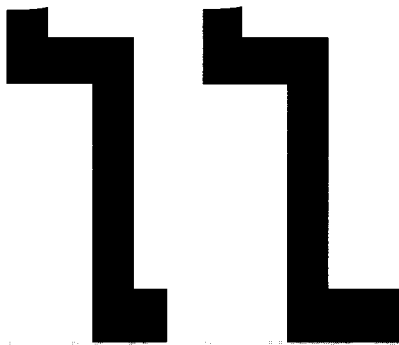




MECHANICAL MANUFACTURING

MOULDING MACHINE SET-UP AND OPERATION

PROGRAM OF STUDY
5693

**OCATIONAL and
ECHNICAL
EDUCATION**

Québec 

MOULDING MACHINE SET-UP AND OPERATION

PROGRAM OF STUDY
5693

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MECHANICAL MANUFACTURING

MOULDING MACHINE SET-UP AND OPERATION

PROGRAM OF STUDY 5693

The *Moulding Machine Set-up and Operation* program
leads to the Diploma of Vocational Studies (DVS)
and prepares the student to practise the trade of

MOULDING MACHINE SET-UP OPERATOR

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This program of study, *Moulding Machine Set-up and Operation*, is issued in accordance with section 461 of the *Education Act* (R.S.Q., c. I-13.3).

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), the confessional committees of the Conseil supérieur de l'éducation have given their opinion on this program of study.

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INTRODUCTION

The *Moulding Machine Set-up and Operation* program is based on 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. 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.

This program includes two components: the first involves 20 compulsory competencies; the second involves a choice of two competencies totaling 180 hours from among six optional modules.

The compulsory training and the optional training are divided into 22 modules and make up the minimum requirements for a Diploma of Vocational Studies (DVS) for students in both the youth and adult sectors. The training also provides the basis for organizing courses, planning teaching strategies, and designing instructional and evaluation materials.

Regardless of the option selected, the duration of the program is 1350 hours, which includes 795 hours spent on the specific competencies required to practise the trade and 555 hours on general competencies. The modules vary in length from 15 to 120 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.

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: 22
 Duration in hours: 1350
 Credits: 90

Moulding Machine Set-up and Operation

Code: 5693

CODE	TITLE OF THE MODULE	HOURS	CREDITS*
870 011	1. The Trade and the Training Process	15	1
870 021	2. Occupational Health and Safety	15	1
870 034	3. Reading and Interpreting Simple Blueprints	60	4
870 042	4. Raw Materials	30	2
870 053	5. Processing Methods	45	3
870 062	6. Applied Mathematics	30	2
870 074	7. Measurements and Quality Control	60	4
870 082	8. Concepts of Electricity	30	2
870 096	9. Basic Machining Tasks	90	6
870 105	10. Minor Maintenance of Moulds and Dies	75	5
870 115	11. Concepts of Hydraulics and Pneumatics	75	5
870 122	12. Computerized Equipment	30	2
870 135	13. Installing Moulds and Dies	75	5
870 148	14. Wet and Ventilated Extrusion	120	8
870 168	15. Conventional Injection Moulding	120	8
870 178	16. Computer-Aided Injection Moulding	120	8
870 192	17. Laboratory Tests	30	2
870 203	18. Minor Maintenance of Machines, Peripherals and Accessories	45	3
870 211	19. Job Search Techniques	15	1
870 226	20. Entering the Work Force	90	6
Plus 180 hours (12 credits) selected from among the following:			
870 155	21. Dry Extrusion	75	5
870 187	22. Extrusion Blow Moulding	105	7
870 236	23. Preparing Rubber Compositions	90	6
870 246	24. Extrusion of Rubber	90	6
870 255	25. Rotational Moulding	75	5
870 267	26. Thermoforming	105	7

* 15 hours = 1 credit

This program leads to a DVS in Moulding Machine Set-up and Operation.

2. PROGRAM TRAINING GOALS

The training goals of the *Moulding Machine Set-up and Operation* 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 moulding machine set-up and operation 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 and psychomotor skills needed to perform trade-related tasks;
 - a concern for effective communication with superiors and colleagues;
 - the development of professional ethics and a sense of responsibility;
 - habits of order, cleanliness and precision in the practice of the trade;
 - a constant concern for occupational health and safety;
 - ergonomic work habits.

To ensure integration into the job market.

- To familiarize students with the trade of moulding machine set-up operator.
- To familiarize students with the workplace in a moulding company.
- To familiarize students with their rights and responsibilities as workers.

To foster personal development and the acquisition of occupational knowledge.

- To foster independence, a sense of responsibility and the desire to succeed.
- To help students develop the desire for excellence and the basic attitudes required for success.
- To help students understand the principles underlying the techniques used.
- To help students acquire knowledge and develop skills with respect to a variety of raw materials.
- To help students recognize various manufacturing processes and their derivative products.
- To help students develop a habit of inspecting their work.
- To help students acquire good work habits and a sense of discipline.

