Electrical Engineering Technician Program Standard

The approved program standard for Electrical Engineering Technician program of instruction leading to an Ontario College Diploma delivered by Ontario Colleges of Applied Arts and Technology.
(MTCU funding code 55613)

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Inquiries regarding specific Electrical Engineering Technician programs offered by colleges of applied arts and technology in Ontario should be directed to the relevant college.

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I.   Introduction

This document is the Program Standard for the Electrical Engineering Technician program of instruction leading to an Ontario College Diploma delivered by Ontario colleges of applied arts and technology (MTCU funding code 55613).

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 has 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 Training, Colleges and Universities will undertake regular reviews of the vocational learning outcomes for this program to ensure that the Electrical 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, contact the ministry:

psu@ontario.ca

II. Vocational Standard

All graduates of the Electrical Engineering Technician program of instruction must have achieved the 17 vocational learning outcomes listed in the following pages, in addition to achieving the essential employability skills learning outcomes and meeting the general education requirement.

Preamble

Graduates of the Electrical Engineering Technician Program have demonstrated the ability to perform a defined number of electrical engineering technician functions under the supervision of a qualified person.

The vocational learning outcomes and their respective elements of the performance are articulated to clearly define the range and level of skills, knowledge, and attitudes required by graduates to be successful as entry-level electrical engineering technicians. Graduates of the program have had exposure to a defined range of electrical functions, such as installation, testing, maintaining, repairing, analyzing and troubleshooting specified kinds of electrical circuits, equipment, and systems, under the supervision of a qualified person. Graduates have had exposure to quality control and assurance programs and have applied communication, documentation, computer applications, information technology, and teamwork skills to support the electrical engineering activities of an organization.

Upon completion of the program, some graduates may work as entry-level electrical engineering technicians in a range of employment settings in commercial, utility and industries using electrical technology, in both large and small organizations. Their jobs could involve working in various electrical environments including those relating to power distribution and utilization; electrical power generation, transmission, and protection; industrial telecommunications; electrical maintenance and installation; and control systems. At this point in the technicians' training, the range of functions would be limited and under the supervision of a qualified person to ensure safety and compliance with relevant codes and standard practices. Other graduates may pursue further education or apprenticeship training.

This program standard has identified a cluster of common skills, knowledge, and attitudes essential to entry-level employees in the electrical engineering field; however, individual programs may choose to build on this standard by offering some degree of specialization.

Graduates may be granted some credits towards apprenticeship certification. Students should contact individual colleges for further details of a college's articulation agreements with training facilities, other education institutions or professional associations.

Synopsis of the Vocational Learning Outcomes
Electrical Engineering Technician Program

The graduate has reliably demonstrated the ability to

1. interpret and produce electrical and electronics drawings including other related documents and graphics.
2. analyze and solve routine technical problems related to electrical systems by applying mathematics and science principles.
3. use, verify, and maintain instrumentation equipment and systems.
4. assemble, test, modify and maintain electrical circuits and equipment to fulfill requirements and specifications under the supervision of a qualified person.
5. install and troubleshoot static and rotating electrical machines and associated control systems under the supervision of a qualified person.
6. verify acceptable functionality and apply troubleshooting techniques for electrical and electronic circuits, components, equipment, and systems under the supervision of a qualified person.
7. analyze, assemble and troubleshoot control systems under the supervision of a qualified person.
8. use computer skills and tools to solve routine electrical related problems.
9. assist in creating and conducting quality assurance procedures under the supervision of a qualified person.
10. prepare and maintain records and documentation systems.
11. install, test and troubleshoot telecommunication systems under the supervision of a qualified person.
12. apply health and safety standards and best practices to workplaces.
13. perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.
14. configure installation and apply electrical cabling requirements and system grounding and bonding requirements for a variety of applications under the supervision of a qualified person.
15. assist in commissioning, testing and troubleshooting electrical power systems under the supervision of a qualified person.
16. select electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.
17. apply project management principles to assist in the implementation of projects.

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*

interpret and produce electrical and electronics drawings including other related documents and graphics.

Elements of the Performance

- use computer software and other technology to produce, reproduce and modify drawings, sketches, diagrams, charts, tables, and graphs (e.g., Computer Aided Design (CAD) software);
- apply relevant codes and standard symbols in the production of drawings;
- use graphics such as single-line drawings, schematics, and assembly drawings to convey technical data;
- assist in the interpretation, preparation, and modification of electrical specifications and project related documents;
- prepare equipment lists and bills of material;
- assist in the interpretation of circuit diagrams;

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

analyze and solve routine technical problems related to electrical systems by applying mathematics and science principles.

Elements of the Performance

- use mathematical and scientific applications to solve routine technical problems (e.g., basic algebra and trigonometry);
- apply accurately mathematical and scientific concepts to troubleshoot, maintain, and test electrical circuits, equipment, systems, and subsystems;
- identify routine technical problems related to electrical systems and formulate alternative solutions;
- use statistical measures to analyze and solve routine technical problems
- represent graphically experimental data;
- use appropriate software for calculations;
- interpret and support the results of calculations;
- perform conversion in and among number systems such as hexadecimal, decimal, octal, binary, and binary-coded decimal.

