
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.



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.



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

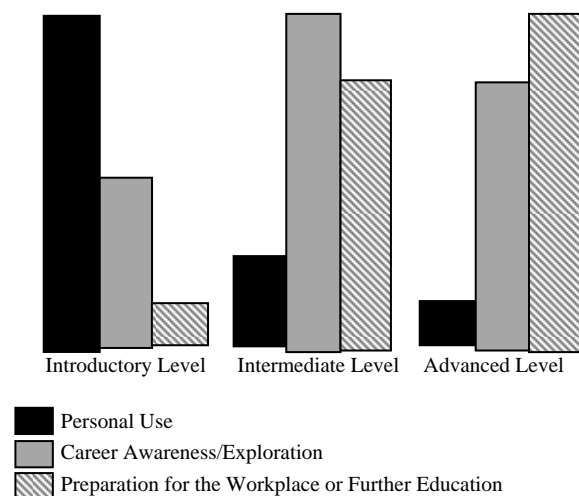
Courses are organized into three levels of achievement: **introductory**, **intermediate** and **advanced**. As students progress through the levels, they will be expected to meet higher standards and demonstrate an increased degree of competence, in both the program outcomes and the general outcomes 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— <i>The student:</i>	Stage 2— <i>The student:</i>	Stage 3— <i>The student:</i>	Stage 4— <i>The student:</i>
<p>Managing Learning</p> <ul style="list-style-type: none"> <input type="checkbox"/> comes to class prepared for learning <input type="checkbox"/> follows basic instructions, as directed <input type="checkbox"/> acquires specialized knowledge, skills and attitudes <input type="checkbox"/> identifies criteria for evaluating choices and making decisions <input type="checkbox"/> uses a variety of learning strategies 	<p><input type="checkbox"/> </p> <ul style="list-style-type: none"> <input type="checkbox"/> follows instructions, with limited direction <input type="checkbox"/> sets goals and establishes steps to achieve them, with direction <input type="checkbox"/> applies specialized knowledge, skills and attitudes in practical situations <input type="checkbox"/> identifies and applies a range of effective strategies for solving problems and making decisions <input type="checkbox"/> explores and uses a variety of learning strategies, with limited direction 	<p><input type="checkbox"/> </p> <ul style="list-style-type: none"> <input type="checkbox"/> follows detailed instructions on an independent basis <input type="checkbox"/> sets clear goals and establishes steps to achieve them <input type="checkbox"/> transfers and applies specialized knowledge, skills and attitudes in a variety of situations <input type="checkbox"/> uses a range of critical thinking skills to evaluate situations, solve problems and make decisions <input type="checkbox"/> selects and uses effective learning strategies <input type="checkbox"/> cooperates with others in the effective use of learning strategies 	<p><input type="checkbox"/> </p> <p><input type="checkbox"/> </p> <ul style="list-style-type: none"> <input type="checkbox"/> demonstrates self-direction in learning, goal setting and goal achievement <input type="checkbox"/> transfers and applies learning in new situations; demonstrates commitment to lifelong learning <input type="checkbox"/> thinks critically and acts logically to evaluate situations, solve problems and make decisions <input type="checkbox"/> <input type="checkbox"/> provides leadership in the effective use of learning strategies
<p>Managing Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> adheres to established timelines; uses time/schedules/planners effectively <input type="checkbox"/> uses information (material and human resources), as directed <input type="checkbox"/> uses technology (facilities, equipment, supplies), as directed, to perform a task or provide a service <input type="checkbox"/> maintains, stores and/or disposes of equipment and materials, as directed 	<ul style="list-style-type: none"> <input type="checkbox"/> creates and adheres to timelines, with limited direction; uses time/schedules/planners effectively <input type="checkbox"/> accesses and uses a range of relevant information (material and human resources), with limited direction <input type="checkbox"/> uses technology (facilities, equipment, supplies), as appropriate, to perform a task or provide a service, with minimal assistance and supervision <input type="checkbox"/> maintains, stores and/or disposes of equipment and materials, with limited assistance 	<ul style="list-style-type: none"> <input type="checkbox"/> creates and adheres to detailed timelines on an independent basis; prioritizes task; uses time/schedules/planners effectively <input type="checkbox"/> accesses a range of information (material and human resources), and recognizes when additional resources are required <input type="checkbox"/> selects and uses appropriate technology (facilities, equipment, supplies) to perform a task or provide a service on an independent basis <input type="checkbox"/> maintains, stores and/or disposes of equipment and materials on an independent basis 	<ul style="list-style-type: none"> <input type="checkbox"/> creates and adheres to detailed timelines; uses time/schedules/planners effectively; prioritizes tasks on a consistent basis <input type="checkbox"/> uses a wide range of information (material and human resources) in order to support and enhance the basic requirement <input type="checkbox"/> recognizes the monetary and intrinsic value of managing technology (facilities, equipment, supplies) <input type="checkbox"/> demonstrates effective techniques for managing facilities, equipment and supplies
<p>Problem Solving and Innovation</p> <ul style="list-style-type: none"> <input type="checkbox"/> participates in problem solving as a process <input type="checkbox"/> learns a range of problem-solving skills and approaches <input type="checkbox"/> practices problem-solving skills by responding appropriately to a clearly defined problem, specified goals and constraints, by: <ul style="list-style-type: none"> – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action 	<ul style="list-style-type: none"> <input type="checkbox"/> identifies the problem and selects an appropriate problem-solving approach, responding appropriately to specified goals and constraints <input type="checkbox"/> applies problem-solving skills to a directed or a self-directed activity, by: <ul style="list-style-type: none"> – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action 	<ul style="list-style-type: none"> <input type="checkbox"/> thinks critically and acts logically in the context of problem solving <input type="checkbox"/> transfers problem-solving skills to real-life situations, by generating new possibilities <input type="checkbox"/> prepares implementation plans <input type="checkbox"/> recognizes risks 	<ul style="list-style-type: none"> <input type="checkbox"/> identifies and resolves problems efficiently and effectively <input type="checkbox"/> identifies and suggests new ideas to get the job done creatively, by: <ul style="list-style-type: none"> – combining ideas or information in new ways – making connections among seemingly unrelated ideas – seeking out opportunities in an active manner

