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ELECTROTECHNOLOGY

MAINTENANCE ELECTRICITY

PROGRAM OF STUDY
5552

VOCATIONAL and TECHNICAL EDUCATION
020801
7595001

Québec

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The *Maintenance Electricity* program leads to the Secondary School Vocational Diploma (SSVD) and prepares the student to practise the trade of

MAINTENANCE ELECTRICIAN

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This program of study, *Maintenance Electricity*, is issued in accordance with section 461 of the *Education Act* (R.S.Q., c. I-13.3).

It has been approved by the confessional committees of the Conseil supérieur de l'éducation in conformity with the provisions of paragraph (a) of section 23 of the *Act respecting the Conseil supérieur de l'éducation* (R.S.Q., c. C-60), as replaced by section 569 of the *Education Act* (1988, chapter 84). This program of study has been authorized for teaching Maintenance Electricity in the schools as of September 1994.

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INTRODUCTION

The *Maintenance Electricity* program is based on the orientations for secondary school vocational education adopted by the government in 1986. It was designed on the basis of a new framework for developing vocational education programs that calls for the participation of experts from the workplace and the field of education.

The program of study is developed in terms of competencies, expressed as objectives. These objectives are divided into modules, which are organized into teaching blocks. Various factors were kept in mind in developing the program: training needs, the job situation, purposes, goals, and strategies and means used to attain objectives.

The program of study lists the competencies that are the minimum requirements for a Secondary School Vocational Diploma (SSVD) for students in both the youth and adult sectors. It also provides the basis for organizing courses, planning teaching strategies, and designing instructional and evaluation materials.

The duration of the program is 1800 hours, which includes 1005 hours spent on the specific competencies required to practise the trade and 795 hours on general competencies. The program of study is divided into 28 modules, which vary in length from 15 to 105 hours (multiples of 15). The time allocated to the program is to be used not only for teaching but also for evaluation and remedial work. Modules are divided into four blocks of 450 hours.

This document contains two parts. Part I is of general interest and provides an overview of the training plan. It includes a synoptic table of basic information about the modules, a description of the program training goals, the competencies to be developed and the general objectives, and an explanation of operational objectives. Part II is designed primarily for those directly involved in implementing the program. It contains a description of the operational objectives of each module.

In keeping with this broad approach, three accompanying documents will be provided: a teaching guide, an evaluation guide, and a planning guide.

GLOSSARY

Program Training Goals

Statements that describe the educational aims of a program. These goals are the general goals of vocational education adapted to a specific trade or occupation.

Competency

A set of socio-affective behaviours, cognitive skills or psycho-sensori-motor skills that enable a person to correctly perform a role, function, activity or task.

General Objectives

Instructional objectives that provide an orientation for leading the students to attain one or more related objectives.

Operational Objectives

Statements of the educational aims of a program in practical terms. They serve as the basis for teaching, learning and evaluation.

Module of a Program

A component part of a program of study comprising a first-level operational objective and the related second-level operational objectives.

Credit

A unit used for expressing quantitatively the value of the modules in a program of study. One credit corresponds to 15 hours of training. Students must accumulate a set number of credits to graduate from a program.

PART I

1. SYNOPTIC TABLE

Number of modules: 28
Duration in hours: 1800
Credits: 120

Maintenance Electricity
CODE: 5552

CODE	TITLE OF THE MODULE	HOURS	CREDITS*
783 211	1. The Trade and the Training Process	15	1
842 052	2. Occupational Health and Safety	30	2
786 056	3. Direct-Current Circuit Analysis	90	6
786 034	4. Using Tools and Anchors	60	4
786 123	5. Producing Sketches and Diagrams	45	3
783 223	6. Using Technical Manuals and Plans	45	3
786 115	7. Alternating-Current Circuit Analysis	75	5
783 236	8. Installing Electricity Supply Materials	90	6
786 291	9. Communicating in the Workplace	15	1
843 192	10. Using a Microcomputer	30	2
843 076	11. Solid-State Circuits	90	6
783 246	12. Installing Electrical Systems	90	6
783 393	13. Combinational Logic	45	3
783 384	14. Sequential Logic	60	4
783 256	15. Installing Industrial Equipment	90	6
783 262	16. Introduction to the Trade	30	2
783 295	17. Repairing Direct-Current Motor Controls	75	5
783 306	18. Repairing Alternating-Current Motor Controls	90	6
783 286	19. Modifying Electrical System Installations	90	6
783 316	20. Power Electronics	90	6
783 274	21. Industrial Processes	60	4
783 323	22. Preventive Maintenance	45	3
783 337	23. Modifying Automated Programs	105	7
783 346	24. Fluid Circuits	90	6
783 353	25. Industrial Instrumentation	45	3
783 367	26. Repairing Automated Systems	105	7
843 121	27. Job Search Techniques	15	1
783 376	28. Entering the Work Force	90	6

* 15 hours = 1 credit
Modules are divided into blocks of 450 hours.
This program leads to a Secondary School Vocational Diploma in Maintenance Electricity.

2. PROGRAM TRAINING GOALS

The training goals of the *Maintenance Electricity* program are based on the general goals of vocational education and take into account the specific nature of the trade. These goals are:

To develop effectiveness in the practice of a trade.

- To teach students to perform maintenance electricity tasks and activities correctly, at an acceptable level of competence for entry into the job market.

- To prepare students to perform satisfactorily on the job by fostering:
  - the intellectual skills and techniques needed to make sound decisions on the job;
  - a concern for communicating effectively with superiors and colleagues;
  - a constant concern for occupational health and safety;
  - a sense of precision and efficiency in carrying out various job-related tasks;
  - the ability to work in situations that are often urgent and constricting.

To ensure integration into the working world.

- To familiarize students with their rights and responsibilities as workers.

- To familiarize students with the job market in general and the trade of maintenance electrician in particular.

To foster personal development and the acquisition of occupational knowledge.

- To foster independence, and instill a sense of responsibility and the desire to succeed.

- To foster the ability to learn, to obtain information and to improve themselves.

- To help students acquire effective work methods and techniques.

- To encourage students to develop verbal communication skills, initiative and a positive attitude.

- To help students understand the principles underlying the techniques used.

- To help students apply their knowledge.

To ensure job mobility.

- To help students develop a positive attitude toward technological change and new situations.

- To prepare students for a creative job search.

3. COMPETENCIES

The competencies to be developed in the *Maintenance Electricity* program are shown in the grid of learning focuses on the following page. The grid lists general and specific competencies as well as the major steps in the work process.

General competencies involve activities common to several tasks or situations. They cover, for example, the technological or scientific principles that the students must understand to practise the trade or occupation. Specific competencies focus on tasks and activities that are of direct use in the trade or occupation. The work process includes the most important steps in carrying out the tasks and activities of the trade or occupation.

The grid of learning focuses shows the relationship between the general competencies on the horizontal axis and the specific competencies on the vertical axis. The symbol (△) indicates a correlation between a specific competency and a step in the work process. The symbol (○) indicates a correlation between a general and a specific competency.

The symbols (▲) and (●) indicate that these relationships have been taken into account in the formulation of objectives intended to develop specific competencies related to the trade or occupation.

The logic used in constructing the grid influences the course sequence. Generally speaking, this sequence follows a logical progression in terms of the complexity of the learning involved and the development of the students' autonomy. The vertical axis of the grid shows the competencies directly related to the practice of a specific trade or occupation. These competencies are arranged in a relatively fixed order; therefore, the modules should be taught, insofar as possible, in the order represented on the grid. The modules including the general competencies on the horizontal axis should be taught in relation to those on the vertical axis. This means that some modules are prerequisite to others, while other modules are taught concurrently.

GRID OF LEARNING FOCUSES

MAINTENANCE ELECTRICITY

MODULE	SPECIFIC COMPETENCIES (directly related to the practice of the specific occupation)	FIRST-LEVEL OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	WORK PROCESS (major steps)							GENERAL COMPETENCIES (Technology, personal development, etc.)															TOTALS	
				Clarify the overall situation	Determine the standard operating condition	Analyze the actual operating condition	Diagnose the problem	Determine a solution	Perform trials and tests	Communicate the results	Apply occupational health and safety rules	Analyze a direct-current circuit	Use basic tools and anchors	Produce basic electrical sketches and diagrams	Use a technical manual and a plan	Analyze an alternating-current circuit	Communicate in the workplace	Use a microcomputer	Analyze solid-state circuits	Apply concepts of combinational logic	Apply concepts of sequential logic	Analyze an industrial manufacturing process	Apply combinational and sequential logic to a fluid circuit	Use industrial instrumentation	Use job search techniques	NUMBER OF OBJECTIVES	DURATION (IN HOURS)
	MODULE										2	3	4	5	6	7	9	10	11	13	14	21	24	25	27		
	FIRST-LEVEL OPERATIONAL OBJECTIVES										B	B	B	B	B	B	S	B	B	B	B	B	B	B	S	15	
	DURATION (IN HOURS)										30	90	60	45	45	75	15	30	90	45	60	60	90	45	15		795
1	Determine their suitability for the trade and the training process	S	15	△		△	△	△	△	△	○	○	○	○	○	○	○	○	○	○	○	○	○	○			
6	Install electricity supply materials	B	90	△				▲	▲		●	●	●	●	●	●											
12	Install and connect an electrical system	B	90	△				▲	▲		●	●	●	●	●	●	●										
15	Install and connect industrial equipment	B	90	△				▲	▲	▲	●	●	●	●	●	●	●										
16	Become familiar with the trade	S	30		△	△	△	△	△	▲	●	○	○		○	○	●		○								
17	Repair a direct-current motor control	B	75	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●			○	○						
18	Repair an alterning-current motor control	B	90	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●			○	○						
19	Modify electrical system installations	B	90	△		▲		▲	▲	▲	●	●	●	○	●	●	●	○	●								
20	Repair a power electronics system	B	90	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●		●								
22	Carry out preventive maintenance on industrial equipment	B	45	△	△	△		▲	▲	△	●	●	●	●	●	●	●	●	●	●	●	●					
23	Modify an automated program	B	105	△		▲		▲	▲	▲	○	○		●	●	○	●	●	○	●	●	●					
26	Repair an automated system	B	105	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
28	Enter the work force	S	90	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
NUMBER OF OBJECTIVES		13																								28	
DURATION (IN HOURS)			1005																								1800

S: Situational objective

B: Behavioural objective

△ Correlation between step and specific competency
▲ Correlation to be taught and evaluated
○ Correlation between a general and specific competency
● Correlation to be taught and evaluated

4. GENERAL OBJECTIVES

The general objectives of the *Maintenance Electricity* program are presented below, along with the major statement of each corresponding first-level operational objective.

