Ontario

# Forestry Technician Program Standard

***The approved program standard for Forestry Technician program of instruction leading to an Ontario College Diploma delivered by Ontario Colleges of Applied Arts and Technology (MTCU funding code 54203)***

**Ministry of Training, Colleges and Universities**
**June 2015**

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# I. Introduction

*This document is the Program Standard for the Forestry Technician program of instruction leading to an Ontario College Diploma delivered by Ontario colleges of applied arts and technology (MTCU funding code 52308).*

## 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 Training, Colleges and Universities 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 will undertake regular reviews of the vocational learning outcomes for this program to ensure that the Forestry 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:

psu@ontario.ca

# II. Vocational Standard

*All graduates of Forestry Technician programs have achieved the ten (10) vocational learning outcomes (VLOs) listed in the following pages, in addition to achieving the essential employability skills (EES) learning outcomes and meeting the general education (GE) requirement.*

## Preamble

Graduates of the Forestry Technician program carry out technical functions related to the creation, management, conservation and restoration of sustainable forests in a variety of public and private sector operations within the forestry sector.

Graduates conduct forest inventory surveys and collect forest resource and values* information while applying an ecosystem approach to the assessment of forested environments. Using advanced technological tools and approaches, graduates collect, analyze, interpret and display data related to forested areas. Graduates provide technical support to the planning, implementation and evaluation of sustainable forest management plans and silvicultural* operations. Graduates identify forest diseases, pests, invasive species and other disturbance* events and implement and evaluate mitigation strategies.

Graduates work independently and collaboratively with a wide range of forest stakeholders applying effective teamwork, leadership and interpersonal skills in a range of forest related work settings. Graduates demonstrate an awareness and sensitivity to diverse perspectives on forest values* and uses and in particular to the beliefs held by Aboriginal peoples.

Forestry Technician program graduates promote safety for themselves, others and for the natural environment and act in accordance with all relevant legislation, regulations and professional codes of ethics that apply to the forestry sector.

There are a variety of employment and career opportunities for Forestry Technician graduates within the forestry sector, including woodlands, mill companies, government ministries, conservation authorities, parks, municipal forests, private contractors and self-employment. Graduates may find employment in a range of entry-level technical positions in areas such as tree marking, forest inventory, forest environment and ecosystem assessment, compliance monitoring, forest renewal, silvicultural* operations, scaling and logging operations, harvesting, invasive species, pests, and forest disease management, wildlife protection management, forest fire control and arboriculture.

There may be opportunities for graduates to pursue further educational qualifications through transfer pathways between the colleges and universities or occupational certifications through professional organizations. Graduates should contact individual colleges and professional associations for further information.

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

**See Glossary*

# Synopsis of the Vocational Learning Outcomes

## Forestry Technician (Ontario College Diploma)

*The graduate has reliably demonstrated the ability to*

1. **conduct forest inventory surveys and field measurements to determine forest resources and values* in forests and woodlots.**
2. **assess soil characteristics, vegetation and wildlife habitats to identify their interactions within forest ecosystems.**
3. **perform technical functions in silvicultural* operations and assist in the monitoring and evaluation of the effectiveness of silvicultural* practices.**
4. **collect, analyze, interpret, and display spatial data using mapping technology and Geographical Information Systems (GIS) to contribute to forest resource management.**
5. **contribute to sustainable forest management plans, including conservation and rehabilitation measures, taking into consideration the perspectives of a variety of stakeholders and the requirements of relevant legislation and regulations.**
6. **identify and analyze forest diseases, pests, invasive species and other disturbance* events and implement mitigation strategies to maintain and improve forest ecosystems.**
7. **select, operate, troubleshoot and maintain tools and equipment in a variety of environmental conditions and in accordance with safety and operating standards.**
8. **work independently and in a collaborative environment while applying effective teamwork, leadership and interpersonal skills.**
9. **communicate technical information to a variety of stakeholders in oral, written, visual and electronic forms.**
10. **develop strategies for ongoing professional development to enhance work performance in the forestry sector.**

**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*

**conduct forest inventory surveys and field measurements to determine forest resources and values* in forests and woodlots.**