Stage 1— <i>The student:</i>	Stage 2— <i>The student:</i>	Stage 3— <i>The student:</i>	Stage 4— <i>The student:</i>
<p>Communicating Effectively</p> <ul style="list-style-type: none"> <input type="checkbox"/> uses communication skills; e.g., reading, writing, illustrating, speaking <input type="checkbox"/> uses language in appropriate context <input type="checkbox"/> listens to understand and learn <input type="checkbox"/> demonstrates positive interpersonal skills in selected contexts 	<ul style="list-style-type: none"> <input type="checkbox"/> communicates thoughts, feelings and ideas to justify or challenge a position, using written, oral and/or visual means <input type="checkbox"/> uses technical language appropriately <input type="checkbox"/> listens and responds to understand and learn <input type="checkbox"/> demonstrates positive interpersonal skills in many contexts 	<ul style="list-style-type: none"> <input type="checkbox"/> prepares and effectively presents accurate, concise, written, visual and/or oral reports providing reasoned arguments <input type="checkbox"/> encourages, persuades, convinces or otherwise motivates individuals <input type="checkbox"/> listens and responds to understand, learn and teach <input type="checkbox"/> demonstrates positive interpersonal skills in most contexts 	<ul style="list-style-type: none"> <input type="checkbox"/> negotiates effectively, by working toward an agreement that may involve exchanging specific resources or resolving divergent interests <input type="checkbox"/> negotiates and works toward a consensus <input type="checkbox"/> listens and responds to understand, learn, teach and evaluate <input type="checkbox"/> promotes positive interpersonal skills among others
<p>Working with Others</p> <ul style="list-style-type: none"> <input type="checkbox"/> fulfills responsibility in a group project <input type="checkbox"/> works collaboratively in structured situations with peer members <input type="checkbox"/> acknowledges the opinions and contributions of others in the group 	<ul style="list-style-type: none"> <input type="checkbox"/>  <input type="checkbox"/> cooperates to achieve group results <input type="checkbox"/> maintains a balance between speaking, listening and responding in group discussions <input type="checkbox"/> respects the feelings and views of others 	<ul style="list-style-type: none"> <input type="checkbox"/> seeks a team approach, as appropriate, based on group needs and benefits; e.g., idea potential, variety of strengths, sharing of workload <input type="checkbox"/> works in a team or group: <ul style="list-style-type: none"> – encourages and supports team members – helps others in a positive manner – provides leadership/followership as required – negotiates and works toward consensus as required 	<ul style="list-style-type: none"> <input type="checkbox"/> leads, where appropriate, mobilizing the group for high performance <input type="checkbox"/> understands and works within the context of the group <input type="checkbox"/> prepares, validates and implements plans that reveal new possibilities
<p>Demonstrating Responsibility</p> <p>Attendance</p> <ul style="list-style-type: none"> <input type="checkbox"/> demonstrates responsibility in attendance, punctuality and task completion <p>Safety</p> <ul style="list-style-type: none"> <input type="checkbox"/> follows personal and environmental health and safety procedures <input type="checkbox"/> identifies immediate hazards and their impact on self, others and the environment <input type="checkbox"/> follows appropriate/emergency response procedures <p>Ethics</p> <ul style="list-style-type: none"> <input type="checkbox"/> makes personal judgements about whether or not certain behaviours/actions are right or wrong 	<ul style="list-style-type: none"> <input type="checkbox"/>  <input type="checkbox"/> recognizes and follows personal and environmental health and safety procedures <input type="checkbox"/> identifies immediate and potential hazards and their impact on self, others and the environment <input type="checkbox"/>  <input type="checkbox"/> assesses how personal judgements affect other peer members and/or family; e.g., home and school 	<ul style="list-style-type: none"> <input type="checkbox"/>  <input type="checkbox"/> establishes and follows personal and environmental health and safety procedures <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> assesses the implications of personal/group actions within the broader community; e.g., workplace 	<ul style="list-style-type: none"> <input type="checkbox"/>  <input type="checkbox"/> transfers and applies personal and environmental health and safety procedures to a variety of environments and situations <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> demonstrates accountability for actions taken to address immediate and potential hazards <input type="checkbox"/> analyzes the implications of personal/group actions within the global context <input type="checkbox"/> states and defends a personal code of ethics as required
<p>★Developmental Framework</p> <ul style="list-style-type: none"> • <i>Simple task</i> • <i>Structured environment</i> • <i>Directed learning</i> 	<ul style="list-style-type: none"> • <i>Task with limited variables</i> • <i>Less structured environment</i> • <i>Limited direction</i> 	<ul style="list-style-type: none"> • <i>Task with multiple variables</i> • <i>Flexible environment</i> • <i>Self-directed learning, seeking assistance as required</i> 	<ul style="list-style-type: none"> • <i>Complex task</i> • <i>Open environment</i> • <i>Self-directed/self-motivated</i>

