



Civil Engineering Technician Program Standard

The approved program standard for Civil Engineering Technician program of instruction leading to an Ontario College Diploma delivered by Ontario Colleges of Applied Arts and Technology (MTCU funding code 51003)

Ministry of Advanced Education and Skills Development
July 2016

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I. Introduction

This document is the Program Standard for the Civil Engineering Technician program of instruction leading to an Ontario College Diploma delivered by Ontario colleges of applied arts and technology (MTCU funding code 51003).

Development of System-Wide Program Standards

In 1993, the Government of Ontario initiated program standards development with the objectives of bringing a greater degree of consistency to college programming offered across the province, broadening the focus of college programs to ensure graduates have the skills to be flexible and to continue to learn and adapt, and providing public accountability for the quality and relevance of college programs.

The Program Standards and Evaluation Unit of the Ministry of Advanced Education and Skills Development have responsibility for the development, review and approval of system-wide standards for programs of instruction at Ontario colleges of applied arts and technology.

Program Standards

Program standards apply to all similar programs of instruction offered by colleges across the province. Each program standard for a postsecondary program includes the following elements:

- **Vocational standard** (the vocationally specific learning outcomes which apply to the program of instruction in question),
- **Essential employability skills** (the essential employability skills learning outcomes which apply to all programs of instruction); and
- **General education requirement** (the requirement for general education in postsecondary programs of instruction).

Collectively, these elements outline the essential skills and knowledge that a student must reliably demonstrate in order to graduate from the program.

Individual colleges of applied arts and technology offering the program of instruction determine the specific program structure, delivery methods and other curriculum matters to be used in assisting students to achieve the outcomes articulated in the standard. Individual colleges also determine whether additional local learning outcomes will be required to reflect specific local needs and/or interests.

The Expression of Program Standards as Vocational Learning Outcomes

Vocational learning outcomes represent culminating demonstrations of learning and achievement. They are not simply a listing of discrete skills, nor broad statements of knowledge and comprehension. In addition, vocational learning outcomes are interrelated and cannot be viewed in isolation of one another. As such, they should be viewed as a comprehensive whole. They describe performances that demonstrate that significant integrated learning by graduates of the program has been achieved and verified.

Expressing standards as vocational learning outcomes ensures consistency in the outcomes for program graduates, while leaving to the discretion of individual colleges, curriculum matters such as the specific program structure and delivery methods.

The Presentation of the Vocational Learning Outcomes

The **vocational learning outcome** statements set out the culminating demonstration of learning and achievement that the student must reliably demonstrate before graduation.

The **elements of the performance** for each outcome define and clarify the level and quality of performance necessary to meet the requirements of the vocational learning outcome. However, it is the performance of the vocational learning outcome itself on which students are evaluated. The elements of performance are indicators of the means by which the student may proceed to satisfactory performance of the vocational learning outcome. The elements of performance do not stand alone but rather in reference to the vocational learning outcome of which they form a part.

The Development of a Program Standard

In establishing the standards development initiative, the Government determined that all postsecondary programs of instruction should include vocational skills coupled with a broader set of essential skills. This combination is considered critical to ensuring that college graduates have the skills required to be successful both upon graduation from the college program and throughout their working and personal lives.

A program standard is developed through a broad consultation process involving a range of stakeholders with a direct interest in the program area, including employers, professional associations, universities, secondary schools and program graduates working in the field, in addition to students, faculty and administrators at the colleges themselves. It represents a consensus of

participating stakeholders on the essential learning that all program graduates should have achieved.

Updating the Program Standard

The Ministry of Advanced Education and Skills Development will undertake regular reviews of the vocational learning outcomes for this program to ensure that the Civil Engineering Technician Program Standard remains appropriate and relevant to the needs of students and employers across the Province of Ontario. To confirm that this document is the most up-to-date release, please contact the Ministry of Advanced Education and Skills Development at the address or email address noted on the inside cover page.