To ensure job mobility.

- To help students develop a positive attitude toward technological change and new situations.
- To help students achieve the required versatility to work with injection, extrusion and extrusion blow moulding processes.
- To help students become familiar with new technologies.
- To help students increase their ability to learn and find information.
- To prepare students for a creative job search.

3. COMPETENCIES

The competencies to be developed in the *Moulding Machine Set-up and Operation* 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 (Δ) indicates a correlation between a specific competency and a step in the work process. The symbol ($\circ$) indicates a correlation between a general and a specific competency.

The symbols (Δ) and ($\bullet$) 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.

However, *Moulding Machine Set-up and Operation* includes an optional section. Schools must select two of the six optional specific competencies totaling 180 hours.

These competencies have been grouped together at the end of the grid of learning focuses. Therefore, their numbering should not be perceived as prescribing a sequence of instruction.

GRID OF LEARNING FOCUSES IN MOULDING MACHINE SET-UP AND OPERATION		FIRST-LEVEL OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	WORK PROCESS (major steps)				GENERAL COMPETENCIES (related to technology, subjects, personal development, etc.)												TOTALS	
				Plan the work	Prepare the machine and equipment	Do the work	Perform complementary activities	Take responsibility for applying occupational health and safety rules	Read and interpret simple blueprints	Apply concepts related to raw materials	Make connections between processing methods, machines and derivative products	Solve problems related to mathematics as it applies to moulding	Measure and control the quality of moulded parts	Apply concepts of electricity to processing methods	Perform basic machining tasks	Perform minor maintenance tasks on moulds and dies	Apply concepts of hydraulics and pneumatics to processing methods	Use computerized equipment to process plastics and polymers	Use job search techniques	NUMBER OF OBJECTIVES	DURATION (IN HOURS)
MODULES	MODULES							2	3	4	5	6	7	8	9	10	11	12	19		
	FIRST-LEVEL OPERATIONAL OBJECTIVES							S	B	B	B	B	B	B	B	B	B	B	S	12	
	DURATION							15	60	30	45	30	60	30	90	75	75	30	15		555
21	Extrude profiles using the dry extrusion process	B	75	▲	▲	▲	▲	●	●	●	●	●	●	●	●	○	●				
22	Process plastics using extrusion blow moulding	B	105	▲	▲	▲	▲	●	●	●	●	●	●	●	●	○	●	●			
23	Prepare rubber compositions	B	90	▲	▲	▲	▲	●		●	○	●	○	●	●		●				
24	Process rubbers by extrusion	B	90	▲	▲	▲	▲	●	●	●	●	●	●	●	●	○	●				
25	Process raw materials using rotational moulding	B	75	▲	▲	▲	▲	●	●	●	●	●	●	●	●	○	●				
26	Process raw materials using thermoforming	B	105	▲	▲	▲	▲	●	●	●	●		●	●	●	○	●				
NUMBER OF OBJECTIVES		15																		22	
DURATION (IN HOURS)			795																		1350

S: Situational objective

▲ Correlation between a step and a specific competency

○ Correlation between a general and a specific competency

B: Behavioural objective

▲ Correlation to be taught and evaluated

● Correlation to be taught and evaluated

* Schools must select two of the six optional specific competencies totaling 180 hours. The total duration of the program must not exceed 1350 hours.

4. FIRST- AND SECOND-LEVEL OPERATIONAL OBJECTIVES

4.1 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

4.2 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: 870 011

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.
- Understand the training process.
- Confirm their career choice.
- Be aware of the impact of technological developments on the practice of the trade.

LEARNING CONTEXT

PHASE 1: Information on the Trade

- Learning about the job market in polymer processing.
- Learning about the nature and requirements of the trade.
- Learning about the technological developments in polymer processing and their impact on automation.
- Learning about the program and the training process.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: Participation in the Training Process

- Discussing their perception of polymer processing:
 - advantages and disadvantages
 - requirements resulting from new technologies
 - the knowledge, skills and attitudes required to practise the trade
- Confirming the information obtained on the trade during company visits or trade shows, conferences with specialists in the field, demonstrations, and so on.
- Sharing their initial reactions to the program of study and the training process.
- Discussing ways of keeping up to date with technological developments.
- Keeping a log.

PHASE 3: Evaluation and Confirmation of Career Choice

- Assessing their career choice by comparing the nature and requirements of the trade with their preferences, aptitudes and interests.
- Preparing a report in which they present the result of their assessment.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate that fosters cooperation.
- Encourage the students to engage in discussions and express their opinions.
- Help the students to arrive at an accurate perception of the trade, especially in terms of new technologies.
- Organize some of the following activities: visits to industrial sites that are representative of the workplace, visits to trade shows, meetings with specialists in the field, demonstrations, and so on.
- Make available all pertinent reference materials.
- Provide an outline for the report.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Gather information on most of the topics to be covered.

PHASE 2:

- Express their views on the trade and the training program during a group discussion.
- Participate in the various activities.