To develop in the students the competencies required to integrate harmoniously into the school and work environments.

- Determine their suitability for the trade and the training process.
- Become familiar with the trade.
- Enter the work force.
- Communicate in the workplace.
- Use job search techniques.

To develop in the students the competencies required to safely practise the trade of maintenance electricity.

- Apply occupational health and safety rules.

To develop in the students the competencies required to perform tasks related to mechanics.

- Use basic tools and anchors.
- Produce basic electrical sketches and diagrams.
- Analyze an industrial manufacturing process.
- Apply combinational and sequential logic to a fluid circuit.

To develop in the students the competencies required to perform tasks related to electricity.

- Analyze a direct-current circuit.
- Analyze an alternating-current circuit.
- Use a technical manual and a plan.
- Install electricity supply materials.
- Install and connect an electrical system.
- Install and connect industrial equipment.
- Carry out preventive maintenance on industrial equipment.
- Modify electrical system installations.
- Repair a direct-current motor control.
- Repair an alternating-current motor control.

To develop in the students the competencies required to perform tasks related to electronics.

- Use a microcomputer.
- Analyze solid-state circuits.
- Apply concepts of combinational logic.
- Apply concepts of sequential logic.
- Repair a power electronics system.
- Use industrial instrumentation.
- Modify an automated program.
- Repair an automated system.

5. FIRST- AND SECOND-LEVEL OPERATIONAL OBJECTIVES

5.1 DEFINITION

A first-level objective is defined for each competency to be developed. Competencies are organized into an integrated training program designed to prepare students to practise the trade or occupation. This systematic organization of competencies produces better overall results than training by isolated objectives. More specifically, it fosters a smooth progression from one objective to the next, saves teaching time by eliminating needless repetition, and integrates and reinforces learning material.

First-level operational objectives are the main, compulsory teaching/learning targets and they are specifically evaluated for certification. There are two kinds of operational objectives: behavioural and situational.

- **A behavioural objective** is a relatively closed objective that describes the actions and results expected of the student by the end of a learning step. Evaluation is based on expected results.

- **A situational objective** is a relatively open-ended objective that outlines the major phases of a learning situation. It allows for output and results to vary from one student to another. Evaluation is based on the student's participation in the activities of the learning context.

Second-level operational objectives are intermediate teaching/learning targets deemed prerequisite for attaining first-level objectives. They are grouped according to the specifications (see 5.2 A) or the phases (see 5.2 B) of the first-level objective.

The division of operational objectives into first- and second-level objectives is based on a clear distinction between the levels of learning:

- learning involving prerequisite knowledge

- learning involving competencies

Second-level operational objectives indicate prerequisite knowledge. They prepare the students to learn what is necessary to attain the first-level operational objectives, which collectively lead to the development of a competency. The objectives should always be adapted to meet the particular needs of the individual students or groups of students.

First-level operational objectives cover the learning that the students need to develop a competency:

- The specifications or the phases of the objective determine or guide specific learning, thereby allowing the competency to be developed step by step.

- The objective as a whole (i.e. the six components and in particular the last phase of a situational objective) determines or guides the overall learning and the integration and synthesis of this learning, allowing the competency to be developed fully.

To attain the objectives, the following learning activities may be prepared:

- specific learning activities for second-level objectives
- specific learning activities for the specifications or phases of first-level objectives
- general learning activities for first-level objectives

5.2 HOW TO READ FIRST-LEVEL OPERATIONAL OBJECTIVES

A. How to Read a Behavioural Objective

Behavioural objectives consist of six components. The first three provide an overview of the objective:

1. The **expected behaviour** states a competency in terms of the general behaviour that the students are expected to have acquired by the end of the module.

2. The **conditions for performance evaluation** define what is necessary or permissible to the students during evaluation designed to verify whether or not the students have attained the objective. This means that the conditions for evaluation are the same wherever and whenever the program is taught.

3. The **general performance criteria** define the requirements by which to judge whether or not the results obtained are generally satisfactory.

The last three components ensure that the objective is understood clearly and unequivocally:

4. The **specifications of the expected behaviour** describe the essential elements of the competency in terms of specific behaviours.

5. The **specific performance criteria** define the requirements for each of the specifications of behaviour. They ensure a more enlightened decision on the attainment of the objective.

6. The **field of application** defines the limits of the objective, where necessary. It indicates cases where the objective applies to more than one task, occupation or field.

B. How to Read a Situational Objective

Situational objectives consist of six components:

1. **The expected outcome** states a competency as an aim to be pursued throughout the course.

2. The **specifications** outline the essential aspects of the competency and ensure a better understanding of the expected outcome.

3. The **learning context** provides an outline of the learning situation designed to help the students develop the required competencies. It is normally divided into three phases of learning:

   - information
   - performance, practice or involvement
   - synthesis, integration and self-evaluation

4. The **instructional guidelines** provide suggested ways and means of teaching the course to ensure that learning takes place and that the same conditions apply wherever and whenever the course is taught. These guidelines may include general principles or specific procedures.

5. The **participation criteria** describe the requirements the students must fulfil, which are usually related to each phase of the learning context. They focus on how the students take part in the activities rather than on the results obtained. Participation criteria are normally provided for each phase of the learning context.

6. **The field of application** defines the limits of the objective, where necessary. It indicates cases where the objective applies to more than one task, occupation or field.

PART II

MODULE 1: THE TRADE AND THE TRAINING PROCESS

CODE: 783 211 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
determine their suitability for the trade and the training process.

SPECIFICATIONS

At the end of this module, the students will:

- Be familiar with the nature of the trade and the possibilities of self-employment.
- Understand the training process.
- Confirm their career choice.

LEARNING CONTEXT

PHASE 1: **Information on the Trade**

- Learning about the job market in maintenance electricity: work environments (types of enterprises, products), job prospects, remuneration, opportunities for promotion and transfer, women in the trade, and the selection of candidates.

- Learning about the nature and requirements of the trade: tasks, working conditions, evaluation criteria, rights and responsibilities of workers.

- Gathering this information through meetings, interviews, reference materials, and so on.

- Assessing the possibility of starting up a business or being self-employed.

- Presenting the information gathered in a group meeting and discussing their views on the trade: advantages, disadvantages, requirements.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Information on and Participation in the Training Process**

- Discussing the skills, aptitudes and knowledge required to practise the trade.

- Becoming familiar with the training process: program of study, training program, methods of evaluation, certification of studies.

- Discussing how the training program prepares them for work as maintenance electricians.

- Sharing their initial reactions to the trade and the training process.

PHASE 3: **Evaluation and Confirmation of Career Choice**

- Preparing a report in which they:
  - specify their preferences, aptitudes and interests with respect to maintenance electricity;
  - assess their career choice by comparing the nature and requirements of the trade with their preferences, aptitudes and interests.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate that favours the students' personal growth and integration into the job market.
- Encourage the students to engage in discussions and express their opinions.
- Motivate the students to take part in the suggested activities.
- Help the students to arrive at an accurate perception of the trade.
- Provide the students with the means to assess their career choice honestly and objectively.
- Organize visits to companies that are representative of the workplace in maintenance electricity.
- Make available all pertinent reference materials, e.g. information on the trade, training programs, guides.
- Organize a meeting with specialists in the field.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Gather information on most of the topics to be covered.
- Adequately express their views on the trade during a group discussion, relating them to the information they have gathered.

PHASE 2:

- Give their opinions on some requirements for practising the trade.
- Study the documents provided.
- Listen attentively to explanations.
- Adequately express their views on the training program during a group meeting.
- Clearly express their reactions.

PHASE 3:

- Write a report that:
  - sums up their preferences, interests, aptitudes and personal qualities;
  - clearly explains how they arrived at their career choice;
  - justifies their decision to continue or not to continue with the program.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before undertaking the activities in each of the phases:

1. Be receptive to information about the trade and the training process.
2. Be willing to share their views on the trade with other members of the group.

Before undertaking the activities of Phase 1:

3. Find the appropriate information.
4. Determine how to record and present information.
5. Distinguish between a task and a workstation.
6. Explain the term *entry-level qualifications*.
7. Explain the main rules governing group discussions.