II. Vocational Standard

All graduates of Civil Engineering Technician programs have achieved the eleven vocational learning outcomes (VLOs) listed in the following pages, in addition to achieving the essential employability outcomes and meeting the general education (GE) requirement.

Preamble

Graduates of the Civil Engineering Technician program carry out technical functions related to a broad range of civil engineering fields including structural, municipal, highway and transportation engineering, water resources, geotechnical engineering, environmental protection and infrastructure rehabilitation.

As members of a civil engineering or multi-disciplinary team, graduates work collaboratively with a range of *project stakeholders** to contribute to the accomplishment of civil engineering project goals in accordance with project plans, workplace health and safety practices, *sustainability practices** and all applicable laws, codes, industry standards and ethical practices.

Graduates participate in the design and modeling phase of *civil engineering projects** by applying engineering concepts, *basic technical mathematics** and principles of science to the review and production of project plans. They collect, process and interpret technical information to produce written and graphical project-related documentation. Graduates assist in scheduling, cost estimation, quality control* and monitoring of *civil engineering projects**.

Graduates of Civil Engineering Technician programs work in a range of employment settings including consulting engineering, civil construction and surveying firms, quality control* facilities and municipal government engineering or operations departments.

Graduates are typically employed in entry-level positions in the field as Computer-aided Design (CAD) operators, material testing technicians, surveying assistants, junior inspectors or estimators.

Graduates of the Civil Engineering Technician program develop and use strategies to enhance professional growth and ongoing learning.

There may be opportunities for graduates to pursue further educational and occupational qualifications through articulation agreements between the colleges, universities or professional organizations. Graduates may be granted credits towards an advanced diploma, degree and certification. Students should contact individual colleges and professional associations, such as the Ontario

Association of Certified Engineering Technicians and Technologists (OACETT).

*See Glossary

Endnote: The Ontario Council on Articulation and Transfer (ONCAT) maintains the provincial postsecondary credit transfer portal, ONTransfer.

Synopsis of the Vocational Learning Outcomes

Civil Engineering Technician (Ontario College Diploma)

The graduate has reliably demonstrated the ability to

1. develop and use strategies to enhance professional growth and ongoing learning in the civil engineering field.
2. comply with workplace health and safety practices and procedures in accordance with current legislation and regulations.
3. complete duties and assist in monitoring that work is performed in compliance with contractual obligations, applicable laws, standards, bylaws, codes and ethical practices in the civil engineering field.
4. carry out sustainable practices* in accordance with contract documents, industry standards and environmental legislative requirements.
5. collaborate with the project team and communicate effectively with *project stakeholders** to support *civil engineering projects**.
6. collect, process and interpret technical data to produce written and graphical project-related documents.
7. use industry-specific electronic and digital technologies to support *civil engineering projects**.
8. participate in the design and modeling phase of *civil engineering projects** by applying engineering concepts, *basic technical mathematics** and principles of science to the review and production of project plans.
9. assist in the scheduling, cost estimation and monitoring of the progression of *civil engineering projects** by applying principles of construction project management.
10. perform *quality control** testing and the monitoring of equipment, materials and methods involved in the implementation and completion of *civil engineering projects**.
11. apply teamwork, leadership and interpersonal skills when working individually or within multidisciplinary teams to complete *civil engineering projects**.

*See Glossary

Note: The learning outcomes have been numbered as a point of reference; numbering does not imply prioritization, sequencing, nor weighting of significance.

The Vocational Learning Outcomes

1. The graduate has reliably demonstrated the ability to

develop and use strategies to enhance professional growth and ongoing learning in the civil engineering field.

Elements of the Performance

- keep abreast of changes in the civil engineering field
- use appropriate self-management techniques (e.g., time management, stress management)
- identify the need for self-evaluation and explain the importance of lifelong learning
- seek out and act upon constructive feedback to enhance work performance
- seek assistance to resolve problems beyond own knowledge and skills
- identify the roles and benefits of professional organizations and certification (e.g., Ontario Association of Certified Engineering Technicians and Technologists (OACETT))
- develop a plan to keep pace with and adapt to changing workforce demands and trends, as well as technological advances in the civil engineering services field
- identify the career importance of building a professional network and for participating in professional associations and activities

2. The graduate has reliably demonstrated the ability to
comply with workplace health and safety practices and procedures in
accordance with current legislation and regulations.

