and transaxles
- identify the parts of a torque converter and automatic transmission or transaxle, and determine the path of power and the shifting control operation in each gear setting
- inspect, diagnose, service and complete a minor repair to an automatic transmission and transaxle assembly
- demonstrate basic competencies.

MODULE MEC3140: DRIVE TRAIN REPAIR

Level: Advanced

Theme: Guidance and Control Systems

Prerequisite: MEC2130 Drive Trains

Module Description: Students perform overhauls on clutch, transmission and differential assemblies.

Module Learner Expectations: *The student will:*

- demonstrate established safe work practices, and follow established lab procedures
- replace a clutch assembly
- remove, overhaul and replace a manual transmission/transaxle
- measure and adjust a differential assembly
- overhaul a drive axle assembly
- demonstrate basic competencies.

MODULE MEC3150: WHEEL ALIGNMENT

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC2150 Suspension Systems

Module Description: Students develop the knowledge, skills and attitudes necessary for repairing and aligning various vehicle steering systems.

Module Learner Expectations: *The student will:*

- follow established safe work procedures
- investigate and determine the condition of various components that affect wheel alignment and tracking
- identify measurements and angles used to check and adjust suspension and steering systems
- use specialized alignment equipment to check and adjust alignment angles on various suspension types to manufacturers' specifications
- use road test information to determine the quality of service work performed
- demonstrate basic competencies.

MODULE MEC3160: BODY REPAIR ESTIMATION

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC1160 Structures & Materials

Module Description: Students apply knowledge in estimating, including close attention to detail in determining the cost of a repair.

Module Learner Expectations: *The student will:*

- state the role of insurance in the body repair industry and legal obligations involved in estimating
- identify and describe types of body damage
- outline skills needed to successfully estimate collision damage
- complete an estimate by determining what parts/components are to be replaced or repaired and their subsequent costs
- demonstrate basic competencies.

MODULE MEC3170: DAMAGE ANALYSIS

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC2170 Metal Repair & Finishing

Module Description: Students identify and examine physical damage caused by collisions, and learn cost estimating procedures.

Module Learner Expectations: *The student will:*

- demonstrate established safe work procedures
- identify types and signs of collision damage
- examine and use measurements to determine extent of vehicle damage
- prepare a repair strategy for a given vehicle
- demonstrate basic competencies.

MODULE MEC3180: DAMAGE REPAIR 1

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC2170 Metal Repair & Finishing

Module Description: Students examine the methods used to complete a repair involving removing, replacing and aligning of body parts.

Module Learner Expectations: *The student will:*

- demonstrate established safety procedures
- follow an approved sequence of repairs involving removing and replacing damaged external parts
- align parts used to repair and prepare components for painting or priming
- remove, repair or replace trim parts as required
- demonstrate basic competencies.

MODULE MEC3190: DAMAGE REPAIR 2

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC3180 Damage Repair 1

Module Description: Students examine methods used to complete a collision repair involving unibody parts replacement and frame correction.

Module Learner Expectations: *The student will:*

- demonstrate established safe work procedures
- describe construction features and materials used in vehicle bodies and methods of repair
- use a "bench" frame straightening system and related measurements to straighten/align a component
- identify misalignment of frame and suspension parts and components
- correct frame/body alignment involving replacement of unibody panels and use of hydraulic jacks and welders
- explain the importance of proper frame and suspension alignment, including legal implications
- demonstrate basic competencies.

MODULE MEC3200: REFINISHING 2

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC2200 Refinishing 1

Module Description: Students demonstrate finishing skills and techniques related to the preparation and application of metallic paints.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices and follow all warnings identified by product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety
- describe top coats, solvents and additives used in surface finishes
- apply metallic, tutone and/or base/clear coat and acrylic enamel finishes
- apply problem-solving techniques to paint and equipment problems
- demonstrate basic competencies.

MODULE MEC3210: PLASTIC & FIBREGLASS

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC1160 Structures & Materials

Module Description: Students determine the types of plastic and fibreglass materials required for repairs, and perform appropriate repair procedures.

Module Learner Expectations: *The student will:*

- identify hazards and safety precautions to be observed when working with plastics
- describe types of plastics, welding equipment and bonding processes used to repair plastic parts
- apply plastic welding and/or bonding techniques to repair a plastic component
- identify types of fibreglass materials and repair procedures
- perform a fibreglass repair on a component
- demonstrate basic competencies.

MODULE MEC3220: GLASS REPLACEMENT

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC2180 Trim Replacement

Module Description: Students demonstrate knowledge, skills and practice related to vehicle glass installation and adjustment.

Module Learner Expectations: *The student will:*

- handle glass and related materials safely
- identify glass types and glass retaining systems
- demonstrate knowledge of tools and procedures used by glass technicians
- complete glass removal installations and adjustments
- demonstrate basic competencies.

MODULE MEC3230: REFINISHING 3

Level: Advanced

Theme: Suspension and Structural Systems

Prerequisite: MEC3200 Refinishing 2

Module Description: Students demonstrate knowledge and skills of advanced finishing techniques, including custom painting, mixing, tinting, colour and texture matching.

Module Learner Expectations: *The student will:*

- demonstrate safe work practices, and follow all product warnings and labels identified by the product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety
- investigate and describe advanced products, techniques and equipment used to achieve an acceptable original equipment manufacturer finish
- apply an advanced level finish
- demonstrate basic competencies.