Before undertaking the activities of Phase 2:

8. Identify the skills, aptitudes and knowledge required to practise a trade.
9. Describe the nature, purpose and content of a program of study.

Before undertaking the activities of Phase 3:

10. Differentiate preferences from aptitudes and interests.
11. Describe the main parts of a report confirming their career choice.

MODULE 2: OCCUPATIONAL HEALTH AND SAFETY

CODE: 842 052 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply occupational health and safety rules
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- On the basis of:
  - relevant research
  - a simulated accident
- Using:
  - relevant reference materials (e.g. laws, regulations, CSST documents)
  - audiovisual materials
  - information about the school's emergency procedures

GENERAL PERFORMANCE CRITERIA

- Comprehension of the legislation
- Comprehension and determination of parameters concerning occupational health and safety
- Accurate association of the causes and effects of industrial accidents and occupational diseases
- Accurate explanations

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Explain some of the general principles of the *Act respecting occupational health and safety* (R.S.Q., c. S-2.1).	- Accurate knowledge of their rights and obligations
B. Explain some of the main regulations concerning the quality of the work environment (R.R.Q, c. S-2.1, r. 15) and industrial and commercial enterprises (R.R.Q., c. S-2.1, r. 9).	- Correct understanding of regulations
C. Identify the causes of the accidents that occur most frequently in the trade.	- Association of tasks with the type of accidents that occur most frequently
D. Describe work situations involving the most common pollutants.	- Accurate association of work situations and the presence of pollutants - Comprehension of a material safety data sheet (MSDS)
E. State the preventive measures applicable to the practice of the trade and to the work environment.	- Accurate knowledge of preventive measures applicable to the practice of the trade (personal safety) and to the environment (general measures)
F. Explain the principles applicable to the layout of a workshop or laboratory.	- Proper comprehension of safety principles applicable to the layout of work areas
G. Outline an emergency procedure for accidents.	- Accurate knowledge of the main emergency procedures - Logical sequence of procedures

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to explain some of the general principles of the *Act respecting occupational health and safety* (R.S.Q., c. S-2.1) (A):

1. Understand the importance of prevention.
2. Be familiar with the statistics pertaining to industrial accidents.
3. Understand the importance of making employers aware of occupational health and safety.

Before learning how to explain some of the main regulations concerning the quality of the work environment (R.R.Q., c. S-2.1, r. 15) and industrial and commercial enterprises (R.R.Q., c. S-2.1, r. 9) (B):

4. Be familiar with the possible recourses in matters of occupational health and safety.

Before learning how to identify the causes of the accidents that occur most frequently in the trade (C):

5. Describe various ways of promoting accident prevention in the workplace.

Before learning how to describe work situations involving the most common pollutants (D):

6. Describe various health hazards in the workplace.
7. Name various pollutants encountered in the trade (e.g. greases, oils, solvents).
8. Describe the methods used to dispose of pollutants.
9. List various ways of preventing occupational diseases.

Before learning how to state the preventive measures applicable to the practice of the trade and to the work environment (E):

10. Understand the importance of keeping the work area clean.
11. List personal and general safety measures (e.g. goggles, boots, padlocks).
12. Describe various ergonomic work positions.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to explain the principles applicable to the layout of a workshop or laboratory (F):

13. Describe the basic rules pertaining to fire prevention.

Before learning how to outline an emergency procedure for accidents (G):

14. Understand the importance of knowing emergency procedures.
15. Be familiar with the school's emergency procedures.
16. Be familiar with the basic first-aid measures for the most common accidents.

MODULE 3: DIRECT-CURRENT CIRCUIT ANALYSIS

CODE: 786 056 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze a direct-current circuit
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Working with a complex circuit containing six resistors
- Using a circuit diagram
- Using the appropriate tools, measuring instruments and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Proper use of instruments and equipment
- Careful work
- Organized work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Read a circuit diagram.	- Proper use of terminology - Correct interpretation of symbols and conventions
B. Calculate values at different points of the circuit.	- Correct application of laws - Accurate calculations
C. Measure values at different points of the circuit.	- Accurate measurements - Systematic observance of safety measures - Accuracy of connections at measuring points
D. Explain the results.	- Accurate calculation of differences - Acceptable list of reasons for the differences

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to read a circuit diagram (A):

1. Describe the atomic structure of matter.
2. Describe the methods of producing electricity.
3. Identify the characteristics of the components of direct-current circuits (sources, resistors, capacitors, inductors).
4. Recognize the different groupings of components.

Before learning how to calculate values at different points of the circuit (B):

5. Explain Ohm's Law and the expression of power.
6. Describe the characteristics of direct-current circuits.
7. Describe the characteristics of RC and LR time constants in circuits.
8. Simplify circuits.

Before learning how to measure values at different points of the circuit (C):

9. Recognize the colour code of components.
10. Verify the condition of circuit components.
11. Locate the connection points on a work board.
12. Apply the laws of magnetism.
13. Describe the characteristics of direct-current measuring instruments.
14. Connect the measuring instruments to a circuit.
15. Interpret readings from measuring instruments.

Before learning how to explain the results (D):

16. Identify the possible sources of errors in readings.
17. Define the internal resistance of a source.

MODULE 4: USING TOOLS AND ANCHORS

CODE: 786 034

Duration: 60 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
use basic tools and anchors
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using the sketches required to perform the tasks
- Using an electrician's basic hand and power tools

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules as well as of personal and general safety measures
- Compliance with instructions
- Result in conformity with sketches
- Use of proper techniques
- Proper maintenance and storage of tools and materials
- Clean, careful work
- Respect for layout and environment

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Use hand tools.	- Correct choice of tools - Proper, safe use of tools - Precise work
B. Use power tools.	- Proper testing and preparation of tools - Proper, safe use of tools - Precise work
C. Use anchors.	- Correct choice of anchor - Proper preparation of anchorings - Proper fastening technique - Solid anchorings

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to use hand tools (A):

1. Recognize the hand tools used in electricity and their characteristics.
2. Demonstrate how to use the various tools.
3. Identify the accidents associated with hand tools and the precautions to be taken.
4. Describe the methods for maintaining and storing hand tools.
5. Recognize the main types of fasteners.

Before learning how to use power tools (B):

6. Recognize the power tools used in electricity and their characteristics.
7. Do a routine check of power tools.
8. Demonstrate how to use power tools.
9. Identify the accidents associated with power tools.
10. Select the power tools appropriate to the tasks to be performed.
11. Describe the methods for maintaining and storing power tools.

Before learning how to use anchors (C):

12. Distinguish between the various types of anchors, their characteristics and their uses.
13. Distinguish between the various materials to which anchors may be fastened.
14. Recognize the tools required for anchoring.
15. Determine the criteria for selecting an anchor.
16. Describe the techniques for fastening anchors.
17. Recognize the quality criteria for anchoring.

MODULE 5: PRODUCING SKETCHES AND DIAGRAMS

CODE: 786 123 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
produce basic electrical sketches and diagrams
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Working with a mechanical part
- Without using instruments

GENERAL PERFORMANCE CRITERIA

- Compliance with instructions
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Draw sketches: • orthographic views; • isometric views.	- Correct use of standard drafting lines - Accurate representation of dimensions in both the imperial and metric systems of measurement - Proper drawing of top, front and side views - Correct proportions
B. Draw basic electrical symbols.	- Proper drawing method - Selection of proper symbols
C. Produce basic electrical drawings: • line diagrams; • ladder diagrams.	- Observance of methods - Appropriate arrangement of elements and symbols

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to draw sketches:

- **orthographic views;**
- **isometric views (A):**

1. Draw geometric figures.
2. Recognize the standard drafting lines, their meanings and their uses.
3. Use the metric and imperial systems of measurement.
4. Distinguish between top, front and side views.

Before learning how to draw basic electrical symbols (B):

5. Identify the main components of a basic electrical circuit.
6. Recognize the symbols used to represent the main components of a circuit.
7. Describe the method used to draw symbols.

Before learning how to produce basic electrical drawings:

- **line diagrams;**
- **ladder diagrams (C):**

8. Recognize the various types of diagrams used in electricity.
9. Describe the method for producing various types of diagrams.

MODULE 6: USING TECHNICAL MANUALS AND PLANS

CODE: 783 223 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
use a technical manual and a plan
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions for finding and interpreting information
- Using:
  - a technical manual for an emergency power supply system
  - an installation plan

GENERAL PERFORMANCE CRITERIA

- Methodical work
- Concern for detail

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Consult a technical manual.	- Methodical use of the table of contents - Thorough, precise summary of safety and warranty information - Accurate description of technical information - Proper use of technical terms
B. Interpret drawings and diagrams in a technical manual.	- Accurate interpretation of: • symbols • value of components • conventions regarding layout and annotations
C. Read a plan.	- Accurate reading of symbols, conventions and annotations - Correct location of components in imperial or metric measurements

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to consult a technical manual (A):

1. Recognize the various types of technical manuals used in industrial maintenance.
2. Recognize the various abbreviations used in industrial technical reference materials.
3. Describe a method for finding information in a manual.
4. List the elements making up a parts table.
5. Distinguish between the various codes used for parts.
6. Become familiar with safety and warranty information in a technical manual.

Before learning how to interpret drawings and diagrams in a technical manual (B):

7. Explain the various conventions used for the production of drawings and diagrams.
8. Distinguish between the various symbols used in industrial technical reference materials.
9. Distinguish between the various ways of identifying components in diagrams and drawings.