FABRICATION STUDIES

B. STRAND RATIONALE AND PHILOSOPHY

Metal products and structures have shaped world history. For thousands of years, metals have been shaped, joined and cast into items that have utilitarian and artistic value. Today, the search continues to develop new metals, processes and products for the 21st century.

The fabricated materials sector of the Canadian economy is characterized by a large number of small entrepreneurial businesses that supply the construction and manufacturing industries' intermediate or finished product requirements. This sector is a medium technology industry that depends principally on metals and related materials.

To compete in North American and global markets, the fabricated materials sector is investing in leading-edge technology and is hiring highly trained and talented people to manage and operate this technology effectively and efficiently.

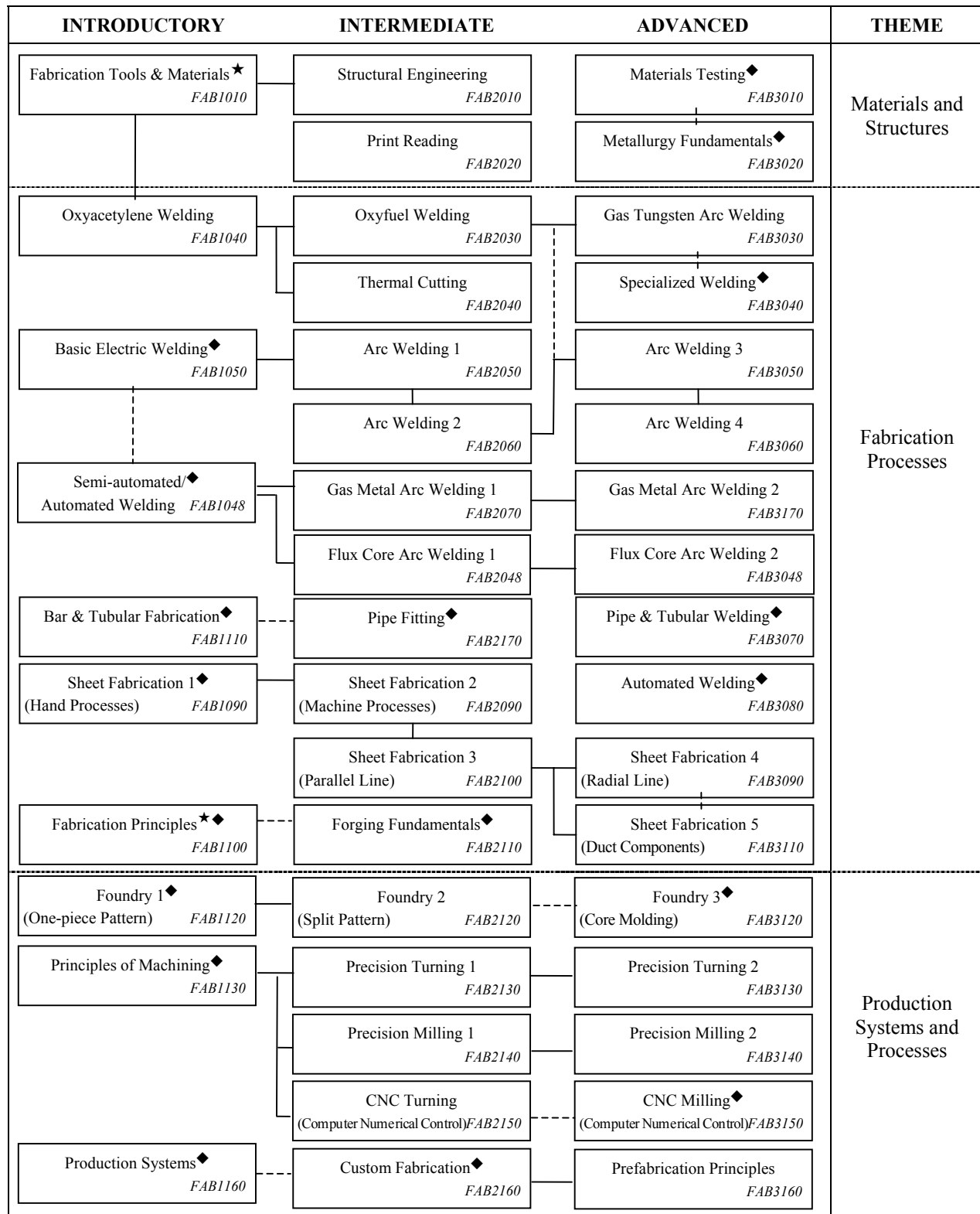
The Fabrication Studies strand has been developed within Career and Technology Studies to help meet this training need. Students selecting courses from the Fabrication Studies strand have the opportunity to investigate and develop important knowledge, skills and attitudes related to the properties of materials and the design and fabrication of products.