PHASE 3:

- Write a report that:
 - sums up their preferences, aptitudes and interests with respect to the trade;
 - assesses their career choice by comparing the nature and requirements of the trade with their preferences, aptitudes and interests.

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. Find sources of information.
2. Show a willingness to learn.
3. Adopt a research method.

Before undertaking the activities of Phase 2:

4. Explain the main rules governing group discussion.
5. Describe the behaviours to adopt during the suggested activities.
6. Identify the attitudes required to be a good student.
7. Show concern for respecting the opinions of others.

Before undertaking the activities of Phase 3:

8. Be aware of the need to do work that meets their expectations and aspirations.

MODULE 2: OCCUPATIONAL HEALTH AND SAFETY

CODE: 870 021

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
take responsibility for applying occupational health and safety rules.

SPECIFICATIONS

During this module, the students will:

- Become aware of the risks associated with the trade of moulding machine set-up operator.
- Become familiar with the main occupational health and safety rules.
- Adopt a positive attitude toward means of preventing accidents and occupational diseases associated with the trade.
- Adopt responsible behaviours with respect to occupational health and safety.

LEARNING CONTEXT

PHASE 1: Information on Occupational Health and Safety

- Learning about the essential elements of the *Act respecting occupational health and safety*.
- Learning about the rights and responsibilities of the various parties.
- Learning about risks associated with the trade as well as means of preventing accidents and occupational diseases.
- Learning about the basic principles of ergonomics.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

LEARNING CONTEXT

- Learning about the rules regarding the handling of toxic and hazardous products and the methods of disposing of them (WHMIS).
- Learning about emergency intervention measures.

PHASE 2: Reflection on the Importance of Observing Occupational Health and Safety Rules

- Reflecting on their attitudes and behaviours regarding occupational health and safety.
- Participating in activities during which each student will:
 - identify the risk factors associated with behaviours observed or environmental conditions
 - suggest effective corrective and preventive measures regarding accidents and occupational diseases
 - discuss the behaviours to adopt during emergency situations
- Participating in a discussion on the advantages of developing safe work habits.

PHASE 3: Evaluation of Behaviours and Attitudes regarding Occupational Health and Safety

- Establishing a link between the results of their research and the changes in their perception of occupational health and safety.
- Critically examining their behaviours and attitudes regarding occupational health and safety.
- Presenting the conclusions of their reflection in a report.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate that encourages the students to take responsibility for their actions.
- Propose activities that reflect concrete situations.
- Motivate students to participate in the suggested activities.
- Help students become aware of occupational health and safety risks.
- Make available all pertinent reference materials and encourage students to consult them.
- Provide an outline for the report.

PARTICIPATION CRITERIA

PHASE 1:

- Gather information on each of the topics to be covered.

PHASE 2:

- Participate in the suggested activities.
- Show interest in the topics covered.
- Express their views.

PHASE 3:

- Write a report that presents:
 - the results of their research
 - their perception of occupational health and safety
 - an examination of their behaviours and attitudes regarding occupational health and safety

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. Find sources of information.
2. Use a research method.
3. Be receptive to information on occupational health and safety.

Before undertaking the activities of Phase 2:

4. Be aware of the importance of prevention.
5. Be aware of the importance of developing positive attitudes and behaviours likely to protect their own health and safety and that of others.
6. Explain the impact of controlling the risk of accidents on the preservation of psychological and physical well-being.
7. Show a good sense of observation.
8. Show concern for respecting the opinions of others.

Before undertaking the activities of Phase 3:

9. Be willing to evaluate themselves honestly.

MODULE 3: READING AND INTERPRETING SIMPLE BLUEPRINTS

CODE: 870 034

Duration: 60 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **read and interpret simple blueprints** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - assembly and detail drawings
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Precise, methodical work
- Accurate calculations
- Proper use of imperial and metric systems of measurement
- Correct analysis

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

- A. Locate information in the title block and the list of terms used.

- B. Interpret blueprints of workpieces.

- C. Locate on the assembly and simple detail drawings information pertaining to:
 - moulds
 - dies
 - machines

SPECIFIC PERFORMANCE CRITERIA

- Accurate location of all information
- Accurate interpretation of information

- Accurate location of all information:
 - dimensions
 - shapes
 - positions
 - materials
- Accurate interpretation of:
 - data
 - symbols
 - tolerances
 - annotations
- Conformity with standards and observance of conventions

- Recognition of mould, die and machine components
- Accurate location of all data:
 - dimensions
 - shapes
 - allowances
- Accurate interpretation of:
 - data
 - specifications
 - tolerances

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 and interpret simple blueprints:

1. Differentiate among the types of drawings associated with the processing of raw materials.
2. Recognize the importance of handling drawings with care.

Before learning how to interpret blueprints of workpieces (B):

3. Explain the concept of tolerance.
4. Show concern for the accuracy of information to be communicated.
5. Establish a link between the abstract and the concrete.