Elements of the Performance

- identify employee rights and responsibilities associated with health and safety practices
- conduct self in safe manner and in accordance with the requirements of work situation
- participate in health and safety training
- identify unsafe and hazardous situations or materials in the workplace
- initiate actions to mitigate risks to health and safety
- prepare and analyze accident reports
- identify and comply with workplace health and safety signs
- inform site visitors and others related to health and safety practices
- comply with all requirements of the current *Ontario Health and Safety Act, 1990*
- adhere to and maintain all required health and safety training and certification such as, Workplace Hazardous Materials Information System (WHMIS), Fall Arrest Protection and Confined Space Safety training where appropriate
- apply best safety practices when working on road construction e.g., Ontario Traffic Manual Book 7
- review and implement a site or project-specific health and safety plan
- verify excavation work sites have utility locates and that the guidelines for excavation are followed
- encourage and support a culture of safety in the workplace

3. The graduate has reliably demonstrated the ability to complete duties and assist in monitoring that work is performed in compliance with contractual obligations, applicable laws, standards, bylaws, codes and ethical practices in the civil engineering field.

Elements of the Performance

- identify relevant legislation and bylaws that apply in specific situations e.g., *Drainage Act (1990)*, *Lakes and Rivers Improvement Act (1990)*, *Water Resources Act (1990)* etc.
- read and interpret relevant building codes i.e., National and/or Ontario Building Codes
- assist in the preparation of estimates, tenders and construction bids
- assist in the review and preparation of typical contracts for compliance with basic legal principles and the tendering processes
- select and use equipment, materials and practices that comply with relevant legislation, standards, codes and bylaws
- identify codes of ethics of the applicable provincial association, societies or workplaces
- apply ethical reasoning to social and contractual issues that evolve when implementing *civil engineering projects**
- identify and adhere to labour-management principles and practices including applicable collective agreements
- read and interpret Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings

*See Glossary

4. The graduate has reliably demonstrated the ability to carry out *sustainability practices** in accordance with contract documents, industry standards and environmental legislative requirements.

Elements of the Performance

- identify legislative requirements for compliance with environmental protection regulations
- identify the principles of sustainable development, combining environmental stewardship and economic performance in project work
- identify economic, social and environmental impacts of *civil engineering projects**
- contribute to environmental site assessments and implement identified remediation strategies
- identify various types of contamination and environmental risks e.g., groundwater contamination, soil erosion, pollutants, noise pollution, etc. and associated remediation techniques
- identify *sustainable practices** across building and infrastructure lifecycle processes and rehabilitation/renewal practices
- minimize waste and use appropriate waste management techniques
- identify technologies with a lower carbon footprint, e.g., LEED processes

*See Glossary

5. The graduate has reliably demonstrated the ability to collaborate with the project team and communicate effectively with *project stakeholders** to support *civil engineering projects**.

Elements of the Performance

- identify the disciplines involved in the planning, designing and implementation of *civil engineering projects**, i.e., architecture and surveying along with structural, mechanical, electrical and environmental engineering
- identify the relationships among the various disciplines involved in *civil engineering projects**
- describe the rights, roles and responsibilities of the civil engineering technician as a member of the project team
- participate as a member of a multi-disciplinary team to design, implement, complete and evaluate *civil engineering projects**
- identify the rights, roles and responsibilities of *project stakeholders** associated with *civil engineering projects**
- use appropriate interpersonal skills and terminology suited to the situation and *project stakeholders**
- participate as a team member in project-related meetings
- report in written, graphic and oral formats the results of project-related meetings as required
- use communication technologies to facilitate clear and concise communication among *project stakeholders** e.g., email, file transfer etc.
- build and maintain effective client service skills

*See Glossary

6. The graduate has reliably demonstrated the ability to collect, process and interpret technical data to produce written and graphical project-related documents.