In this strand, students are provided with a broad base of relevant theory and practice that builds daily living and career-specific skills. Successful completion of advanced level courses gives students the skills and experience required for entry-level employment or for post-secondary education.

Within the philosophy of Career and Technology Studies, *students* in Fabrication Studies *will*:

- develop safe work and environmental practices
- develop self- and resource-management skills
- link the knowledge, skills and attitudes developed in other courses in meaningful and practical ways to the study of fabrication processes
- demonstrate flexibility, cooperative work behaviours, and effective communication and leadership skills
- link theory and practice, using available resources, tools and materials responsibly and efficiently
- expand personal knowledge and appreciation of career options and training opportunities.

SCOPE AND SEQUENCE



—— Prerequisite

----- Recommended sequence

★ Course provides a strong foundation for further learning in this strand.

◆ Refer to specific course for additional prerequisites.

GENERAL OUTCOMES: INTRODUCTORY LEVEL

COURSE FAB1010: FABRICATION TOOLS & MATERIALS

Level: Introductory

Theme: Materials and Structures

Prerequisite: None

Description: Students develop knowledge and skills in the use of basic hand tools and materials used in fabrication processes, and safely transform common metals into useful products.

General Outcomes: *The student will:*

- identify and describe the safe use of basic hand tools used in fabricating an artifact or structure
- identify and compare the properties of common ferrous and nonferrous metals used in fabrication processes
- apply fabrication processes and skills in a safe manner to produce a useful product
- demonstrate basic competencies.

COURSE FAB1040: OXYACETYLENE WELDING

Level: Introductory

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students develop basic skills in the safe handling and operation of oxyacetylene equipment.

General Outcomes: *The student will:*

- recognize health and safety hazards associated with oxyacetylene welding (OAW), and take preventive measures to avoid accidents and personal injury to self and others
- perform safe oxyacetylene start-up and shut-down procedures
- demonstrate basic oxyacetylene welding competencies
- demonstrate basic competencies.

COURSE FAB1050: BASIC ELECTRIC WELDING

Level: Introductory

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students develop basic skills related to safe use and operation of one or more common electric welding processes.

General Outcomes: *The student will:*

- recognize health and safety hazards associated with electric welding processes, and preventive measures to avoid accidents and personal injury to self and others
- perform safe gas metal and/or shielded metal arc welding start-up and shut-down procedures
- demonstrate basic arc welding competencies
- demonstrate basic competencies.

COURSE FAB1090: SHEET FABRICATION 1 (HAND PROCESSES)

Level: Introductory

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students use basic tools, materials and processes to fabricate sheet materials into finished products, models or prototypes.

General Outcomes: *The student will:*

- identify and describe basic tools and processes used to fabricate sheet stock
- demonstrate basic measurement and layout skills and techniques
- apply basic sheet stock fabrication skills and techniques to produce a product
- demonstrate basic competencies.

COURSE FAB1100: FABRICATION PRINCIPLES

Level: Introductory

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students investigate and apply fundamental principles of fabrication to build an artifact or structure from common structural materials.

General Outcomes: *The student will:*

- identify and describe the principles of separating, forming and combining materials
- describe the characteristics and give examples of permanent, semipermanent and temporary fastening systems
- demonstrate basic fabrication skills and techniques, using simple hand and power tools
- demonstrate basic competencies.

COURSE FAB1110: BAR & TUBULAR FABRICATION

Level: Introductory

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students use cutting, bending and fastening processes to create a variety of products from bar and tubular stock.

General Outcomes: *The student will:*

- list and describe common shapes and sizes of bar and tubular stock
- demonstrate approved material handling and storage practices
- apply basic bar and tubular fabrication skills and techniques to produce a product
- demonstrate basic competencies.