Before learning how to read a plan (C):

10. Recognize the various types of plans used in maintenance electricity.
11. Recognize the general information found on electrical installation, architectural, heating and plumbing plans.
12. Describe the function and principle of scale.
13. Become familiar with the information contained in a legend and title.

MODULE 7: ALTERNATING-CURRENT CIRCUIT ANALYSIS

CODE: 786 115 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze an alternating-current circuit
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Working with a series or parallel circuit containing one resistor, one inductor and one capacitor
- Using a circuit diagram
- Using the appropriate tools, measuring instruments and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of instruments and equipment
- Careful work
- Organized work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Read a circuit diagram.	- Proper use of terminology - Correct interpretation of symbols and conventions
B. Calculate values at different points of the circuit.	- Correct application of laws - Accurate calculations
C. Measure values at different points of the circuit.	- Accurate measurements - Systematic observance of safety measures - Accuracy of connections at measuring points
D. Explain the results.	- Accurate calculation of differences - Acceptable list of reasons for the differences

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to read a circuit diagram (A):

1. Explain how a sine wave is produced.
2. Define the terms associated with alternating current.
3. Describe the characteristics of inductors in an alternating-current circuit.
4. Describe the characteristics of capacitors in an alternating-current circuit.
5. Apply the laws of electromagnetism.
6. Describe the characteristics of transformers.

Before learning how to calculate values at different points of the circuit (B):

7. Describe the characteristics of alternating-current circuits.
8. Differentiate between the terms *resistance, reactance* and *impedance.*
9. Draw vector diagrams.
10. Calculate the values of a sine wave.
11. Differentiate between the terms *real power, reactive power, apparent power* and *power factor.*
12. Describe the characteristics of series and parallel resonant circuits.

Before learning how to measure values at different points of the circuit (C):

13. Verify the condition of circuit components.
14. Explain the safety measures to take before connecting instruments and when taking readings.
15. Use alternating-current measuring instruments.
16. Interpret readings from measuring instruments.

Before learning how to explain the results (D):

17. Identify the possible sources of errors in readings.

MODULE 8: INSTALLING ELECTRICITY SUPPLY MATERIALS

CODE: 783 236 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install electricity supply materials
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using:
  - an installation sketch
  - the *Québec Electrical Code*
  - the appropriate equipment, tools and materials
  - personal protective equipment
- With the help of a person for pulling in conductors

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment and tools
- Compliance with the *Québec Electrical Code* and the installation sketch
- Correct installation of materials
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Plan the installation.	- Detailed, thorough list of materials - Correct choice of equipment and tools - Correct testing of tools and equipment - Functional, safe workstation
B. Mount a distribution panel and boxes.	- Location in conformity with installation sketch - Proper mounting technique - Solidity and quality of mounting
C. Install raceways and pull in conductors.	- Precise performance of preliminary operations such as: • cutting • boring • threading • bending • assembling - Levelling of raceways - Proper installation techniques - Proper pulling-in technique
D. Install cables.	- Proper baring technique - Proper installation technique - Economical use of materials
E. Connect conductors.	- Proper connection techniques - Connections in conformity with installation sketch - Proper connection of the grounding conductor - Suitable arrangement of conductors after the connection
F. Test the installation.	- Methodical control of the quality of the installation

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to plan the installation (A):

1. Recognize the various types of cables.
2. Recognize the boxes and wiring accessories.
3. Recognize the various types of raceways and their accessories.
4. Become familiar with the *Québec Electrical Code*.
5. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that apply to the installation of cables and raceways.
6. Use the mathematical formulas required to install cables and raceways.
7. Produce wiring diagrams based on electrical diagrams.

Before learning how to mount a distribution panel and boxes (B):

8. Identify the components of a distribution panel.
9. Demonstrate the techniques for mounting distribution panels and boxes.
10. Recognize the safety rules and protective measures to observe for the installation and connection of electrical system components.
11. Describe an effective, safe method for cleaning and storing.

Before learning how to install raceways and pull in conductors (C):

12. Use the tools and equipment required to cut, bore, thread, bend and assemble raceways.
13. Demonstrate the technique for installing a raceway.
14. Demonstrate the technique for pulling conductors in a raceway.
15. Mark conductors.
16. Identify the size of conductors used for the installation of various electrical distribution circuits.

Before learning how to install cables (D):

17. Demonstrate the techniques for baring and installing cables.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to connect conductors (E):

18. Recognize the colours used in electrical conductor identification codes.
19. Explain the purpose of a grounding conductor.
20. Distinguish between the various types of connections.
21. Recognize the overcurrent devices that protect electrical distribution circuits.
22. Demonstrate the technique for connecting conductors to a distribution panel.

Before learning how to test the installation (F):

23. Describe a method for controlling the quality of an electrical installation.

MODULE 9: COMMUNICATING IN THE WORKPLACE

CODE: 786 291 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
communicate in the workplace.

SPECIFICATIONS

At the end of this module, the students will:

- Be familiar with the general principles of communication.
- Apply principles and techniques of communication in the workplace.
- Be aware of their strengths and weaknesses with regard to communication.

LEARNING CONTEXT

PHASE 1: **Principles of Communication**

- Learning about the factors involved in the communication process.

- Listing the obstacles to communication and the factors that promote effective communication.

- Examining the way they communicate on the basis of their personal and work experiences.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Communication Techniques**

- Experimenting with situations which involve colleagues and superiors and in which they must:
  - interpret messages of a technical nature;
  - verbally explain technical problems;
  - write a report.

- Analyzing the performance of a work team with communication problems and suggesting solutions to improve the situation.

PHASE 3: **Evaluation**

- Summarizing their strengths and weaknesses with regard to the way they communicate with colleagues and superiors.

- Summarizing the skills acquired during this module.

- Finding means of improving their ability to communicate.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate of trust and openness.
- Use simulation techniques in learning situations representative of the workplace.
- Encourage the exchange of opinions by means of appropriate leadership techniques.
- Ensure that discussions take place in a respectful atmosphere.
- Encourage the students to try out new behaviours.
- Help the students evaluate themselves and provide them with the appropriate tools to do so.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Gather information on the various topics to be covered.
- Indicate at least one strength and one weakness related to the way they communicate.

PHASE 2:

- Participate in all activities, following the general instructions.

PHASE 3:

- Submit a report containing the following information:
  - one strength and one weakness related to the way they communicate with colleagues and superiors
  - two skills acquired during the module
- Indicate at least two ways of improving the way they communicate.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before undertaking the activities of Phase 1:

1. Recognize the importance of communicating effectively as maintenance electricians.
2. Recognize the different theoretical models of communication.
3. Recognize the basic principles of communication.
4. Recognize the main obstacles to effective communication.

Before undertaking the activities of Phase 2:

5. Recognize the main types of communication involved in a maintenance electrician's work.
6. Recognize situations requiring communication during teamwork.
7. Recognize the importance of adequately using technical terms of the trade.
8. List the various types of information that can be found in a work order, a list of materials and a report.

MODULE 10: USING A MICROCOMPUTER

CODE: 843 192

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
use a microcomputer
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
  - a microcomputer with a hard disk
  - a disk operating system (DOS) and the DOS reference manual
  - the reference manual for the microcomputer
  - diskettes

GENERAL PERFORMANCE CRITERIA

- Careful, clean work
- Proper use of microcomputer
- Proper execution of DOS commands

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Differentiate between the various types of microcomputers.	- Accurate interpretation
B. Connect the various peripherals to the microcomputer.	- Observance of specifications - Proper procedure
C. Perform operations using DOS.	- Compliance with instructions
D. Manage a hard disk.	- Proper procedure

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to differentiate between the various types of microcomputers (A):

1. Explain the function of a microcomputer.
2. Describe the various types of microcomputers.
3. Describe the various models of microcomputers.

Before learning how to connect the various peripherals to the microcomputer (B):

4. Identify the components making up a microcomputer environment.
5. List the functions and characteristics of peripherals.
6. Differentiate between the input and output connections of a microcomputer.
7. Describe the characteristics of serial and parallel communication.
8. Show concern for the maintenance required for a microcomputer and its peripherals.

Before learning how to perform operations using DOS (C):

9. Explain the function of DOS.
10. Differentiate between internal and external DOS commands.
11. Explain the DOS commands.
12. List the main families of files.

Before learning how to manage a hard disk (D):

13. Describe the operations for formatting a hard disk.
14. Explain the concept of *subdirectory*.
15. Describe the operations for saving files on the hard disk onto diskettes.
16. Describe the operations for restoring a hard disk.

MODULE 11: SOLID-STATE CIRCUITS

CODE: 843 076 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze solid-state circuits
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Working with an assembly containing an active component and related circuits
- Using:
  - an electronic diagram
  - data sheets for components
  - measuring instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Methodical work
- Concern for detail
- Accurate terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Explain how the active components of solid-state circuits work.	- Precise explanation of: • path of currents • state of polarization - Conformity with standard characteristics of active components
B. Read diagrams of basic: • supply circuits; • amplifier circuits; • oscillation circuits.	- Correct identification of: • active and passive components • standard characteristics of active components • specific characteristics of the function and reference values of related circuits
C. Measure the values of basic: • supply circuits; • amplifier circuits; • oscillation circuits.	- Suitable choice of instrument according to the value to be measured - Accurate measurements - Observance of health and safety rules
D. Determine the operating condition of circuits.	- Accurate interpretation of reference values and measured values - Precise determination of operating condition

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to explain how the active components of solid-state circuits work (A):

1. Recognize the basic properties of semiconductor materials.
2. Describe the two basic groups of optoelectronic components.
3. Describe the basic function of photosensitive components.
4. Describe the operating principles of the main photosensitive components.
5. Describe the basic principle of a light-emitting diode.
6. List the advantages of light-emitting diodes in comparison with other sources of light.