Elements of the Performance

- collect, interpret and check data by using systematic approaches in accordance with recognized standards and practices
- prepare and modify documents according to established criteria and industry standards e.g., Canadian Construction Documents Committee (CCDC)
- select and use appropriate technologies to produce documents for *civil engineering projects**
- present civil engineering data to *project stakeholders**
- use relevant information to construct models for *civil engineering projects** by using drawings and computer-assisted technologies
- contribute to the development of strategies to collect technical data
- participate as an active member of the team to measure, record and evaluate technical data
- select and operate a variety of civil engineering-related equipment
- measure, record and evaluate technical data to ensure data meet industry standards and are within expected parameters for precision and accuracy
- read the criteria for the project and identify appropriate information sources
- report data and assist in proposing recommendations to the appropriate team member
- use systematic approaches and paper-based and computerized techniques to collect civil engineering data
- collect and organize project-related information in a retrievable manner according to approved techniques
- keep ongoing, accurate project records, minutes and accounts of *civil engineering projects** according to established formats, policies and procedures
- use collected and stored information accurately and effectively to assist in decision making, reporting and quality control
- ensure that project data is used and shared in accordance with relevant privacy legislation, guidelines and data sharing agreements

*See Glossary

7. The graduate has reliably demonstrated the ability to use industry-specific electronic and digital technologies to support *civil engineering projects**.

Elements of the Performance

- keep abreast of changes in technology that affect civil engineering (e.g., imaging, heavy equipment machine control systems, mobile integration, cloud accessibility and Drone technologies)
- identify the impact and application of technology throughout the lifecycle of *civil engineering projects**, i.e., field data collection, design and engineering, estimating and construction
- select and use industry-specific electronic and digital technologies to design projects, produce plans and to solve project-related problems (e.g., Computer-aided Design (CAD), hydrologic and hydraulic modeling software, 3D laser scanning technologies, etc.
- select and use standard survey instruments and Global Navigation Satellite Systems (GNSS) to verify and/or produce engineering and construction layouts
- apply survey techniques and use survey equipment (i.e., levels and total station)
- use and interpret satellite and other digital imagery
- visualize, manipulate and analyze spatial data using a variety of data sources and technologies

*See Glossary

8. The graduate has reliably demonstrated the ability to participate in the design and modeling phase of *civil engineering projects** by applying engineering concepts, *basic technical mathematics** and principles of science to the review and production of project plans.

Elements of the Performance

- apply known and routine calculations to solve defined problems
- apply standardized mathematical and scientific formulas and techniques accurately
- use mathematical and scientific terminology correctly in written and oral communication
- implement checks to ensure calculations and/or design concepts are accurate
- review the technical criteria used in the design, layout and construction of *civil engineering projects**
- select and apply standards, codes and procedures to participate in the design of civil infrastructure components (i.e., sewers, water mains, structural elements of wood, concrete and steel, geotechnical infrastructure, storm water, potable water, waste water infrastructure and transportation)
- perform inspections, identifying structural, physical and/or environmental deficiencies and issues
- interpret issues found during inspections and provide recommendations and design repair solutions
- seek assistance to resolve situations in the analysis, design, or construction of *civil engineering projects** that are beyond the scope of the technician's training, knowledge or legal authority

*See Glossary

9. The graduate has reliably demonstrated the ability to assist in the scheduling, cost estimation and monitoring of the progression of *civil engineering projects** by applying principles of construction project management.