## Elements of the Performance

- identify the composition, structure, strata, crown class, tolerance level, health and history of trees, stands and forests
- use and interpret a variety of maps, including topographic and Forest Resource Inventory maps, and Universal Transverse Mercaptor (UTM) coordinates to determine azimuth, distances and location
- carry out field inventories safely, using mensuration* equipment to determine tree age, basal area, diameter, height and location, e.g., chaining tools, compass, dendrometers, hypsometer, clinometer and prism
- collect forest values* data according to prescribed methods and to specified quality standards
- identify potential sources of mensuration* error and employ strategies to increase accuracy
- record and compile accurate field measurements using a variety of instruments and tools including tablet computers and data recorders
- select and apply various formulas to calculate forest growth and yield
- determine site class, stocking, basal area, volume, stand area and construct stand and stock tables
- use sampling strategies to conduct systematic measurement of stands

*See Glossary

*2. The graduate has reliably demonstrated the ability to*

**assess soil characteristics, vegetation and wildlife habitats to identify their interactions within forest ecosystems**.

## Elements of the Performance

- describe and classify the biotic and abiotic components of forest ecosystems
- explain the relationship between diversity and ecosystem structure and function
- assess soil physical, chemical and biological properties, including deposition, moisture regime and drainage applying standard field test procedures
- identify all vegetation species by strata i.e., tree, shrub, herbs, ferns, mosses and lichens
- determine ecological land classification units in different ecosite types applying the Ontario Ecological Land Classification system
- predict the effects that natural and human activities have on various soils, vegetation types and wetlands

*identify modifications to forest operations to protect wildlife habitat*

*3. The graduate has reliably demonstrated the ability to*

**perform technical functions in silvicultural* operations and assist in the monitoring and evaluation of the effectiveness of silvicultural* practices.**

## Elements of the Performance

- link silvicultural* practices to ecological principles, environmental protection and forest management objectives
- identify the ecology and silvics of both crop trees and competing vegetation
- differentiate silvicultural* systems and harvesting methodologies
- identify and recommend acceptable guidelines and best management practices for silvicultural* methods
- conduct basic silvicultural* surveys, considering sampling methods, data collection and timing e.g., reforestation audits, regeneration surveys and stand analysis
- read and interpret silvicultural* treatments, prescriptions and reports
- conduct harvest boundary marking
- plan and implement silvicultural* regeneration and harvesting techniques to develop stands in urban and natural environments, in both private and public sector operations
- contribute to the planning, budgeting and implementation of forest harvesting operations
- contribute to the evaluation of silvicultural* effectiveness and conduct compliance monitoring
- apply marking prescriptions according to provincial tree marking guidelines
- critically assess forest sites and collect field information to assist in the development of prescriptions for harvest, renewal and tending operations

**See Glossary*

*4. The graduate has reliably demonstrated the ability to*

**collect, analyze, interpret and display spatial data using mapping technology and Geographical Information Systems (GIS) to contribute to forest resource management.**

## Elements of the Performance

- determine areas, coordinates, directions and distances using maps and compass
- use and interpret aerial photographs, satellite and digital images and Global Positioning System (GPS) data
- conduct forestry related analysis applying remote sensing and photogrammetry skills
- move information to and from Global Positioning Systems (GPS) and Geographical Information Systems (GIS) as part of field data collection
- query, manipulate and present forest data using a Geographic Information System (GIS)
- apply cartographic standards to create maps using Geographic Information Systems (GIS)
- visualize, manipulate and analyze spatial data using a variety of data sources and technologies
- edit forestry field data using relevant software including databases, spreadsheets and forest related applications

*5. The graduate has reliably demonstrated the ability to*

**contribute to sustainable forest management plans, including conservation and rehabilitation measures, taking into consideration the perspectives of a variety of stakeholders and the requirements of relevant legislation and regulations**