Before learning how to read diagrams of basic:

- **supply circuits;**
- **amplifier circuits;**
- **oscillation circuits (B):**

7. Describe the functions of rectifier circuits.
8. Describe the functions of filter components.
9. Explain how power supplies work.
10. Explain how amplifier circuits work.
11. Explain how oscillation circuits work.
12. Recognize the characteristics of linear integrated circuits.

Before learning how to measure the values of basic:

- **supply circuits;**
- **amplifier circuits;**
- **oscillation circuits (C):**

13. Use an oscilloscope.

Before learning how to determine the operating condition of circuits (D):

14. Interpret the input and output parameters of various circuits.

MODULE 12: INSTALLING ELECTRICAL SYSTEMS

CODE: 783 246 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install and connect an electrical system
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using:
  - a description of the task
  - a plan
  - the *Québec Electrical Code*
  - the appropriate equipment, tools and materials
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment and tools
- Compliance with the *Québec Electrical Code*
- Proper operation of the system
- Clean, careful work
- Respect for layout and environment

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Plan the installation.	- Detailed, thorough list of materials - Correct choice of tools - Proper testing of tools and equipment - Relevance of installation sketch - Functional, safe workstation
B. Install the components of: • lighting systems; • heating systems.	- Location in conformity with installation plan - Proper installation technique - Solidity and acceptable appearance of the installation
C. Connect conductors to: • lighting system components; • heating system components.	- Proper connection techniques - Connections in conformity with installation plan - Suitable arrangement of conductors
D. Test the installation.	- Methodical control of the quality of the installation - Correct, safe start-up of the system - Proper use of measuring instruments

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to plan the installation (A):

1. List the characteristics of a three-phase current.
2. Distinguish between the various types of relays and low-voltage controls according to their uses.
3. Distinguish between the different types of lighting fixtures according to their use, energy efficiency and applicable CSA standards.
4. List the components required for the installation of industrial systems.
5. Recognize various heating systems and their components.
6. Distinguish between the various ways in which heat is diffused.
7. Explain the basic operating principles of different types of heating systems.
8. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that apply to the installation of electrical systems.
9. Associate the various types of cables with different types of electrical systems.
10. Use the mathematical formulas necessary to install electrical systems.
11. Produce installation diagrams for electrical systems.

Before learning how to install the components of:
- **lighting systems;**
- **heating systems (B):**

12. Identify the risks of accident and the hazards related to the installation of electrical systems as well as the precautions to be taken.
13. Recognize the safety rules applicable to the handling of electrical system components.
14. Locate heating system controls.
15. Demonstrate the techniques for installing electrical system components.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to connect conductors to:
- **lighting system components;**
- **heating system components (C):**

16. Recognize the various types of connections.
17. Recognize the wiring circuits used for the installation of heating systems.
18. Demonstrate the techniques for connecting conductors to electrical system components.

Before learning how to test the installation (D):

19. Activate electrical systems.
20. Demonstrate the procedure for testing the installation of electrical circuits.
21. Use the measuring instruments required to test an electrical system.

MODULE 13: COMBINATIONAL LOGIC

CODE: 783 393 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply concepts of combinational logic
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- On the basis of an unsimplified equation
- Using:
  - technical manuals
  - data sheets
  - logic components
  - tools and measuring instruments
  - assembly materials
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Methodical, precise work
- Proper use of materials and measuring instruments
- Operation in conformity with equation

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Apply concepts of Boolean algebra.	- Observance of rules
B. Do conversions between number bases and codes.	- Accurate conversions
C. Construct truth tables for a circuit.	- Observance of rules - Accurate results
D. Reduce equations using the Karnaugh method.	- Optimal grouping of variables - Accurate results
E. Translate equations into diagrams.	- Conformity of diagram with equation - Clear diagram
F. Assemble basic circuits.	- Suitable selection of components according to instructions - Conformity of assembly with diagram - Observance of occupational health and safety rules - Quality of assembly

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to apply concepts of Boolean algebra (A):

1. List the laws of Boolean algebra.

Before learning how to do conversions between number bases and codes (B):

2. Briefly explain number systems.

Before learning how to construct truth tables for a circuit (C):

3. Explain the basic logic functions and their truth table.

Before learning how to assemble basic circuits (F):

4. Recognize different components on the basis of identification codes.
5. Use a logic probe.

MODULE 14: SEQUENTIAL LOGIC

CODE: 783 384 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply concepts of sequential logic
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- On the basis of a graphic representation of a sequence
- Using:
  - technical manuals
  - data sheets
  - logic components
  - personal protective equipment
  - assembly equipment
  - measuring instruments

GENERAL PERFORMANCE CRITERIA

- Methodical, precise work
- Proper use of materials and measuring instruments
- Normal operating condition of assembly

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Analyze different graphic representations of: • an algorithm sequence; • a chronogram sequence; • a GRAFCET sequence.	- Accurate analysis: • recognition of steps and transitions • description of course of action • explanation of rules of change - Accurate terminology
B. Translate graphic representations of a sequence into electronic diagrams.	- Conformity of diagram with graphic representation - Clear diagram
C. Select components.	- Suitable selection according to: • electronic diagram • component characteristics
D. Produce assembly diagrams.	- Conformity of assembly diagram with electronic diagram - Clear diagram
E. Assemble basic circuits.	- Conformity of assembly with electronic diagram and instructions - Observance of occupational health and safety rules - Quality of assembly: • aesthetic • operational

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to analyze different graphic representations of:

- **an algorithm sequence;**
- **a chronogram sequence;**
- **a GRAFCET sequence (A):**

1. Describe the rules for producing various graphic representations of a sequence.
2. Recognize the main symbols associated with various graphic representations of a sequence.
3. Describe the various start, run and stop modes of a sequence.

Before learning how to select components (C):

4. Recognize the function of logic components and their symbols.
5. Distinguish between sequential circuits and combinational circuits.

MODULE 15: INSTALLING INDUSTRIAL EQUIPMENT

CODE: 783 256 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install and connect industrial equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a description of the task
- Using:
  - a plan and installation specifications
  - the *Québec Electrical Code*
  - the appropriate equipment, tools and materials
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment and tools
- Compliance with the plan and the *Québec Electrical Code*
- Proper operation of the equipment
- Clean, careful work
- Respect for layout and environment

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Plan the installation.	- Detailed, thorough list of materials - Correct choice of tools - Correct testing of tools and equipment - Relevance of installation sketch - Functional, safe workstation
B. Install components.	- Location in conformity with installation plan - Proper installation technique - Solidity and acceptable appearance of the installation
C. Connect conductors to components.	- Proper connection technique - Connections in conformity with installation plan - Suitable arrangement of conductors
D. Test the installation.	- Methodical control of the quality of the installation - Correct, safe start-up of the equipment - Proper use of measuring instruments
E. Communicate the results.	- Correct formulation of report - Inclusion of all important information

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to plan the installation (A):

1. Recognize the different types of transformers, their components and the materials they are made of.
2. Identify the potential environmental risks associated with the materials used to manufacture transformers.
3. Distinguish between the electrical characteristics of single-phase and three-phase transformers with and without loads.
4. Recognize the different parts to be connected in an automated system.
5. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that apply to the installation of industrial equipment.
6. Read installation plans for industrial equipment.
7. Determine the type and size of conductors according to the load connected and the equipment installed.
8. Recognize the overcurrent protection components that are required for the installation of industrial equipment.
9. Use the concepts related to analyzing alternating-current circuits and direct-current circuits that are required for the installation of industrial equipment.

Before learning how to install components (B):

10. Identify the potential hazards related to the installation of industrial equipment as well as the precautions to be taken.
11. Identify the safety rules applicable to the handling of industrial equipment.
12. Demonstrate the techniques for installing the components of a piece of industrial equipment.

Before learning how to connect conductors to components (C):

13. Use the instruments required to verify the polarity of transformers.
14. Recognize the various types of transformer connections.
15. Recognize the wiring circuits used for the installation of equipment in an automated system.
16. Demonstrate the techniques for connecting conductors to the components of a piece of industrial equipment.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to test the installation (D):

17. Activate parts of the equipment.
18. Recognize the main problems encountered with the operation of industrial equipment and their causes.
19. Demonstrate the procedure for testing the installation of a piece of industrial equipment.

Before learning how to communicate the results (E):

20. List the information included in a report on the installation of industrial equipment.

MODULE 16: INTRODUCTION TO THE TRADE

CODE: 783 262

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
become familiar with the trade.

SPECIFICATIONS

During this module, the students will:

- Observe various aspects of the trade in the workplace.
- Participate in certain simple activities related to the trade.
- Reinforce the cognitive and perceptual skills acquired during training.
- Become aware of changes in their views on the work situation, trade practices and the training, and in their aptitudes, preferences and interests, as a result of their practicum.
- Become familiar with the workplace.

LEARNING CONTEXT

PHASE 1: **Preparing for the Practicum**

- Becoming familiar with information on the practicum, including its terms and conditions.