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

use, verify, and maintain instrumentation equipment and systems.

Elements of the Performance

- select and safely use a variety of instrumentation equipment (e.g., signal generators, frequency counters, oscilloscopes, and multimeters);
- perform measurements such as power, voltage, resistance, and current using appropriate instrumentation equipment;
- use test equipment to analyze and troubleshoot circuits;
- troubleshoot and test a range of electrical, electronic, and digital circuits using appropriate instrumentation equipment;
- identify and eliminate hazards while using and maintaining test and instrumentation equipment, by complying with the appropriate safety standards.

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

assemble, test, modify and maintain electrical circuits and equipment to fulfill requirements and specifications under the supervision of a qualified person.

Elements of the Performance

- determine appropriate equipment based on requirements and specifications;
- install equipment protective devices such as fuses, circuit breakers, instrument transformers, and relays;
- install, test, and configure automation and control systems;
- install and test Programmable Logic Controllers (PLC);
- identify wiring requirements for electrical installations;
- apply Electrostatic Discharge (ESD) procedures when handling electrical components.

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

install and troubleshoot static and rotating electrical machines and associated control systems under the supervision of a qualified person.

Elements of the Performance

- install and test alternating current (AC) and direct current (DC) machines, and associated control systems to fulfill requirements and specific applications;
- maintain static and rotating electrical machines and associated control systems;
- apply safety procedures while installing and troubleshooting static and rotating electrical machines and associated control systems;
- assist in the selection, specifications, and installation of electrical machines based on industrial design and regulating standards, and applicable legislation (e.g., frame size or types, torque class);
- assist in the installation and troubleshooting of AC and DC motor drives and control systems.

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

verify acceptable functionality and apply troubleshooting techniques for electrical and electronic circuits, components, equipment, and systems under the supervision of a qualified person.

Elements of the Performance

- identify problems in circuits and equipment by using established procedures;
- use standard electrical, electronic, and computer-based test equipment;
- use available information resources to assist in troubleshooting;
- test, maintain, troubleshoot, repair, and/or replace equipment;
- assist in upgrading equipment when appropriate;
- operate equipment according to manufacturers' requirements and specifications;
- follow established service and preventative maintenance schedules;
- troubleshoot a variety of electrical and electronic equipment at the system level;
- assist in developing and documenting procedures;
- analyze and troubleshoot AC and DC networks including analog, digital, power electronic and/or electromechanical devices;
- apply appropriate techniques to maintain and refurbishment equipment.

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

analyze, assemble and troubleshoot control systems under the supervision of a qualified person.

Elements of the Performance

- install, test, and troubleshoot Programmable Logic Controllers (PLC) and Human Machine Interfaces (HMI);
- install and test semiconductor and electromechanical switching circuits;
- install, analyze, test, service, and assist in programming and tuning of open and closed loop electromechanical control systems;
- test and troubleshoot motor speed control and servo drive systems.

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

use computer skills and tools to solve routine electrical related problems.

Elements of the Performance

- install and use appropriate software to resolve routine technical problems;
- research and share information resources from the Internet such as reference manuals,handbooks, quick start guides, knowledge bases, and databases;
- use appropriate software as an analysis tool;
- integrate control and data collection hardware to monitor and control components and systems using appropriate software;
- use appropriate software to create and document electrical and electronic circuits (e.g. spreadsheet programs for data collection and display);
- use computer programming languages to analyze electrical problems.

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

assist in creating and conducting quality assurance procedures under the supervision of a qualified person.

Elements of the Performance

- assist in reviewing specifications applicable to electrical circuits, equipment, and systems such as evaluation, modification, implementation, impact, and implications;
- monitor and report test results in accordance with organizational quality assurance procedures and specifications;
- conduct quality assurance testing by utilizing appropriate equipment and report results;
- apply standards from relevant quality assurance programs and report results.

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

prepare and maintain records and documentation systems.

Elements of the Performance

- use electronic and/or paper-based systems to store and retrieve information and to prepare reports;
- maintain current, clear, and accurate documents (e.g. reports);
- document the commissioning, testing, and modification of electrical and electronic systems;
- document all work accurately to comply with electrical standards.

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

install, test and troubleshoot telecommunication systems under the supervision of a qualified person.

Elements of the Performance

- troubleshoot telecommunication systems such as audio, video and data systems and their relevant interfaces;
- implement and test audio, video, and intercommunication systems;
- assist in the implementation of Local Area and Wide Area Networks (LANs and WANs) and test using appropriate networking devices;
- identify cabling and wiring for automation communication systems;
- assist in testing and troubleshooting computer networking or electronic data processing cabling, optical fiber cabling, building management systems cabling and wiring;
- test and troubleshoot emergency, fire alarm and other security communication systems.

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

apply health and safety standards and best practices to workplaces.