Before learning how to locate on the assembly and simple detail drawings information pertaining to:

- moulds
- dies
- machines (C):

6. Identify basic fasteners.
7. Identify machine and transmission parts.
8. Develop rational work methods.

MODULE 4: RAW MATERIALS

CODE: 870 042

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **apply concepts related to raw materials** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Given learning situations
- Using:
 - raw materials
 - products
 - materials
 - data sheets
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work methods
- Accurate terminology
- Ability to associate raw materials with their behaviour and processing
- Cleanliness of work station

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

A. Describe polymers.

- Identification of the main families of polymers and their nomenclature
- Proper differentiation among polymers in accordance with their:
 - basic structure
 - characteristics
- Relevant connections between the physical properties of polymers and their structures

B. Compare polymers and non-ferrous metals.

- Relevance of similarities and differences established in accordance with:
 - the source of the raw materials
 - their characteristics
 - their structure
 - their composition
 - their use

C. Describe additives, fillers, reinforcements and colorants.

- Accurate distinction among additives, fillers, reinforcements and dyes in accordance with their:
 - characteristics
 - use
 - limitations

D. Identify plastics.

- Accurate identification of plastics in accordance with their:
 - appearance
 - density
 - hardness
 - grade, etc.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|---|
| E. Locate information about plastics and rubbers on data sheets. | <ul style="list-style-type: none"> - Observance of method of consulting sheets - Accurate location of information contained in the sheets - Identification of limitations of plastics and rubbers |
| F. Select the plastic and rubber for processing. | <ul style="list-style-type: none"> - Proper choice of plastic and rubber in accordance with the: <ul style="list-style-type: none"> • processing method • end product • behaviour of plastic or rubber |
| G. Prepare the plastic for processing. | <ul style="list-style-type: none"> - Appropriate choice of compounding ingredients - Accurate calculation of required quantities - Proper drying of compound - Conformity of compound with requirements |

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 describe polymers (A):

1. Recognize the products made of plastic and rubber.
2. Define the terms specific to plastics, rubbers and their properties.
3. Describe the evolution of plastics.
4. Describe the evolution of rubbers.

Before learning how to compare polymers and non-ferrous metals (B):

5. Associate different finished products with the raw materials used to make them.
6. Describe the use of a rheometer and a viscometer.

Before learning how to identify plastics (D):

7. Show concern for careful, precise work.
8. Become aware of the requirements for identifying plastics.

Before learning how to locate information about plastics and rubbers on data sheets (E):

9. Become aware of the advantages of regularly consulting data sheets when working.

Before learning how to select the plastic and rubber for processing (F):

10. Show concern for the attentive observation of plastic and rubber parts.

Before learning how to prepare the plastic for processing (G):

11. Calculate percentages
12. Use precision balances.

MODULE 5: PROCESSING METHODS

CODE: 870 053

Duration: 45 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **make connections between processing methods, machines and derivative products** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using:
 - materials
 - the necessary documentation

GENERAL PERFORMANCE CRITERIA

- Accurate interpretation of moulding principles
- Ability to relate processing methods, machine components and products

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| <p>A. Compare the different processing methods and their derivatives:</p> <ul style="list-style-type: none"> • injection moulding • extrusion • extrusion blow moulding • injection blow moulding • thermoforming • compression • rotational moulding • calendering | <ul style="list-style-type: none"> - Recognition, for each method, of: <ul style="list-style-type: none"> • its distinctive features • the processing method for plastics and rubbers • its use - Relevant comparisons made among the different methods |
| <p>B. Associate processing methods with products.</p> | <ul style="list-style-type: none"> - Accurate identification of product characteristics - Relevance of connections between processing methods and products |
| <p>C. Differentiate and locate the components of:</p> <ul style="list-style-type: none"> • an injection moulding press • an extruder • an extrusion blow moulding machine | <ul style="list-style-type: none"> - Accurate identification of the parts of each machine in accordance with their: <ul style="list-style-type: none"> • main components • functions - Accurate location of components of different machines |
| <p>D. Associate the progression of processing methods with the operating method of the corresponding machine:</p> <ul style="list-style-type: none"> • injection • extrusion • extrusion blow moulding | <ul style="list-style-type: none"> - Accurate association of operating method with the different phases in the processing methods |

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 compare the different processing methods and their derivatives:

- injection moulding
- extrusion
- extrusion blow moulding
- injection blow moulding
- thermoforming
- compression
- rotational moulding
- calendering (A):

1. Describe the evolution of processing methods.
2. Describe the market share of each of the methods.

Before learning how to associate processing methods with products (B):

3. Identify the objects resulting from the processing of plastics and rubbers in their surroundings.
4. Associate products with various economic sectors.
5. Associate products with different materials.