- Establishing criteria for the selection of companies.

- Preparing a list of companies that might offer practicums.

- Taking steps to obtain a practicum position.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Observing and Performing Tasks related to the Trade in the Workplace**

- Observing the work situation: socio-economic environment (products, market); trade associations; the company's organizational structure; equipment and technological advances; working conditions; interpersonal relations; health and safety measures.
- Observing various aspects of the trade and participating in simple tasks.
- Participating in various interpersonal exchanges.
- Producing a brief report summarizing their observations about the work situation and about the main tasks carried out in the workplace.
- Producing a report summarizing the activities carried out during the practicum.

PHASE 3: **Comparing Their Initial Views with the Actual Work Environment**

- Identifying aspects of the trade that differ from their training.
- Discussing the attitudes and behaviours required in the workplace.
- Discussing the accuracy of their views on the various aspects of the trade.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide the students with the means of selecting a suitable practicum position.
- Ensure that the students properly understand the objectives and the terms and conditions of the practicum.
- Maintain close ties between the school and the company.
- Make it possible for the student-trainees to observe tasks.
- Ensure regular support and supervision of the student-trainees.
- Ensure that the student-trainees are under the direct supervision of a representative of the company.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

INSTRUCTIONAL GUIDELINES

- Take prompt, effective action should problems arise.
- Provide the students with reference materials on the practicum.
- Encourage the students to engage in discussions and express their opinions.

PARTICIPATION CRITERIA

PHASE 1:

- List, in order of priority, three possible practicum positions that meet their predetermined selection criteria.
- Undergo a selection interview with a representative of the company.

PHASE 2:

- Observe the company's policies with respect to the activities they may carry out as student-trainees, work schedules, and so on.
- Participate in evaluating their practicum with the practicum supervisor.
- Produce a report containing information on at least five topics to observe and describing the tasks observed.

PHASE 3:

- On the basis of their report, share their views on their work experience with the other students.
- Discuss any changes in their views resulting from their work experience.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before undertaking the activities of Phase 1:

1. Describe the steps involved in planning a practicum search.
2. List the attitudes required to carry out a creative practicum search.
3. Describe their expectations and apprehensions concerning the practicum.

Before undertaking the activities of Phase 2:

4. Describe the information to be recorded during the practicum.
5. Describe the behaviours to be adopted in the workplace.

Before undertaking the activities of Phase 3:

6. List their attitudes, preferences and interests with respect to the trade.
7. Describe the requirements of the workplace.
8. Identify the aspects of the trade that differ from their training.

MODULE 17: REPAIRING DIRECT-CURRENT MOTOR CONTROLS

CODE: 783 295 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
repair a direct-current motor control
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a work order concerning a malfunction
- Using:
  - a technical manual and a diagram
  - the appropriate instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment and tools
- Observance of technical characteristics and standards of quality
- Compliance with the *Québec Electrical Code*
- Proper operation
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Clarify the overall situation.	- Gathering of pertinent information - Verification of the equipment by sight, touch and smell - Thorough technical summary of symptoms
B. Determine the standard operating condition of the: • manual control; • magnetic control; • electronic control.	- Correct interpretation of: • technical reference materials • the plan: - classification of sections and components - study of relationships between the subassemblies and between the components - Precise, organized determination of test points - Thorough summary of optimal technical characteristics
C. Analyze the actual operating condition of the control.	- Precise measurement of: • the values at the test points • the components - Accurate comparison of the actual operating condition and the standard operating condition
D. Diagnose the problem.	- Precise location of defective part - Valid definition of the malfunction

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Determine a solution and take corrective measures.	- Lack of input and system voltage - Accurate assessment of the condition of the part - Selection of appropriate solution - Proper disassembly and re-assembly techniques - Correct repair or replacement of part - Updating of parts inventory
F. Perform trials and tests.	- Correct, safe start-up of control - Methodical performance of trials and tests - Accurate assessment of operation
G. Communicate the results.	- Correct preparation of report - Inclusion of all important information

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to clarify the overall situation (A):

1. Distinguish between the various types of direct-current motors and generators.
2. Recognize the components of direct-current rotary machines.
3. Explain the basic operating principles of direct-current motors and generators.
4. Distinguish between various direct-current motors and generators using instruments.
5. Interpret the information recorded on the nameplate of a direct-current motor or generator.
6. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that apply to direct-current motors and generators and their controls.
7. Recognize the safety rules applicable to the repair of industrial system components.
8. Explain the operation of various direct-current motor control circuits: manual, magnetic, electronic.
9. Install and connect direct-current motor controls: manual, magnetic, electronic.
10. Locate the protective devices for direct-current motors and generators.
11. Use the concepts related to communicating in the workplace that are required to clarify a situation pertaining to the malfunction of a control.
12. Describe the verification procedure (sight, touch, smell) of a drive system of electrical rotary machines.

Before learning how to determine the standard operating condition of the:

- **manual control;**
- **magnetic control;**
- **electronic control (B):**

13. Find information in the technical reference materials.
14. Distinguish between the elements (components, sections, inputs, outputs) of a plan for a direct-current motor control.
15. Identify the technical characteristics at the output of each section of a direct-current control.
16. Define the following terms: *standard operating condition* and *actual operating condition* of a piece of equipment.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to analyze the actual operating condition of the control (C):

17. Interpret the measurements taken at the test points of a rotary machine drive circuit.

Before learning how to diagnose the problem (D):

18. Identify the sources of problems in a direct-current motor control circuit.

Before learning how to determine a solution and take corrective measures (E):

19. Use the computer equipment required for inventory management.
20. Select replacement components in manufacturers' catalogues.
21. Deactivate the system and padlock it.

Before learning how to perform trials and tests (F):

22. Describe the procedure for verifying the operation of the control before and after start-up.

MODULE 18: REPAIRING ALTERNATING-CURRENT MOTOR CONTROLS

CODE: 783 306 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
repair an alternating-current motor control
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a work order concerning a malfunction
- Using:
  - a technical manual and a diagram
  - the appropriate instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment and tools
- Observance of technical characteristics and standards of quality
- Compliance with the *Québec Electrical Code*
- Proper operation of equipment
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Clarify the overall situation.	- Gathering of pertinent information - Verification of the equipment by sight, touch and smell - Thorough technical summary of symptoms
B. Determine the standard operating condition of the: • manual control; • magnetic control; • electronic control.	- Correct interpretation of: • technical reference materials • the plan: - classification of sections and components - study of relationships between the subassemblies and between the components - Precise, organized determination of test points - Thorough summary of optimal technical characteristics
C. Analyze the actual operating condition of the control.	- Precise measurement of: • the values at the test points • the components - Accurate comparison of the actual operating condition and the standard operating condition
D. Diagnose the problem.	- Precise location of defective part - Valid definition of the malfunction

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Determine a solution and take corrective measures.	- Lack of input and system voltage - Accurate assessment of the condition of the part - Selection of appropriate solution - Proper disassembly and re-assembly techniques - Correct repair or replacement of part - Updating of parts inventory
F. Perform trials and tests.	- Correct, safe start-up of control - Methodical performance of trials and tests - Accurate assessment of operation
G. Communicate the results.	- Correct preparation of report - Inclusion of all important information

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to clarify the overall situation (A):

1. Distinguish between the various types of alternating-current motors and generators.
2. Recognize the components of alternating-current rotary machines.
3. Explain the basic operating principles of alternating-current motors and generators.
4. Distinguish between the characteristics of various alternating-current motors and generators using instruments.
5. Interpret the information on the nameplate of an alternating-current motor or generator.
6. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that apply to alternating-current motors and generators and their controls.
7. Explain the operation of various alternating-current motor control circuits.
8. Install and connect alternating-current motor controls.
9. Locate the protective devices for alternating-current motors and generators.

Before learning how to determine the standard operating condition of the:

- **manual control;**
- **magnetic control;**
- **electronic control (B):**

10. Distinguish between the elements (components, sections, inputs, outputs) of a plan for an alternating-current motor control.
11. Identify the technical characteristics at the output of each section of an alternating-current control.

Before learning how to analyze the actual operating condition of the control (C):

12. Interpret the measurements taken at the test points of a rotary machine drive circuit.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to diagnose the problem (D):

13. Identify the sources of problems in an alternating-current motor control circuit.

Before learning how to determine a solution and take corrective measures (E):

14. Select replacement components.

Before learning how to perform trials and tests (F):

15. Describe the procedure for verifying and correcting the power factor of a rotary machine.

MODULE 19: MODIFYING ELECTRICAL SYSTEM INSTALLATIONS

CODE: 783 286 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
modify electrical system installations
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a work order
- Using:
  - technical reference materials
  - the appropriate tools and instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of technical characteristics and standards of quality
- Compliance with the *Québec Electrical Code*
- Compliance with standards in effect
- Proper operation of equipment
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Study the modification request.	- Precise definition of operational specifications of the modification - Gathering of all information pertinent to the modification
B. Analyze the existing system installation.	- Accurate determination of the system's operational characteristics - Methodical use of technical reference materials
C. Plan the modification.	- Correct drawing of wiring diagram for the modification - Detailed, thorough list of materials - Proper selection of tools
D. Do the modification.	- Correct location and installation of components - Wiring in conformity with standards and the *Code* - Correct connection of components
E. Perform trials and tests.	- Methodical performance of trials and tests - Correct, safe start-up of system
F. Communicate the results.	- Correct preparation of report - Inclusion of all important information

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to study the modification request (A):

1. Distinguish between the various industrial electrical systems.
2. Distinguish between various types of industrial sensors and actuators.
3. Describe how various electrical systems work.