## Elements of the Performance

- discuss the concept of balancing social, environmental and economic considerations in resource management planning
- contribute to the development of strategic plans for sustainable forest management
- respect Aboriginal peoples' rights, claims and interests in the development and use of forest resources
- implement strategies to engage key forest stakeholders, including citizen groups, business operators and Aboriginal community partners, in forest management planning
- contribute to forest management plans applying business and resource management principles and techniques
- contribute to the planning of the conservation of forests including aquatic, wildlife, habitat and species at risk management
- identify forest fire management practices as a component of a forest management plan
- contribute to the development of annual work schedules and annual reports
- implement plans for forest access roads and water crossing, taking into consideration equipment requirements, scheduling and costs
- comply with all legislation, regulation and policy related to forest management planning e.g., the Forestry Act, 1990; the Ontario Crown Forest Sustainability Act, 1994; the Environmental Assessment Act, 1990; the Professional Foresters Act, 2000; the Public Lands Act, 1990; the Ontario Forest Modernization Act, 2011; The Fish and Wildlife Conservation Act, 1997; and the Endangered Species Act, 2007
- identify the roles and benefits of third party certification in the forestry sector, e.g., Canadian Safety Association (CSA), Forest Stewardship Council (FSC), Sustainable Forestry Initiative(SFI)

*advocate for the sustainable management of Canada's forests and a competitive, responsible forestry sector*

*6. The graduate has reliably demonstrated the ability to*

**identify and analyze forest diseases, pests, invasive species and other disturbance* events and implement mitigation strategies to maintain and improve forest ecosystems.**

## Elements of the Performance

- identify and analyze the impact of pests, invasive species and disease on forest ecosystems
- conduct assessments inventories of forest pests and diseases
- describe how pest management can modify change in forest ecosystems
- implement control measures for commonly occurring forest pests, invasive species, and diseases
- assess fire danger using the Canadian Forest Fire Danger Rating System
- perform forest fire prevention and suppression strategies in accordance with the *Forest Fires Prevention Act, 1990*
- determine the impact of fire and weather factors on forest ecosystems
- determine daily modifications to forest operations in relation to fire danger
- identify and describe the impact of climate change mitigation strategies on forest ecosystems
- determine the impact of human activities on forest ecosystems
- apply the knowledge of forest composition, structure and function to predict forest conditions under natural and human caused disturbances*
- contribute to planning and implementation of strategies to mitigate the impact of humans, diseases, invasive species and other disturbance* events on forest ecosystems

**See Glossary*

*7. The graduate has reliably demonstrated the ability to*

**select, operate, troubleshoot and maintain tools and equipment in a variety of environmental conditions and in accordance with safety and operating standards.**

## Elements of the Performance

- apply safety skills to work in outdoor and remote environments
- operate and maintain equipment required for wood cutting e.g., chainsaws, brush saws
- troubleshoot and maintain equipment to ensure operational safety
- operate transportation vehicles,when required and in accordance with the safety standards
- use communication devices, e.g., cell phones or citizen band (CB) radios, to promote safe travel
- select and wear special safety clothing and personal protective equipment
- identify and implement emergency response plans for accidental occurrences
- perform work responsibilities in accordance with the *Occupational Health and Safety Act, 1990*
- promote a safe work environment for self and others

*8. The graduate has reliably demonstrated the ability to*

**work independently and in a collaborative environment while applying effective teamwork, leadership and interpersonal skills.**

## Elements of the Performance

- take initiative and work independently with minimal supervision
- work as an effective team player to complete tasks while promoting a positive work environment
- collaborate with other forestry professionals including foresters, government inspectors and compliance officers
- collaborate with all forest stakeholders, including Aboriginal peoples, forest industry partners and the general public
- take responsibility for one's job related performance, as an individual and as a forestry team member
- use effective time-management and organizational techniques to accomplish goals
- organize, coordinate and supervise the work of a forestry field team
- provide motivation and positive feedback to others to accomplish tasks and goals
- use conflict resolution skills in work situations
- adhere to workplace discrimination, harassment and violence prevention policies

*9 The graduate has reliably demonstrated the ability to*

**communicate technical information to a variety of forest stakeholders in oral, written, visual and electronic forms.**

## Elements of the Performance

- organize and record complete, detailed, accurate and neat documentation of forestry field activities
- interact with professional foresters, biologists, other technicians, co-workers and the public, demonstrating cognizance of cultural diversity and consideration of stakeholders' values and perspectives
- adapt technical information to promote stakeholder understanding where necessary
- present technical data in a fashion consistent with the expectations of employers and other forest professionals
- assist in the preparation of correspondence, reports and proposals using professional terminology, technical report format and standard government formats where appropriate
- use electronic communication tools effectively and professionally