Before learning how to differentiate and locate the components of:

- an injection moulding press
- an extruder
- an extrusion blow moulding machine (C):

6. Recognize the technical documentation associated with the machines.

MODULE 6: APPLIED MATHEMATICS

CODE: 870 062

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **solve problems related to mathematics as it applies to moulding** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Given problems and mathematical data related to the work being done in the workshop
- Using:
 - drawings
 - formulae and tables
 - reference materials
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Accurate calculations
- Observance of problem-solving process
- Consideration of units of measurement used
- Prompt execution of work

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|--|
| A. Analyze the geometric configuration of moulded parts. | <ul style="list-style-type: none"> - Accurate decomposition of shape into geometric elements - Accurate analysis |
| B. Interpret tables related to calculations. | <ul style="list-style-type: none"> - Observance of method for using tables - Correct interpretation of information in the tables |
| C. Convert units of measurement related to moulding in the imperial and metric systems. | <ul style="list-style-type: none"> - Proper choice of conversion factors - Proper application of conversion formulae - Accurate results |
| D. Solve mathematical problems related to: <ul style="list-style-type: none"> • the physical, geometric and dimensional characteristics of moulded parts • moulding parameters • quality control | <ul style="list-style-type: none"> - Proper choice of mathematical formulae for the problems to be solved - Proper application of mathematical formulae - Logical reasoning - Accurate results |
| E. Validate the calculations. | <ul style="list-style-type: none"> - Proper choice of verification methods - Proper application of verification methods |

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 geometric configuration of moulded parts (A):

1. Recognize the different geometric shapes.
2. Define the terms related to geometric shapes.
3. Develop a rational approach to analysis.

Before learning how to convert units of measurement related to moulding in the imperial and metric systems (C):

4. Differentiate between the metric and imperial systems of measurement.
5. Master the four basic mathematical operations.
6. Be familiar with the functions of a calculator.

MODULE 7: MEASUREMENTS AND QUALITY CONTROL

CODE: 870 074

Duration: 60 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **measure and control the quality of moulded parts** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - detail drawings
 - plastic or rubber pieces of different sizes and shapes
 - testing instruments and apparatus
 - a sampling
 - a scientific calculator
 - a control sheet and card
 - manufacturers' manuals

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Accurate calibration of measuring instruments
- Accurate calculations
- Cleanliness of apparatus, instruments and work area
- Prompt execution of work

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

- A. Interpret the drawings and specifications.
- B. Select the testing instruments and apparatus.
- C. Calibrate and adjust the measuring instruments and testing apparatus.
- D. Check the dimensions, geometric shapes and appearance of the moulded and extruded parts.
- E. Compare the measurements taken with those in the drawing and specifications.
- F. Make the link between statistical methods and the quality control of moulded and extruded parts.

SPECIFIC PERFORMANCE CRITERIA

- Accurate interpretation of:
 - dimensions
 - commentary
 - specifications
- Relevant choice of instruments and apparatus in accordance with the measurements and tests required:
 - conventional instrumentation
 - electronic instrumentation
- Observance of techniques in accordance with the measurements and tests required
- Observance of calibration process
- Precision of calibration and adjustments
- Correct use of measuring instruments and testing apparatus
- Accurate measurements
- Accurate information recorded on the control sheet
- Accurate verification of conformity of measurements with information in the drawing and specifications
- Accurate interpretation of the results of the comparison
- Accurate identification of:
 - statistical methods
 - corresponding instrumentation
- Relevant links made between the statistical methods and the tests required

**FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE**

**SPECIFICATIONS OF THE EXPECTED
BEHAVIOUR**

G. Inspect the moulded parts using statistical quality control.

SPECIFIC PERFORMANCE CRITERIA

- Proper choice of statistical methods in accordance with the tests required
- Identification of an appropriate sampling
- Proper use of instruments and apparatus in accordance with methods used
- Accurate measurements
- Accurate interpretation of information on the control card

H. Clean and store measuring and testing instruments and apparatus.

- Proper maintenance and storage of instruments and apparatus
- Observance of manufacturers' recommendations

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 interpret the drawings and specifications (A):

1. Show concern for accuracy when collecting information from drawings and specifications.
2. Identify the role of metrology as applied to the verification of the dimensions of moulded, extruded and blown parts.

Before learning how to select the testing instruments and apparatus (B):

3. Describe the characteristics and use of measuring and testing instruments used in processing methods.
4. Differentiate between the various methods of taking measurements.

Before learning how to calibrate and adjust the measuring instruments and testing apparatus (C):

5. Describe the origin of calibration.
6. Explain the usefulness of calibration with respect to the validation of measuring and testing instruments.
7. Show concern for handling measuring and testing instruments with care.
8. Recognize a defective measuring or testing instrument.

Before learning how to check the dimensions, geometric shapes and appearance of the moulded and extruded parts (D):

9. Recognize the relevance and usefulness of metrological reading sheets.

Before learning how to compare the measurements taken with those in the drawing and specifications (E):

10. Recognize the importance of observing standards and tolerances.

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 make the connection between statistical methods and the quality control of moulded and extruded parts (F):

11. Define the concept of statistical quality control.
12. Identify the different applications of statistical quality control.