Before learning how to analyze the existing system installation (B):

4. Read the installation plans for alarm systems, motor controls, and so on.
5. Draw the electrical diagram of a system installation from the existing wiring.
6. Use the technical manual of an electrical system.
7. Recognize the safety rules applicable to the modification of industrial systems.

Before learning how to plan the modification (C):

8. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that apply to different electrical systems.
9. Associate the cables and conduits with various industrial electrical systems.
10. Assess the consequences of the modification.

Before learning how to do the modification (D) and perform trials and tests (E):

11. Describe the procedure for testing circuits.

MODULE 20: POWER ELECTRONICS

CODE: 783 316 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
repair a power electronics system
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a work order concerning a malfunction
- Using:
  - technical reference materials
  - the appropriate measuring instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of measuring instruments
- Methodical use of reference materials
- Observance of technical characteristics and standards of quality
- Proper operation of equipment
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Clarify the overall situation.	- Gathering of pertinent information - Verification of the equipment by sight, touch and smell - Thorough technical summary of symptoms
B. Determine the standard operating condition of the equipment.	- Correct interpretation of: • technical reference materials • the plan: - classification of sections and components - study of relationships between the subassemblies and between the components - Precise location of test points - Thorough summary of optimal technical characteristics
C. Analyze the actual operating condition of the equipment.	- Precise measurement of: • the values at the test points • the components - Accurate comparison of the actual operating condition and the standard operating condition
D. Diagnose the problem.	- Precise location of defective part - Valid definition of the malfunction

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to take corrective measures (E):

12. Determine the protective measures applicable to the assembly, disassembly and handling of solid-state circuit boards.
13. Solder and unsolder solid-state components.
14. Describe the methods for disassembling and re-assembling components.

Before learning how to perform trials and tests (F):

15. Activate power electronics systems with loads.
16. Recognize the settings of a variable speed drive.

MODULE 21: INDUSTRIAL PROCESSES

CODE: 783 274 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze an industrial manufacturing process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of specifications
- Using technical reference materials

GENERAL PERFORMANCE CRITERIA

- Methodical use of reference materials
- Observance of method for the functional analysis of processes
- Accurate terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Represent the process graphically.	- Accuracy of the representation of the process: • description of function • identification of inputs: working materials, control data and power sources • identification of outputs: products and by-products
B. Break down the production process.	- Accurate identification of the phases and the purpose of each - Brief description of the actions in each phase - Accurate identification of the physical variables at play
C. Break down each phase of the production process.	- Accurate identification of: • main equipment • initial conditions of the cycle of each phase - Accurate representation of the steps and transitions of the cycle of each phase

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to represent the process graphically (A):

1. Define the terms *system, model, process* and *increment value.*
2. Recognize the elements of a general model of a system.
3. Describe the method for analyzing a process.
4. Recognize the different points of view from which a system can be analyzed.
5. Recognize different sectors of industrial manufacturing.

Before learning how to break down the production process (B):

6. Recognize the actions that are measured and controlled in a simple production process.

Before learning how to break down each phase of the production process (C):

7. Recognize the combinational and sequential actions of a simple production process.
8. Locate and characterize the sensors and actuators of a simple production process.
9. Recognize the methods of graphically representing a cycle of a production process.

MODULE 22: PREVENTIVE MAINTENANCE

CODE: 783 323 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
carry out preventive maintenance on industrial equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a maintenance schedule
- Using:
  - technical reference materials
  - software or maintenance sheets
  - the appropriate tools and instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of tools and instruments
- Observance of technical characteristics of equipment
- Operation in conformity with standards of quality
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Plan the maintenance.	- Conformity with the maintenance schedule and the history of the equipment - Gathering of all relevant information - Effective, quality communication - Optimal organization and feasibility of work - Detailed, thorough list of materials and equipment
B. Carry out maintenance tasks.	- Accurate interpretation of technical reference materials - Correct evaluation of the condition and operation of components - Proper work techniques - Observance of manufacturer's specifications
C. Perform trials and tests.	- Methodical performance of trials and tests - Correct, safe start-up of equipment - Accurate assessment of operation
D. Update the data bank.	- Thorough, accurate update of: • maintenance sheets • parts inventory - Correct preparation of maintenance report

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to plan the maintenance (A):

1. Define *industrial maintenance* according to standards in effect.
2. Distinguish between the various types of maintenance.
3. Distinguish between the two major categories of maintenance tasks, that is, technical tasks and management tasks.
4. Describe the main objectives of maintenance tasks.
5. Characterize the components of a maintenance program.
6. Perform the follow-up of a piece of equipment using specialized software.
7. Break down a maintenance task into its different phases by indicating the work involved in each phase.
8. Describe the basic maintenance tasks associated with various types of equipment.
9. Use the concepts related to communicating in the workplace that are required for the maintenance of industrial equipment.
10. Distinguish between a maintenance program and a maintenance schedule.
11. Use maintenance sheets.

Before learning how to carry out maintenance tasks (B):

12. Use the technical reference materials pertinent to industrial equipment maintenance.
13. Identify the main sources of problems in various types of industrial equipment.
14. Identify the main sources of malfunction in various types of industrial equipment.
15. Detect differences between the actual operating condition of a piece of equipment and its standard operating condition.
16. Use technical reference materials pertinent to the selection of replacement parts.

Before learning how to perform trials and tests (C):

17. Activate the equipment.
18. Identify the types of measurements that indicate the normal operation of various types of equipment.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to update the data bank (D):

19. Explain the contents of a data bank.
20. Describe a method for using a data bank.

MODULE 23: MODIFYING AUTOMATED PROGRAMS

CODE: 783 337 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
modify an automated program
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of:
  - a modification request including a diagram
  - an operational program
- Using technical reference materials
- On a programmable controller with "all or nothing" input-output

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Compliance with the *Québec Electrical Code*
- Proper use of computer equipment and operational terminology
- Observance of methods and conventions for programming controllers
- Proper operation of the assembly following the modification

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Study the modification request.	- Accurate interpretation of technical reference materials - Accurate definition of operational specifications for the modification
B. Analyze the logical structure of the program.	- Methodical study of the evolution of the sequential cycle of the program in real time - Accurate decoding of the instructions of the program's phases - Proper inquiry procedure for inputs and outputs as well as storage cells - Precise location of the modification in the program - Precise location of connection points of the components added to the system
C. Perform the modification: • in the program; • on the equipment.	- Precise programming of additions - Correct introduction of the modification in the memory of the central processor - Modification in conformity with the request
D. Perform trials.	- Operational simulator program - Proper use of software functions - Saving of the modification in mass storage - Proper operation after modification
E. Communicate the results.	- Proper updating of diagrams and drawings - Formal report of changes

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to study the modification request (A):

1. Describe the different parts of the structure of a sequential automatism.
2. Recognize the general components of a programmable controller.
3. Describe the function of a programmable controller.
4. Define the characteristics of the various input and output modules of a controller.

Before learning how to analyze the logical structure of the program (B):

5. Distinguish between the various programming languages and their characteristics.
6. Describe the chronology of actions in a cycle of a simple automatic control.
7. Draw block diagrams in GRAFCET, level I.
8. Draw block diagrams in GRAFCET, level II.
9. Characterize and use different programming consoles.
10. Inquire about and modify the state of a byte or a word in memory and input-output.
11. Distinguish between the hardware and software constraints of a controller.

Before learning how to perform the modification:

- **in the program;**
- **on the equipment (C):**

12. Connect a microcomputer and its interfaces to a programmable controller.
13. Program all the sequences of a simple automatism using various languages.

Before learning how to perform trials (D):

14. Simulate the input conditions for various controller modules.
15. Simulate the operation of a program.

MODULE 24: FLUID CIRCUITS

CODE: 783 346 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply combinational and sequential logic to a fluid circuit
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a problem to be solved
- Using:
  - technical reference manuals
  - the required equipment
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of materials
- Proper operation of the circuit

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Assemble, using simulator software: • a combinational fluid circuit; • a sequential fluid circuit.	- Appropriate selection of components in accordance with diagram - Proper use of software functions - Quality of the circuit: • conventional arrangement of components • operational circuit
B. Assemble on a workbench: • a combinational pneumatic circuit; • a sequential pneumatic circuit.	- Appropriate selection of components in accordance with diagram - Proper, safe use of equipment - Quality of the circuit: • conventional arrangement of components • tightness of connections • operational circuit

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to assemble, using simulator software:
- **a combinational fluid circuit;**
- **a sequential fluid circuit (A):**

1. Situate the use of pneumatics and hydraulics in automated systems.
2. List the basic laws of fluid mechanics and energy conservation.
3. Distinguish between the main pneumatic sensors and actuators, their characteristics, their symbols and their uses.
4. Describe the operation of a compressor and compressed air processing.
5. Characterize the various conduits, connections, valves and sealing materials.
6. Recognize the main combinational pneumatic circuits.
7. Describe how a pneumatic sequence works.
8. Recognize the main sequential pneumatic circuits.
9. Compare the characteristics of pneumatic and hydraulic circuits.
10. Distinguish between the main hydraulic sensors and actuators and their characteristics.
11. Recognize the main combinational hydraulic circuits.
12. Draw simple circuits using simulator software.