COURSE FAB1120: FOUNDRY 1 (ONE-PIECE PATTERN)

Level: Introductory

Theme: Production Systems and Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students develop the basic skills required to produce a simple one-piece pattern, a sand mold and a finished casting.

General Outcomes: *The student will:*

- recognize health and safety hazards associated with casting metal, and take preventive measures to avoid accidents and personal injury to self and others
- demonstrate basic pattern making skills to make a one-piece mold
- demonstrate basic sand casting skills, using a one-piece pattern
- demonstrate basic competencies.

COURSE FAB1130: PRINCIPLES OF MACHINING

Level: Introductory

Theme: Production Systems and Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students develop basic hand and machine tool knowledge, skills and techniques to mechanically remove materials.

General Outcomes: *The student will:*

- identify and describe common machineable materials and machining processes
- perform safe set up, operation and shut down of equipment used in drilling, grinding and turning operations
- demonstrate basic hand and machine tool knowledge, skills and techniques
- demonstrate basic competencies.

COURSE FAB1160: PRODUCTION SYSTEMS

Level: Introductory

Theme: Production Systems and Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students investigate and compare the principles of production operation and the characteristics of a number of production systems.

General Outcomes: *The student will:*

- list and describe common methods of manufacturing durable products
- demonstrate basic production planning and management skills
- identify the present and future career opportunities related to the production of durable products
- demonstrate basic competencies.

COURSE FAB1048: SEMI-AUTOMATED/AUTOMATED WELDING

Level: Introductory

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students develop basic knowledge and skills related to the use of gas metal arc welding (GMAW) and flux core arc welding (FCAW) processes in both personal use and commercial applications. They also develop introductory knowledge of submerged arc welding (SAW) processes.

General Outcomes: *The student will:*

- identify health and safety hazards associated with GMAW, FCAW and SAW processes, and take preventative measures to avoid accidents and personal injury to self and others
- identify power sources used in GMAW, FCAW and SAW processes
- select appropriate electrode wires and shielding gases for use in GMAW and FCAW processes
- perform safe start-up and shut-down procedures for GMAW and/or FCAW processes
- demonstrate safe GMAW and/or FCAW processes on light gauge mild steel and/or mild steel plate in the flat and horizontal positions
- demonstrate basic competencies.

GENERAL OUTCOMES: INTERMEDIATE LEVEL

COURSE FAB2010: STRUCTURAL ENGINEERING

Level: Intermediate

Theme: Materials and Structures

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students investigate the nature of forces and structural materials, and apply their findings to design and fabrication activities.

General Outcomes: *The student will:*

- list and describe the principal characteristics of all structures
- identify strategies to improve the efficiency of a structure
- apply principles of structural design to fabrication and construction activities
- demonstrate basic competencies.

COURSE FAB2020: PRINT READING

Level: Intermediate

Theme: Materials and Structures

Prerequisite: None

Description: Students develop basic skills in reading and interpreting working drawings to prepare a bill of materials and sequence of operations.

General Outcomes: *The student will:*

- identify and describe the principal components of a print
- demonstrate basic print reading skills
- demonstrate basic competencies.

COURSE FAB2030: OXYFUEL WELDING

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1040 Oxyacetylene Welding

Description: Students develop basic skills in the safe and efficient use of oxyfuel equipment and supplies to braze and fusion weld.

General Outcomes: *The student will:*

- describe the essential differences between braze welding and fusion welding
- demonstrate basic braze welding competencies
- demonstrate basic oxyfuel weld (OFW) competencies in the flat, horizontal and vertical positions
- demonstrate basic competencies.

COURSE FAB2040: THERMAL CUTTING

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1040 Oxyacetylene Welding

Description: Students develop basic skills to use, safely and efficiently, thermal cutting equipment and supplies.

General Outcomes: *The student will:*

- identify health and safety hazards associated with thermal cutting, and take preventive measures to avoid accidents and personal injury to self and others
- perform safe start-up and shut-down cutting procedures
- demonstrate basic manual cutting operations
- demonstrate basic competencies.

COURSE FAB2050: ARC WELDING 1

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1050 Basic Electric Welding

Description: Students develop basic knowledge, skills and attitudes related to the operation and use of shielded metal arc welding (SMAW) equipment and accessories to make a variety of welds in the flat position.

General Outcomes: *The student will:*

- identify the appropriate treatment for minor injuries associated with welding processes
- describe the visual characteristics of a desirable weld
- demonstrate basic SMAW competencies in the flat position
- demonstrate basic competencies.

COURSE FAB2060: ARC WELDING 2

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB2050 Arc Welding 1

Description: Students identify appropriate electrodes, visually assessing a weld, and making the necessary adjustments to improve weld quality while developing horizontal position welding skills.

General Outcomes: *The student will:*

- explain the current systems used to classify electrodes in Canada and the United States
- identify strategies to assess and improve weld quality
- demonstrate basic shielded metal arc welding (SMAW) competencies in the horizontal position
- demonstrate basic competencies.