*10 The graduate has reliably demonstrated the ability to*

**develop strategies for ongoing professional development to enhance work performance in the forestry sector.**

## Elements of the Performance

- reflect on one's own performance, identifying strengths and weaknesses
- develop a plan to remedy identified weaknesses in knowledge and skills
- seek out and act upon constructive feedback to enhance work performance
- identify workplace opportunities and challenges in the forestry sector e.g., remote workplace locations, seasonal nature of work, changing wood products and markets, globalization, specialization, intergenerational workforce, increased regulation etc.
- develop a plan to keep pace with and adapt to the changing forestry workplace trends and technological advances
- identify basic business principles and explore entrepreneurial opportunities within the forestry sector
- identify strategies to develop a professional network and participate in forestry related professional development activities
- identify and adhere to professional codes of ethics that apply to the forestry sector

# Glossary

**Forest Disturbance** – A natural (e.g., fire) or anthropogenic (e.g., timber harvest) event in the forest that alters the natural succession of a forest stand or stands (Ontario Ministry of Natural Resources, OMNR, 2009, Forest Management Planning Manual for Ontario's Crown Forests).

**Mensuration** – The measurement of volume, growth and development of individual trees and stands and the various products obtained from them (Ontario Ministry of Natural Resources, OMNR, 2009, Forest Management Planning Manual for Ontario's Crown Forests).

**Silviculture\ Silvicultural** – Pertaining to the science and art of cultivating forest crops based on the knowledge of silvics. The theory and practice of controlling the establishment, composition, constitution and growth of forests (Ontario Ministry of Natural Resources, OMNR, 2009, Forest Management Planning Manual for Ontario's Crown Forests).

**Values** – A term used to describe known natural resources features, land uses or values that may be affected by forest management activities (Ontario Ministry of Natural Resources, OMNR, 2009, Forest Management Planning Manual for Ontario's Crown Forests).

# III. Essential Employability Skills

*All graduates of the Forestry 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:**<br><br>**Skill areas to be demonstrated by graduates:** | **LEARNING OUTCOMES: The levels of achievement required by graduates.**<br><br>**The graduate has reliably demonstrated the ability to:** |
|---|---|---|
| COMMUNICATION | • Reading<br>• Writing<br>• Speaking<br>• Listening<br>• Presenting<br>• Visual literacy | 1. communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience.<br>2. respond to written, spoken or visual messages in a manner that ensures effective communication. |
| NUMERACY | • Understanding and applying mathematical concepts and reasoning<br>• Analyzing and using numerical data<br>• Conceptualizing | 1. execute mathematical operations accurately. |
| CRITICAL THINKING & PROBLEM SOLVING | • Analyzing<br>• Synthesizing<br>• Evaluating<br>• Decision making<br>• Creative and innovative thinking | 1. apply a systematic approach to solve problems.<br>2. use a variety of thinking skills to anticipate and solve problems. |

| SKILL CATEGORY | DEFINING SKILLS:<br><br>Skill areas to be demonstrated by graduates: | LEARNING OUTCOMES: The levels of achievement required by graduates.<br><br>The graduate has reliably demonstrated the ability to: |
|---|---|---|
| INFORMATION MANAGEMENT | • Gathering and managing information<br>• Selecting and using appropriate tools and technology for a task or a project<br>• Computer literacy<br>• Internet skills | 1. *locate, select, organize and document information using appropriate technology and information systems.*<br>2. *analyze, evaluate and apply relevant information from a variety of sources.* |
| INTERPERSONAL | • Teamwork<br>• Relationship management<br>• Conflict resolution<br>• Leadership<br>• Networking | 1. *show respect for the diverse opinions, values, belief systems and contributions of others.*<br>2. *interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.* |
| PERSONAL | • Managing self<br>• Managing change and being flexible and adaptable<br>• Engaging in reflective practices<br>• Demonstrating personal responsibility | 1. *manage the use of time and other resources to complete projects.*<br>2. *take responsibility for one's own actions, decisions and their consequences.* |

# IV. General Education Requirement

*All graduates of the Forestry 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 fulfill 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.