MODULE 8: CONCEPTS OF ELECTRICITY

CODE: 870 082

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **apply concepts of electricity to processing methods** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Given a learning situation
- Using:
 - simple circuit diagrams
 - nameplates
 - a moulding machine or equipment for simulating simple electrical systems
 - tools and measuring instruments
 - materials
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment, tools and measuring instruments
- Accurate calculations
- Accurate terminology
- Prompt execution of work
- Ability to solve problems and work in a team
- Cleanliness of work station

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|---|
| A. Do calculations related to concepts of electricity. | <ul style="list-style-type: none"> - Proper choice of formulae in accordance with the calculations to be done - Correct use of formulae - Observance of units of measurement |
| B. Explain the operating principles of simple electrical circuits. | <ul style="list-style-type: none"> - Accurate identification of components in accordance with their: <ul style="list-style-type: none"> • characteristics • distinctive features • use - Accurate explanation of their respective operating principles |
| C. Read and interpret: <ul style="list-style-type: none"> • simple circuit diagrams • nameplates | <ul style="list-style-type: none"> - Accurate correspondence between electrical components and their symbols - Accurate interpretation of circuits and mechanisms described in the diagrams - Recognition of the risks involved in working with electrical current - Accurate interpretation of safety instructions |
| D. Take measurements. | <ul style="list-style-type: none"> - Proper choice of instruments in accordance with the measurements to be taken - Accurate readings and interpretations |
| E. Connect simple electrical circuits. | <ul style="list-style-type: none"> - Proper choice of material - Proper connections - Careful handling of material - Normal operation of circuit |

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Locate a defective component on a moulding machine and replace it, if necessary.	- Observance of testing methods - Accurate analysis - Appropriate identification of required follow-up - Observance of work methods, if applicable

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 do calculations related to concepts of electricity (A):

1. Describe the atomic structure of the elements.
2. Explain the principles of the production and distribution of electricity.
3. Define Ohm's law.
4. List the uses of electricity in processing methods.

Before learning how to explain the operating principles of simple electrical circuits (B):

5. Differentiate between series and parallel circuits.
6. Become aware of the different electrical components in their environment.

Before learning how to read and interpret:

- simple circuit diagrams
- nameplates (C):

7. Describe the interactions between circuit components.

Before learning how to take measurements (D):

8. Recognize the precautions to take when taking measurements.
9. Describe the characteristics of measuring instruments.

Before learning how to connect simple electrical circuits (E):

10. Be familiar with the conventions used for electrical connections.
11. Become aware of the need to use the circuit's safety device.

Before learning how to locate a defective component on a moulding machine and replace it, if necessary (F):

12. Develop rational work methods.
13. Describe the most common faults in electrical circuits.

MODULE 9: BASIC MACHINING TASKS

CODE: 870 096

Duration: 90 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform basic machining tasks** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a simple drawing or sketch
 - pieces of mild steel or aluminum
 - machine tools
 - tools
 - measuring instruments
 - accessories
 - materials
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment, tools, accessories and measuring instruments
- Accurate calculations
- Accurate terminology
- Concern for precise, quality work
- Prompt execution of work

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

A. Locate, on the drawings and sketches, the information necessary for the work.

- Thorough identification of the required information
- Accurate interpretation of:
 - annotations
 - tolerances
 - symbols
 - assemblies

B. Plan the work.

- Determination of logical sequence of operations
- Proper choice of:
 - machine tool
 - tools
 - accessories
 - materials
 - products

C. Perform tasks such as:

- shaping
- marking out
- whetting
- hand sawing
- hand drilling and boring
- tapping
- threading
- screw extraction
- polishing

- Proper preparation of tools and accessories
- Observance of techniques
- Observance of directions for using products, if applicable
- Absence of burrs

D. Perform machining operations such as:

- drilling
- boring
- recessing
- chamfering
- sawing
- grinding

- Correct installation and adjustment of tools and accessories
- Observance of machining processes and procedures
- Observance of machining parameters
- Observance of directions for using products, if applicable
- Absence of burrs

**FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE**

**SPECIFICATIONS OF THE EXPECTED
BEHAVIOUR**

E. Inspect the work.

- Accurate measurements
- Verification of the conformity of the result with the requirements of the drawing or sketch

F. Tidy up the work station.

- Proper cleaning and storage of the following, as applicable:
 - machine tools
 - tools
 - accessories
- Storage of products in accordance with manufacturers' recommendations

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 locate, on the drawings and sketches, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the drawings and sketches related to the work to be done.
2. Define the main terms associated with basic machining tasks.

Before learning how to plan the work (B):

3. Become aware of the importance of planning with respect to the quality of the work.
4. Determine ways of doing the project.
5. Differentiate among the materials that can be used to machine a part.
6. Show concern for the economical use of materials.
7. Become aware of the difficulties involved in the work to be done.