Before learning how to assemble on a workbench:
- **a combinational pneumatic circuit;**
- **a sequential pneumatic circuit (B):**

13. Describe the characteristics of a workbench.
14. Verify the parameters of a pneumatic circuit.
15. Diagnose a malfunction.

MODULE 25: INDUSTRIAL INSTRUMENTATION

CODE: 783 353 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
use industrial instrumentation
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of:
  - technical information
  - industrial instrumentation
- Using:
  - the appropriate tools and equipment
  - technical reference manuals

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Effective use of technical reference materials
- Observance of technical specifications
- Proper operation of the assembly
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Assemble an analog measuring channel comprising a transmitter and an indicator.	- Relevance of block diagram with respect to initial data - Appropriate selection of components in terms of their compatibility - Assembly in conformity with block diagram - Accurate measurements
B. Assemble a measuring and control channel using a programmable controller.	- Relevance of block diagram with respect to initial data - Appropriate selection of components in terms of their compatibility - Correct use of analog modules - Assembly in conformity with block diagram - Conformity of controlled variable with initial data
C. Assemble a measuring and control channel using an independent PID controller.	- Relevance of block diagram with respect to initial data - Appropriate selection of components in terms of their compatibility - Assembly in conformity with block diagram - Correct programming of controller - Conformity of controlled variable with initial data

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to assemble an analog measuring channel comprising a transmitter and an indicator (A):

1. Describe the different functions of an industrial measuring channel.
2. Situate the use of a measuring channel in the setting of automated systems.
3. Define the concepts of *mass*, *weight*, *velocity*, *volume flow*, *mass flow*, *temperature*, *heat*, *energy* and *thermoelectricity*.
4. Draw a block diagram of a measuring channel used in industrial instrumentation.
5. Describe the operation and characteristics of the main industrial transmitters.
6. Describe the operation and characteristics of the main industrial graphic recorders.
7. Demonstrate the techniques for installing and connecting devices used to measure and control physical variables in an industrial setting.
8. Explain the methods for eliminating the noise produced by wiring and circuits.

Before learning how to assemble a measuring and control channel using a programmable controller (B):

9. Distinguish between the functions of each component of a regulation loop.
10. Distinguish between the characteristics of the main regulation modes.
11. Demonstrate the method for adjusting the controlled variable.
12. Explain the operation of input and output circuits of a programmable controller with analog modules.

Before learning how to assemble a measuring and control channel using an independent PID controller (C):

13. Describe the operation and characteristics of the various industrial controllers.
14. Demonstrate the techniques for installing and connecting the components of a regulation loop.

MODULE 26: REPAIRING AUTOMATED SYSTEMS

CODE: 783 367 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
repair an automated system
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On the basis of a work order concerning a malfunction
- Using:
  - plans of the system
  - ladder diagrams or diagrams produced with GRAFCET
  - technical manuals
  - the appropriate tools and measuring instruments
  - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Compliance with the *Québec Electrical Code*
- Proper use of tools and instruments
- Observance of technical characteristics and standards of quality
- Proper operation of the system
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Clarify the overall situation.	- Gathering of pertinent information - Verification of the equipment by sight, touch and smell - Thorough technical summary of symptoms
B. Determine the standard operating condition of the equipment.	- Correct interpretation of: • technical reference materials • the plan: - classification of sections and components - study of relationships between the subassemblies and between the components - Precise, organized determination of test points - Thorough summary of optimal technical characteristics
C. Analyze the actual operating condition of the equipment.	- Precise measurement of: • the values at the test points • the components - Accurate comparison of the actual operating condition and the standard operating condition
D. Diagnose the problem.	- Precise location of defective part - Valid definition of the malfunction

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Determine a solution and take corrective measures.	- Estimate of repair time - Accurate assessment of the condition of the part - Selection of appropriate solution - Proper disassembly and re-assembly techniques - Correct repair or replacement of part
F. Perform trials and tests.	- Correct, safe start-up of control - Methodical performance of trials and tests - Accurate assessment of operation
G. Communicate the results.	- Correct preparation of report - Inclusion of all important information - Pertinence of proposed improvements - Update of parts inventory

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning how to clarify the overall situation (A):

1. Describe the structure and operating principles of a simple automated system.
2. Distinguish between the mechanical and fluid components of a simple automated system.
3. Distinguish between the various power sources of an automated system.

Before learning how to determine the standard operating condition of the equipment (B):

4. Describe how the controller of an automated system works.
5. Use a programmable controller in "test" mode.

Before learning how to analyze the actual operating condition of the equipment (C):

6. Demonstrate a method for verifying an automated system.
7. Interpret the measurements taken at the test points in an automated system.

Before learning how to diagnose the problem (D):

8. Distinguish between sources of problems in an automated system.

Before learning how to determine a solution and take corrective measures (E):

9. Identify the protective measures applicable to the assembly and disassembly of automated system components.
10. Install, align and verify various types of sensors.

Before learning how to perform trials and tests (F):

11. Describe the procedures for starting up and shutting down an automated system.

MODULE 27: JOB SEARCH TECHNIQUES

CODE: 843 121 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
use job search techniques.

SPECIFICATIONS

During this module, the students will:

- Identify potential employers.
- Write an offer of services and a résumé.
- Participate in a real or simulated job interview.

LEARNING CONTEXT

PHASE 1: **Potential Employers**

- Finding and using various sources of information.
- Preparing a plan of action.
- Identifying the companies corresponding to their personal and occupational interests.

PHASE 2: **Offer of Services**

- Preparing a résumé and a cover letter.
- Carrying out the steps involved in their job search.
- Following up the steps taken.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 3: **Job Interview**

- Specifying their strengths and weaknesses with respect to a particular job.
- Participating in a job interview.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide the students with access to various sources of information on employment offers and employers: newspapers, placement centres, data banks, and so on.
- Ensure that the students plan their job search.
- Provide the students with organizational tools (e.g. plan of action, agenda) and communication tools (e.g. résumé, cover letter, telephone etiquette) that they can use.
- Organize simulated job interviews.
- Encourage the students to share information.

PARTICIPATION CRITERIA

PHASE 1:

- Gather information on potential employers.
- Express their choices of work environments in terms of their interests.

PHASE 2:

- Prepare a résumé.
- Carry out the steps involved in their job search.
- Follow up the steps taken.

PHASE 3:

- Emphasize their strengths in a job interview.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before undertaking the activities of Phase 1:

1. Identify the resources and means that can facilitate a job search.
2. Show initiative and enthusiasm in their job search.

Before undertaking the activities of Phase 2:

3. Identify the information contained in a cover letter and résumé.
4. Describe the steps involved in carrying out a job search.
5. Show perseverance and enthusiasm in carrying out their search.

Before undertaking the activities of Phase 3:

6. Discuss the importance of preparing for an interview.
7. Simulate an interview.
8. Show tact and politeness.
9. Emphasize their strengths.

MODULE 28: ENTERING THE WORK FORCE

CODE: 783 376 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
enter the work force.

SPECIFICATIONS

During this module, the students will:

- Become familiar with the workplace.
- Adjust their views on the trade with respect to the work environment, different trade practices, and their aptitudes, preferences and interests.
- Prepare to enter the work force.

LEARNING CONTEXT

PHASE 1: **Preparing for the Practicum**

- Becoming familiar with information on the practicum, including its terms and conditions.

- Establishing criteria for the selection of companies.

- Preparing a list of companies that might offer practicums.

- Taking steps to obtain a practicum position.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Observing and Performing Tasks related to the Trade in the Workplace**

- Observing the work situation: socio-economic environment (products, market); trade associations; the company's organizational structure; equipment and technological advances; working conditions; interpersonal relations; health and safety measures.

- Observing or carrying out various tasks.

- Producing a brief report summarizing their observations about the work situation and about the main tasks carried out in the workplace.

PHASE 3: **Comparing Their Initial Views with the Actual Work Environment**

- Identifying aspects of the trade that differ from their training.

- Discussing the accuracy of their views on the trade before and after the practicum: workplace, trade practices, and so on.

- Discussing the impact of this experience on their career choice: aptitudes, preferences and interests.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide the students with the means of selecting a suitable practicum position.
- Maintain close ties between the school and the company.
- Make it possible for the student-trainees to observe and carry out tasks.
- Ensure that the student-trainees are under the direct supervision of a representative of the company.
- Ensure regular support and supervision of the student-trainees.
- Intervene if difficulties or problems arise.
- Encourage the students to engage in discussions and express their opinions, especially when they are selecting a practicum position and when they are comparing their views on the trade before and after the practicum.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- List, in order of priority, three possible practicum positions that meet their predetermined selection criteria.
- Undergo a selection interview with a representative of the company.

PHASE 2:

- Observe the company's policies with respect to the activities they may carry out as student-trainees, work schedules, and so on.
- Produce a report containing information on at least five topics to observe and describing the tasks carried out or observed.

PHASE 3:

- Share their views on their work experience with the other students.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before undertaking the activities of Phase 1:

1. Describe the steps involved in planning a practicum search.
2. List the attitudes required to carry out a creative practicum search.

Before undertaking the activities of Phase 2:

3. Describe the information to be recorded during a practicum.
4. Describe the behaviours to be adopted in the workplace.

Before undertaking the activities of Phase 3:

5. List their attitudes, preferences and interests with respect to the trade.
6. Describe the requirements of the workplace.

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