COURSE FAB2070: GAS METAL ARC WELDING 1

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1048 Semi-automated/Automated Welding

Description: Students develop an understanding of the advantages and disadvantages of gas metal arc welding (GMAW) processes, and they gain experience using GMAW processes by performing flat, horizontal and vertical fillet welds and flat groove welds.

General Outcomes: *The student will:*

- outline the advantages and disadvantages of GMAW processes versus other forms of arc welding processes
- describe the characteristics of a desirable gas metal arc weld
- perform safe set-up and maintenance procedures with GMAW equipment
- demonstrate safe GMAW practices to perform:
 - fillet welds on mild steel plate in the flat, horizontal and vertical positions
 - groove welds on mild steel plate in the flat position
- demonstrate basic competencies.

COURSE FAB2090: SHEET FABRICATION 2 (MACHINE PROCESSES)

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1090 Sheet Fabrication 1 (Hand Processes)

Description: Students use basic layout, cutting, bending and fastening operations to transform common types of sheet metals into consumer products.

General Outcomes: *The student will:*

- identify and describe common types of stock sheet metal materials and related tools
- demonstrate approved materials handling and storage practices
- perform basic sheet metal fabrication skills and practices to produce a product
- demonstrate basic competencies.

COURSE FAB2100: SHEET FABRICATION 3 (PARALLEL LINE)

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB2090 Sheet Fabrication 2 (Machine Processes)

Description: Students expand sheet metal skills related to pattern making, seam constructing and edge treating.

General Outcomes: *The student will:*

- describe and give examples of parallel line developments
- create a parallel line development, using standard drawing and layout practices
- apply sheet metal fabrication principles skills to fabricate a product, using parallel line development
- demonstrate basic competencies.

COURSE FAB2110: FORGING FUNDAMENTALS

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1110 Bar & Tubular Fabrication

Description: Students determine the effects of heating and striking metal to change its shape and internal structure, using forging techniques.

General Outcomes: *The student will:*

- identify health and safety hazards associated with metal forging, and take preventive measures to avoid accidents and personal injury to self and others
- identify and describe the basic tools and processes used in forging
- demonstrate basic metal forging skills and practices
- demonstrate basic competencies.

COURSE FAB2120: FOUNDRY 2 (SPLIT PATTERN)

Level: Intermediate

Theme: Production Systems and Processes

Prerequisite: FAB1120 Foundry 1 (One-piece Pattern)

Description: Students expand their pattern making and foundry skills to produce split pattern molds and finished castings.

General Outcomes: *The student will:*

- describe the essential similarities and differences between a one-piece pattern and a split pattern
- describe and perform safe start-up and shut-down procedures for the operation of a foundry furnace
- demonstrate basic pattern making skills to make a split pattern
- apply sand casting principles and skills to make a casting from a split pattern
- demonstrate basic competencies.

COURSE FAB2130: PRECISION TURNING 1

Level: Intermediate

Theme: Production Systems and Processes

Prerequisite: FAB1130 Principles of Machining

Description: Students develop basic turning skills to size, shape and finish common machineable metals and plastics.

General Outcomes: *The student will:*

- identify health and safety hazards specific to metal turning, and take preventive measures to avoid accidents and personal injury to self and others
- perform safe metal lathe set-up, operation and shut-down procedures
- demonstrate basic straight turning and finishing skills
- demonstrate basic competencies.

COURSE FAB2140: PRECISION MILLING 1

Level: Intermediate

Theme: Production Systems and Processes

Prerequisite: FAB1130 Principles of Machining

Description: Students develop basic milling skills to shape and finish common machineable metals and plastics.

General Outcomes: *The student will:*

- identify health and safety hazards specific to milling operations, and take preventive measures to avoid accidents and personal injury to self and others
- perform safe milling machine set-up, operation and shut-down procedures
- demonstrate basic milling machine skills and practices
- demonstrate basic competencies.

COURSE FAB2150: CNC TURNING (COMPUTER NUMERICAL CONTROL)

Level: Intermediate

Theme: Production Systems and Processes

Prerequisite: FAB1130 Principles of Machining

Description: Students develop skills in computer assisted design (CAD) and computer numerical control (CNC) programming to manufacture a product on a CNC lathe.

General Outcomes: *The student will:*

- identify safety hazards associated with CNC equipment and, take preventive measures to avoid accidents and personal injury to self and others
- demonstrate two-dimensional programming and/or CAD skills
- apply CNC programming skills to manufacture a turned part
- demonstrate basic competencies.

COURSE FAB2160: CUSTOM FABRICATION

Level: Intermediate

Theme: Production Systems and Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students work independently, or in a cooperative learning environment, to plan and construct a product/structure that meets a specific client's needs.

General Outcomes: *The student will:*

- demonstrate appropriate communicating and planning skills
- demonstrate effective resource management skills and practices
- demonstrate custom fabrication competencies
- demonstrate basic competencies.

COURSE FAB2170: PIPE FITTING

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students learn about the uses of pipes, basic piping principles and fabrication skills.