Before learning how to perform tasks such as:

- shaping
- marking out
- whetting
- hand sawing
- hand drilling and boring
- tapping
- threading
- screw extraction
- polishing (C):

8. Recognize a defective tool.

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 perform machining operations such as:

- **drilling**
- **boring**
- **recessing**
- **chamfering**
- **sawing**
- **grinding (D):**

9. Associate operations with the different machines.
10. Appreciate the importance of using machines with care.

MODULE 10: MINOR MAINTENANCE OF MOULDS AND DIES

CODE: 870 105

Duration: 75 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform minor maintenance tasks on moulds and dies** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - drawings, tables and manufacturers' manuals
 - a mould and a die
 - machine tools
 - tools
 - measuring instruments
 - accessories
 - materials
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment, tools, accessories and measuring instruments
- Accurate calculations
- Concern for doing precise, quality work
- Organized, methodical work
- Ability to solve problems and work in a team
- Cleanliness of work station
- Prompt execution of work

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the drawings, tables and manufacturers' manuals, the information necessary for the work.

B. Disassemble a mould and a die.

C. Inspect the mould and the die.

D. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of information related to:
 - mould and die components
 - minor maintenance
- Determination of appropriate work method
- Proper choice of tools and equipment
- Observance of methods for:
 - opening the mould
 - disassembling the mould and the die
- Observance of disassembly sequence
- Accurate indication of location of disassembled parts on mould and die
- Accurate observations of:
 - condition of components
 - operation of components
- Correct determination of maintenance operations to be performed
- Proper choice of work methods in accordance with the selected maintenance operations
- Determination of logical sequence of operations
- Proper choice of:
 - equipment
 - tools
 - accessories
 - measuring instruments
 - products
- Verification of availability of premachined parts, if applicable

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

E. Perform maintenance operations on a mould and die, such as:

- cleaning

- Proper use of cleaning products
- Cleanliness of mould and die

- polishing

- Proper use of:
 - plates
 - products
- Observance of polishing techniques
- Surface finishes in conformity with requirements
- Proper use of products

- doing minor repairs and making minor modifications

- Observance of repair and modification techniques
- Repair or modification in conformity with:
 - instructions
 - the desired result

- lubricating

- Location of main points requiring lubrication
- Observance of techniques for applying lubricants

F. Assemble the mould and die.

- Observance of method and logical sequence when assembling
- Accurate positioning of components
- Accurate adjustments
- Proper operation of:
 - moving and stationary parts
 - heat regulation
 - air circulation

G. Produce a maintenance report.

- Accurate, concise information recorded
- Appropriate recommendation of required follow-up

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 locate, in the drawings, tables and manufacturers' manuals, the information required for the work (A):

1. Become aware of the importance of carefully reading the drawings, tables and manufacturers' manuals.

Before learning how to disassemble a mould and a die (B):

2. Be familiar with the precautions associated with the handling of moulds and dies.

Before learning how to inspect the mould and the die (C):

3. Describe the possible consequences of the use of a defective mould or die.
4. Associate faults with their causes.
5. Become used to detecting faults.

Before learning how to plan the work (D):

6. Determine ways of doing the project.
7. Determine the relevance of entrusting certain tasks to experts.

Before learning how to perform maintenance operations on a mould and die, such as:

- cleaning
- polishing
- doing minor repairs and making minor modifications
- lubricating (E):

8. Show concern for quality work.
9. Demonstrate a high degree of precision.

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 produce a maintenance report (G):

10. Show concern for the presentation of a quality report.

MODULE 11: CONCEPTS OF HYDRAULICS AND PNEUMATICS

CODE: 870 115

Duration: 75 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **apply concepts of hydraulics and pneumatics to processing methods** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Given a learning situation
- Using:
 - hydraulic and pneumatic diagrams
 - moulding machines
 - hydraulic and pneumatic system simulators
 - tools
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work methods
- Proper use of equipment and tools
- Accurate terminology
- Prompt execution of work
- Ability to solve problems and work in a team
- Cleanliness of work station

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|--|
| A. Explain the operating principles of hydraulic and pneumatic system components. | <ul style="list-style-type: none"> - Accurate identification of components in accordance with their: <ul style="list-style-type: none"> • characteristics • variants • use - Accurate explanation of their respective operating principles |
| B. Interpret hydraulic and pneumatic circuit diagrams. | <ul style="list-style-type: none"> - Accurate correspondence between components and their symbols - Accurate interpretation of operation of circuits |
| C. Locate the hydraulic and pneumatic components of moulding machines and demonstrate their interaction. | <ul style="list-style-type: none"> - Accurate location of components - Accurate explanation of interaction between components |
| D. Connect, adjust and operate simple hydraulic and pneumatic circuits. | <ul style="list-style-type: none"> - Proper choice of components - Conformity of assembly with requirements - Accurate adjustments |
| E. Detect and locate operating problems in hydraulic and pneumatic circuits. | <ul style="list-style-type: none"> - Observance of testing techniques - Accurate calculations using the metric and imperial systems - Accurate analysis - Determination of appropriate follow-up |

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 operating principles of hydraulic and pneumatic system components (A):

1. Recognize the different energy sources that power mechanisms.
2. Be familiar with the concept of energy efficiency with respect to various mechanisms.
3. Differentiate between hydraulic and pneumatic systems.
4. Recognize the physical principles governing the movement of objects and fluids.
5. Recognize the relationships between pressure, volume and temperature.
6. Differentiate among the fluids used in pneumatics and hydraulics.
7. Recognize the basic machine parts.