Elements of the Performance

- participate as a member of the project team to establish the scope of the project in consultation with the *project stakeholders**
- identify the phases of the project and their component activities
- follow project schedules and cost estimates needed to complete each phase of work
- observe, record, monitor and report work activity
- assist in the identification of problems related to materials, scheduling, resources and budgets
- implement identified risk management strategies
- perform quantity surveys and assist in cost estimates
- assist in the monitoring of the financial resources, project budgets, human resources and timelines used in *civil engineering projects**
- use organizational and time-management strategies effectively in own work
- assist in preparing and presenting formal technical reports, budget forecasts and project estimates
- provide technical information for the development a project schedule
- assist in the development of a project schedule using project management tools and/or software, e.g., MS Project, Critical path, Gantt Chart

*See Glossary

10. The graduate has reliably demonstrated the ability to perform *quality control** testing and the monitoring of equipment, materials and methods involved in the implementation and completion of *civil engineering projects**.

Elements of the Performance

- review the specifications, limitations, use and safety aspects of equipment and construction materials
- test and calibrate a variety of equipment and facilitate repairs in order to complete various project tasks and to ensure equipment accuracy and operational safety
- perform *quality control** sampling and testing, interpret results and make necessary adjustments or changes
- record, plot and assist in the interpretation of the results of *quality control** sampling and testing
- monitor and report quality and cost deviations and non-compliance with project specifications to appropriate team member
- monitor that equipment is used according to manufacturer's recommended directions and relevant legislation
- monitor the proper handling and use of materials
- report on the costs/benefits of methods employed
- use reports, minutes, field data and field notes to monitor *civil engineering projects**

*See Glossary

11. The graduate has reliably demonstrated the ability to apply teamwork, leadership and interpersonal skills when working individually or within multidisciplinary teams to complete *civil engineering projects**.

Elements of the Performance

- take initiative and work independently with minimal supervision
- assume accountability for self in managing the use of time and resources to meet established project deadlines
- work as an effective team player to complete tasks while promoting a positive work environment
- provide leadership when working with sub-trades and general workers
- take responsibility for one's job related performance, as an individual and as a member of a multidisciplinary team
- use effective time-management and organizational techniques to prioritize tasks and to accomplish goals
- provide technical assistance to less experienced members of the team
- provide motivation and positive feedback to others to accomplish tasks and goals
- use conflict resolution skills in work situations including coordination, cooperation and compromise
- follow established reporting procedures within a team environment

*See Glossary

Glossary

basic technical mathematics – The application of foundational mathematics to solve civil engineering problems. Basic technical math includes models, geometry, trigonometry, vectors, elementary algebraic equations, descriptive statistical methods and mathematical reasoning using appropriate checks and balances (adapted from National Technology Benchmarks, 2014).

civil engineering projects - The product of the practical application of applied sciences, math and technology and the technical tasks required to plan, design and construct structures and infrastructures primarily for transportation systems, municipal water and wastewater systems, storm water management systems and other related infrastructure development and rehabilitation/renewal activities.

project stakeholders – Any group or individual who has a vested interest in the project including the clients, architects, quantity surveyors, engineers, sub-contractors, tradespersons, suppliers, management team, government authorities, building operators, building users and the public.

quality control – The control and improvement of civil engineering projects by sampling, testing, calibrating, monitoring, correcting and enhancing performance. Quality control is based on the potential, specifications and limitations of materials, equipment, methods, human resources and environmental benefit/deficit.

sustainability practices – The decisions and activities that apply the concepts of environmental, economic and social sustainability and lifecycle assessment into the planning, design, operation and evaluation of civil engineering projects (adapted from The Canadian Society of Civil Engineering, *“Entrusted to Our Care” Guidelines for Sustainable Development*, 2007).

III. Essential Employability Skills

All graduates of the Civil Engineering Technician program of instruction must have reliably demonstrated the essential employability skills learning outcomes listed on the following pages, in addition to achieving the vocational learning outcomes and meeting the general education requirement.

Context

Essential Employability Skills (EES) are skills that, regardless of a student's program or discipline, are critical for success in the workplace, in day-to-day living and for lifelong learning.

The teaching and attainment of these EES for students in, and graduates from, Ontario's colleges of applied arts and technology are anchored in a set of three fundamental assumptions:

- these skills are important for every adult to function successfully in society today;
- our colleges are well equipped and well positioned to prepare graduates with these skills;
- these skills are equally valuable for all graduates, regardless of the level of their credential, whether they pursue a career path, or they pursue further education.