General Outcomes: *The student will:*

- identify and describe common pipe fitting materials and applications
- research and profile a trade or occupation within the pipe fitting field
- demonstrate approved methods of joining common types of pipes and materials
- demonstrate basic competencies.

COURSE FAB2048: FLUX CORE ARC WELDING 1

Level: Intermediate

Theme: Fabrication Processes

Prerequisite: FAB1048 Semi-automated/Automated Welding

Description: Students develop an understanding of the advantages and disadvantages of flux core arc welding (FCAW) processes, and they gain experience using FCAW processes by performing flat, horizontal and vertical fillet welds and flat groove welds.

General Outcomes: *The student will:*

- outline the advantages and disadvantages of FCAW processes versus other forms of arc welding processes
- describe the characteristics of a desirable flux core arc weld
- perform safe set-up and maintenance procedures with FCAW equipment
- demonstrate safe FCAW practices and perform:
 - fillet welds on mild steel plate in the flat, horizontal and vertical positions
 - groove welds on mild steel plate in the flat position
- demonstrate basic competencies.

GENERAL OUTCOMES: ADVANCED LEVEL

COURSE FAB3010: MATERIALS TESTING

Level: Advanced

Theme: Materials and Structures

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students are introduced to the principles of materials testing, and to the development and evaluation of a mechanical materials test.

General Outcomes: *The student will:*

- describe the purpose and nature of materials testing
- apply testing principles to construct or use a piece of materials testing apparatus
- test and compare the properties of common materials used in construction and fabrication
- demonstrate basic competencies.

COURSE FAB3020: METALLURGY FUNDAMENTALS

Level: Advanced

Theme: Materials and Structures

Prerequisite: FAB1010 Fabrication Tools & Materials

Description: Students develop fundamental understandings and skills related to metallurgy, and apply these skills to fabrication processes.

General Outcomes: *The student will:*

- identify and describe the fundamental principles of metallurgy and their industrial applications
- identify the basic alloy components and properties of common alloys
- apply metallurgical principles, skills and processes to heat treat a component or product
- demonstrate basic competencies.

COURSE FAB3030: GAS TUNGSTEN ARC WELDING

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2030 Oxyfuel Welding

Description: Students develop basic knowledge and skills related to the use of gas tungsten arc welding (GTAW) equipment and supplies to weld mild steel in the flat and horizontal positions.

General Outcomes: *The student will:*

- identify health and safety hazards associated with GTAW, and take preventive measures to avoid accidents and personal injury to self and others
- outline the advantages of GTAW over other forms of welding
- demonstrate basic GTAW competencies in the flat and horizontal positions
- demonstrate basic competencies.

COURSE FAB3040: SPECIALIZED WELDING

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2030 Oxyfuel Welding

Description: Students develop specific skills associated with advanced welding techniques to join and repair metals other than low carbon steel.

General Outcomes: *The student will:*

- list health and safety specific hazards associated with welding metals other than low carbon steels, and take preventive measures to avoid accidents and personal injury to self and others
- describe the unique welding characteristics of weldable metals other than low carbon steel
- select appropriate filler material and welding process to weld a metal other than low carbon steel
- demonstrate basic competencies.

COURSE FAB3050: ARC WELDING 3

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2060 Arc Welding 2

Description: Students learn the role of codes and standards in the welding trade, as well as test welds and develop vertical position welding skills.

General Outcomes: *The student will:*

- examine and maintain sheet metal arc welding (SMAW) equipment and accessories
- read and interpret weld drawings and symbols
- demonstrate advanced level SMAW competencies in the vertical position
- demonstrate basic competencies.

COURSE FAB3060: ARC WELDING 4

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB3050 Arc Welding 3

Description: Students apply and extend positional welding skills, by using a variety of common electrodes and thickness of materials.

General Outcomes: *The student will:*

- explain the effects heating and cooling have on a weld and weldment
- demonstrate advanced level sheet metal arc welding (SMAW) competencies in the flat, horizontal and vertical positions
- describe a career related to the welding field
- demonstrate basic competencies.

COURSE FAB3070: PIPE & TUBULAR WELDING

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB3170 Gas Metal Arc Welding 2

Description: Students develop specific skills related to pipe layout, preparation of pipe/tube joints and welding techniques.

General Outcomes: *The student will:*

- identify health and safety hazards associated with pipe and enclosed vessel welding, and take preventive measures to avoid accident and personal injury to self and others
- describe the advances made in pipe welding, and identify common types of joints and welding procedures
- demonstrate basic pipe/tube preparation and welding competencies
- demonstrate basic competencies.

COURSE FAB3080: AUTOMATED WELDING

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB3170 Gas Metal Arc Welding 2

Description: Students investigate and describe the operation of various manual, semi-automated and automated welding processes and systems used in fabrication industries.