Elements of the Performance

- select and use personal protective equipment (PPE) and clothing to ensure personal health and safety at workplaces, including arc flash;
- select, operate, and maintain hand and power tools safely;
- interpret and apply safety codes, policies and practices, and accident prevention procedures;
- assist in conducting safety inspections of shop environments to detect and correct hazardous conditions;
- apply regulatory and licensing requirements when completing installations, maintenance, and repairs of electrical equipment;
- apply procedures for the safe handling, storage, and disposal of hazardous materials, such as Workplace Hazardous Materials Information System (WHMIS) and Transporting of Dangerous Goods (TDG);
- apply best practice at workplaces (e.g. keep premises cleaned and secure);
- apply safety related design practices, including job safety planning and assessing risks associated with operating electrical equipment and job safety planning.

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

perform tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.

Elements of the Performance

- apply legal principles and rules when preparing clients' contracts;
- interpret and comply with project specifications and drawings;
- adhere to legislation, codes and standards including occupational health and safety regulations, and labour laws;
- use equipment and materials in accordance with relevant legislation, standards, and codes;
- adhere to professional code of ethics, as established by the professional association that governs the province;
- work to enhance the positive environmental, ecological, and social impact of all tasks;
- apply knowledge of collective agreements and electrical associations as they relate to one's rights and responsibilities in the workplace.

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

configure installation and apply electrical cabling requirements and system grounding and bonding requirements for a variety of applications under the supervision of a qualified person.

Elements of the Performance

- produce and interpret electrical drawings related to cabling, system grounding and bonding;
- apply electrical cabling and wiring building practices in accordance with applicable electrical and safety codes;
- apply codes, procedures, and processes for the testing of system grounding and bonding;
- identify and troubleshoot systems faults and instabilities, harmonics and impedance grounding;
- prepare wire and cable lists and assemblies according to the Electrical Code of the province or country where the equipment will be in operation.

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

assist in commissioning, testing and troubleshooting electrical power systems under the supervision of a qualified person.

Elements of the Performance

- perform power calculations in single phase and polyphase systems to resolve problems;
- interpret electrical drawings related to power systems, such as single lines and relaying, and metering drawings;
- calculate system fault currents by per-unit and symmetrical component methods;
- perform power factor correction calculations;
- troubleshoot systems faults, instabilities, and harmonics;
- install and maintain equipment protective devices such as fuses, circuit breakers, instrument transformers, relays, and associated equipment;
- maintain generation, transmission and distribution systems;
- install, test, and maintain power, instrument, and control transformers to meet requirements and specifications according to criteria, such as voltage or current ratios, power, impedances, and operating environments;
- assist in the installation of alternative and sustainable energy generation systems.

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

select electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.

Elements of the Performance

- contact clients, manufacturers, consultants, and suppliers to obtain information required to select and purchase appropriate equipment, components, and systems;
- determine and adhere to requirements and specifications of the equipment, components, and systems;
- conduct cost-benefit analysis;
- select electronic equipment, components, and systems by consulting manufacturers' specifications, catalogues, and electronic sources (e.g., Internet, CD-ROM).

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

apply project management principles to assist in the implementation of projects.

Elements of the Performance

- assist in the monitoring of resources and expenditures to maintain cost effectiveness and timelines as required;
- assist in the consolidation of project updates regularly;
- assist in the estimation of the time required to complete project elements;
- assist in the completion of project elements according to schedule;
- interpret and use project planning documents (e.g., Gantt Charts, Critical Path Analysis, PERT Charts);
- assist in the identification of problems that will affect the project timeline and suggest changes as soon as possible;
- maintain current, clear, and accurate project-related documents which adhere to organizational and industry standards and procedures;
- use project management software.

III. Essential Employability Skills

All graduates of the Electrical 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	• Reading • Writing • Speaking • Listening • Presenting • 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.* 2. *respond to written, spoken, or visual messages in a manner that ensures effective communication.*
NUMERACY	• Understanding and applying mathematical concepts and reasoning • Analyzing and using numerical data • Conceptualizing	3. *execute mathematical operations accurately.*
CRITICAL THINKING & PROBLEM SOLVING	• Analysing • Synthesizing • Evaluating • Decision making • Creative and innovative thinking	4. *apply a systematic approach to solve problems.* 5. *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	- Gathering and managing information - Selecting and using appropriate tools and technology for a task or a project - Computer literacy - Internet skills	6. *locate, select, organize, and document information using appropriate technology and information systems.* 7. *analyze, evaluate, and apply relevant information from a variety of sources.*
INTERPERSONAL	- Team work - Relationship management - Conflict resolution - Leadership - Networking	8. *show respect for the diverse opinions, values, belief systems, and contributions of others.* 9. *interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.*
PERSONAL	- Managing self - Managing change and being flexible and adaptable - Engaging in reflective practices - Demonstrating personal responsibility	10. *manage the use of time and other resources to complete projects.* 11. *take responsibility for one's own actions, decisions, and consequences.*

IV. General Education Requirement

All graduates of the Electrical 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 student's 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, and 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 Canada 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 development 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.