Skill Categories

To capture these skills, the following six categories define the essential areas where graduates must demonstrate skills and knowledge.

- Communication
- Numeracy
- Critical Thinking & Problem Solving
- Information Management
- Interpersonal
- Personal

Application and Implementation

In each of the six skill categories, there are a number of defining skills, or sub skills, identified to further articulate the requisite skills identified in the main skill categories. The following chart illustrates the relationship between the skill categories, the defining skills within the categories and learning outcomes to be achieved by graduates from all postsecondary programs of instruction that lead to an Ontario College credential.

EES may be embedded in General Education or vocational courses, or developed through discrete courses. However these skills are developed, all graduates with Ontario College credentials must be able to reliably demonstrate the essential skills required in each of the six categories.

Skill Category	Defining Skills: Skill areas to be demonstrated by graduates:	Learning Outcomes: The levels of achievement required by graduates. The graduate has reliably demonstrated the ability to:
Communication	<ul style="list-style-type: none"> • Reading • Writing • Speaking • Listening • Presenting • Visual literacy 	<ol style="list-style-type: none"> 1. communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience. 2. respond to written, spoken or visual messages in a manner that ensures effective communication.
Numeracy	<ul style="list-style-type: none"> • Understanding and applying mathematical concepts and reasoning • Analyzing and using numerical data • Conceptualizing 	<ol style="list-style-type: none"> 1. execute mathematical operations accurately.
Critical Thinking & Problem Solving	<ul style="list-style-type: none"> • Analyzing • Synthesizing • Evaluating • Decision making • Creative and innovative thinking 	<ol style="list-style-type: none"> 1. apply a systematic approach to solve problems. 2. use a variety of thinking skills to anticipate and solve problems.

Skill Category	Defining Skills: Skill areas to be demonstrated by graduates:	Learning Outcomes: The levels of achievement required by graduates. The graduate has reliably demonstrated the ability to:
Information Management	<ul style="list-style-type: none"> • Gathering and managing information • Selecting and using appropriate tools and technology for a task or a project • Computer literacy • Internet skills 	<ol style="list-style-type: none"> 1. locate, select, organize and document information using appropriate technology and information systems. 2. analyze, evaluate and apply relevant information from a variety of sources.
Interpersonal	<ul style="list-style-type: none"> • Teamwork • Relationship management • Conflict resolution • Leadership • Networking 	<ol style="list-style-type: none"> 1. show respect for the diverse opinions, values, belief systems and contributions of others. 2. interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
Personal	<ul style="list-style-type: none"> • Managing self • Managing change and being flexible and adaptable • Engaging in reflective practices • Demonstrating personal responsibility 	<ol style="list-style-type: none"> 1. manage the use of time and other resources to complete projects. 2. take responsibility for one's own actions, decisions and their consequences.

IV. General Education Requirement

All graduates of the Civil Engineering Technician program must have met the general education requirement described on the following pages, in addition to achieving the vocational and essential employability skills learning outcomes.

Requirement

The General Education Requirement for programs of instruction is stipulated in the Credentials Framework (Appendix A in the Minister's Binding Policy Directive Framework for Programs of Instruction).

In programs of instruction leading to either an Ontario College Diploma or an Ontario College Advanced Diploma, it is required that graduates have been engaged in learning that exposes them to at least one discipline outside their main field of study and increases their awareness of the society and culture in which they live and work. This will typically be accomplished by students taking 3 to 5 courses (or the equivalent) designed discretely and separately from vocational learning opportunities.

This general education learning would normally be delivered using a combination of required and elective processes.

Purpose

The purpose of General Education in the Ontario college system is to contribute to the development of citizens who are conscious of the diversity, complexity and richness of the human experience; who are able to establish meaning through this consciousness; and who, as a result, are able to contribute thoughtfully, creatively and positively to the society in which they live and work.