General Outcomes: *The student will:*

- explain how manual, semi-automated and automated welding processes differ from one another
- identify employment and further training opportunities related to production welding
- apply knowledge of advanced welding processes to demonstrate/simulate an automated welding system
- demonstrate basic competencies.

COURSE FAB3090: SHEET FABRICATION 4 (RADIAL LINE)

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2100 Sheet Fabrication 3 (Parallel Line)

Description: Students develop specialized skills in cylindrical and conical pattern development and seam construction of ferrous and nonferrous sheet metals.

General Outcomes: *The student will:*

- describe the procedures that are used to lay out a typical cylindrical and conical shape
- demonstrate parallel and radial line pattern making skills
- perform advanced cylindrical and conical sheet stock fabrication skills and processes
- demonstrate basic competencies.

COURSE FAB3110: SHEET FABRICATION 5 (DUCT COMPONENTS)

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2100 Sheet Fabrication 3 (Parallel Line)

Description: Students apply and develop specialized skills in duct component pattern making and fabrication techniques.

General Outcomes: *The student will:*

- identify common duct components and applications
- demonstrate the principle of triangulation to create a transition pattern
- apply pattern making and sheet metal fabrication skills to create a duct component
- demonstrate basic competencies.

COURSE FAB3120: FOUNDRY 3 (CORE MOLDING)

Level: Advanced

Theme: Production Systems and Processes

Prerequisite: FAB1120 Foundry 1 (One-piece Pattern)

Description: Students investigate and apply advanced foundry processes to produce a hollow casting, using a sand and core mold.

General Outcomes: *The student will:*

- list and describe common core materials and production processes
- demonstrate advanced sand casting and coring skills and techniques
- create a profile of a trade or occupation within the foundry field
- demonstrate basic competencies.

COURSE FAB3130: PRECISION TURNING 2

Level: Advanced

Theme: Production Systems and Processes

Prerequisite: FAB2130 Precision Turning 1

Description: Students develop specialized lathe skills for thread cutting and taper turning techniques.

General Outcomes: *The student will:*

- demonstrate print reading and job sequencing competencies
- perform safe taper turning and thread cutting set-up procedures
- perform taper turning and thread cutting operations
- demonstrate basic competencies.

COURSE FAB3140: PRECISION MILLING 2

Level: Advanced

Theme: Production Systems and Processes

Prerequisite: FAB2140 Precision Milling 1

Description: Students develop specialized skills to use vertical and/or horizontal milling machines.

General Outcomes: *The student will:*

- demonstrate print reading and job sequencing competencies
- perform safe vertical and/or horizontal mill set-up procedures
- perform groove keyway and gear cutting operations
- demonstrate basic competencies.

COURSE FAB3150: CNC MILLING (COMPUTER NUMERICAL CONTROL)

Level: Advanced

Theme: Production Systems and Processes

Prerequisite: FAB1130 Principles of Machining

Description: Students develop skills in computer numerical control (CNC) programming to manufacture a three-dimensional product.

General Outcomes: *The student will:*

- demonstrate three-dimensional CNC programming skills
- apply CNC programming and operating skills to manufacture a milled part
- identify further training and employment opportunities related to CNC machining
- demonstrate basic competencies.

COURSE FAB3160: PREFABRICATION PRINCIPLES

Level: Advanced

Theme: Production Systems and Processes

Prerequisite: FAB2160 Custom Fabrication

Description: Students work in a cooperative learning environment to plan and construct a prefabricated product/structure to meet the specific needs of a client.

General Outcomes: *The student will:*

- perform basic shop drawing take-off skills
- demonstrate advanced level resource management skills
- demonstrate appropriate prefabrication skills and practices
- demonstrate basic competencies.

COURSE FAB3170: GAS METAL ARC WELDING 2

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2070 Gas Metal Arc Welding 1

Description: Students develop skills to evaluate and improve the quality of gas metal arc weldings, and they extend their gas metal arc welding (GMAW) skills by performing horizontal and vertical groove welds.

General Outcomes: *The student will:*

- identify variables that affect the quality of gas metal arc welds, and identify strategies to evaluate and improve weld quality
- perform safe set-up, maintenance and troubleshooting procedures with GMAW equipment
- demonstrate safe GMAW practices to perform groove welds on mild steel plate in the horizontal and vertical positions
- demonstrate basic competencies.

COURSE FAB3048: FLUX CORE ARC WELDING 2

Level: Advanced

Theme: Fabrication Processes

Prerequisite: FAB2048 Flux Core Arc Welding 1

Description: Students develop skills to evaluate and improve the quality of flux core arc weldings, and they extend their flux core arc welding (FCAW) skills by performing horizontal and vertical groove welds.

General Outcomes: *The student will:*

- identify variables that affect the quality of flux core arc welds, and identify strategies to evaluate and improve weld quality
- perform safe set-up, maintenance and troubleshooting procedures with FCAW equipment
- demonstrate safe FCAW practices and perform groove welds on mild steel plate in the horizontal and vertical positions
- demonstrate basic competencies.