General Education strengthens students' essential employability skills, such as critical analysis, problem solving and communication, in the context of an exploration of topics with broad-based personal and/or societal importance.

Themes

The themes listed below will be used to provide direction to colleges in the development and identification of courses that are designed to fulfil the General Education Requirement for programs of instructions.

Each theme provides a statement of Rationale and offers suggestions related to more specific topic areas that could be explored within each area. These suggestions are neither prescriptive nor exhaustive. They are included to provide guidance regarding the nature and scope of content that would be judged as meeting the intent and overall goals of General Education.

1. Arts in Society:

Rationale:

The capacity of a person to recognize and evaluate artistic and creative achievements is useful in many aspects of his/her life. Since artistic expression is a fundamentally human activity, which both reflects and anticipates developments in the larger culture, its study will enhance the student's cultural and self-awareness.

Content:

Courses in this area should provide students with an understanding of the importance of visual and creative arts in human affairs, of the artist's and writer's perceptions of the world and the means by which those perceptions are translated into the language of literature and artistic expression. They will also provide an appreciation of the aesthetic values used in examining works of art and possibly, a direct experience in expressing perceptions in an artistic medium.

2. Civic Life:

Rationale:

In order for individuals to live responsibly and to reach their potential as individuals and as citizens of society, they need to understand the patterns of human relationships that underlie the orderly interactions of a society's various structural units. Informed people will have knowledge of the meaning of civic life in relation to diverse communities at the local, national and global level and an awareness of international issues and the effects of these on Canada, as well as Canada's place in the international community.

Content:

Courses in this area should provide students with an understanding of the meaning of freedoms, rights and participation in community and public life, in addition to a working knowledge of the structure and function of various levels of government (municipal, provincial, national) in a Canadian and/or in an international context. They may also provide an historical understanding of major political issues affecting relations between the various levels of government in Canada and their constituents.

3. Social and Cultural Understanding:

Rationale:

Knowledge of the patterns and precedents of the past provide the means for a person to gain an awareness of his or her place in contemporary culture and society. In addition to this awareness, students will acquire a sense of the main currents of their culture and that of other cultures over an extended period of time in order to link personal history to the broader study of culture.

Content:

Courses in this area are those that deal broadly with major social and cultural themes. These courses may also stress the nature and validity of historical evidence and the variety of historical interpretation of events. Courses will provide the students with a view and understanding of the impact of cultural, social, ethnic or linguistic characteristics.

4. Personal Understanding:

Rationale:

Educated people are equipped for life-long understanding and development of themselves as integrated physiological and psychological entities. They are aware of the ideal need to be fully functioning persons: mentally, physically, emotionally, socially, spiritually and vocationally.

Content:

Courses in this area will focus on understanding the individual: his or her evolution; situation; relationship with others; place in the environment and universe; achievements and problems; and his or her meaning and purpose. They will also allow students the opportunity to study institutionalized human social behaviour in a systematic way. Courses fulfilling this requirement may be oriented to the study of the individual within a variety of contexts.

5. Science and Technology:

Rationale:

Matter and energy are universal concepts in science, forming a basis for understanding the interactions that occur in living and non-living systems in our universe. Study in this area provides an understanding of the behaviour of matter that provides a foundation for further scientific study and the creation of broader understanding about natural phenomena.

Similarly, the various applications and developments in the area of technology have an increasing impact on all aspects of human endeavour and have numerous social, economic and philosophical implications. For example, the operation of computers to process data at high speed has invoked an interaction between machines and the human mind that is unique in human history. This and other technological developments have a powerful impact on how we deal with many of the complex questions in our society.

Content:

Courses in this area should stress scientific inquiry and deal with basic or fundamental questions of science rather than applied ones. They may be formulated from traditional basic courses in such areas of study as biology, chemistry, physics, astronomy, geology or agriculture. As well, courses related to understanding the role and functions of computers (e.g., data management and information processing) and assorted computer-related technologies should be offered in a non-applied manner to provide students with an opportunity to explore the impact of these concepts and practices on their lives.