Before learning how to interpret hydraulic and pneumatic circuit diagrams (B):

8. Differentiate between series and parallel circuits.

Before learning how to locate the hydraulic and pneumatic components of moulding machines and demonstrate their interaction (C):

9. Become aware of the importance of consulting technical documentation.
10. Appreciate the importance of taking safety precautions.

Before learning how to connect, adjust and operate simple hydraulic and pneumatic circuits (D):

11. Become aware of the need to use a circuit's safety device.

Before learning how to detect and locate operating problems in hydraulic and pneumatic circuits (E):

12. Use their analytical and reasoning abilities to solve problems.
13. Communicate effectively.

MODULE 12: COMPUTERIZED EQUIPMENT

CODE: 870 122

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **use computerized equipment to process plastics and polymers** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - technical specifications
 - manufacturers' manuals
 - computerized equipment including a moulding machine and peripherals
 - processing software
 - personal safety gear
 - the necessary documentation

GENERAL PERFORMANCE CRITERIA

- Proper use of equipment and software
- Cleanliness of work area

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

- A. Locate, in the technical specifications and manufacturers' manuals, the information necessary for the work.

- B. Associate data to be entered with the software commands on the machines and peripherals.

- C. Enter the data related to the operation of peripherals and polymer processing machines:
 - injection
 - extrusion blow moulding

SPECIFIC PERFORMANCE CRITERIA

- Observance of methods of consulting specifications and manuals
- Accurate interpretation of instructions related to:
 - data entry
 - use of equipment, peripherals and software

- Accurate distinction between machine software commands and peripheral software commands
- Recognition of their functions
- Relevant associations between data to be entered and software commands

- Accurate interpretation of codes associated with commands
- Commands correctly entered on machine and peripherals
- Conformity of data entered with the instructions in the technical specifications

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 locate, in the technical specifications and manufacturers' manuals, the information necessary for the work (A):

1. Recognize the importance of consulting technical documentation.
2. Interpret the terminology associated with the software.

Before learning how to associate data to be entered with the software commands on the machines and peripherals (B):

3. Establish a relationship among the manual commands of the machines, the software commands and the machine components.

Before learning how to enter the data related to the operation of peripherals and polymer processing machines:

- injection
- extrusion blow moulding (C):

4. Recognize the precautions to take with respect to the machines and peripherals.
5. Recognize the importance of entering data in a logical sequence.

MODULE 13: INSTALLING MOULDS AND DIES

CODE: 870 135

Duration: 75 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **install moulds and dies on moulding machines and remove them** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using:
 - technical specifications
 - a mould or a die
 - a moulding machine
 - tools and equipment
 - measuring instruments
 - accessories
 - materials and products
 - a progress card for the mould and die
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of tools, equipment and instruments
- Methodical, careful work
- Accurate measurements
- Accurate calculations
- Ability to solve problems and work in a team
- Observance of time limits
- Cleanliness of area
- Installation of mould and die in conformity with the requirements of the technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications, the information necessary for installing moulds and dies.

B. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - drawings
 - instructions
 - information
- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of:
 - tools
 - equipment
 - measuring instruments
 - materials
 - accessories
 - products
- Accurate verification of compatibility of mould and die with machine

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| C. Prepare a mould and a die. | <ul style="list-style-type: none"> - Accurate observations of the condition of: <ul style="list-style-type: none"> • the mould • the die - Appropriate touch-ups, if applicable - Appropriate use of lubricants |
| D. Mount the mould and the die on a moulding machine. | <ul style="list-style-type: none"> - Safe handling of mould and die - Observance of mounting process and methods in accordance with the type of machine used - Proper installation of accessories - Observance of tolerances - Precise, solid assembly - Proper connection of hydraulic and pneumatic systems, if applicable |
| E. Adjust a mould's closing block. | <ul style="list-style-type: none"> - Accurate adjustment of parameters: <ul style="list-style-type: none"> • opening of mould • closure of mould • ejection - Conformity with instructions |
| F. Install the cooling and heating circuits on the mould and die. | <ul style="list-style-type: none"> - Proper arrangement of temperature control elements - Determination of appropriate connections - Appropriate connection of: <ul style="list-style-type: none"> • water pipes • electrical circuits - Proper adjustment of moulding temperatures - Leaktight, operational circuits |
| G. Inspect the installation of the mould and die. | <ul style="list-style-type: none"> - Complete inspection of: <ul style="list-style-type: none"> • installation • normal operation of mould and die |

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
H. Remove the mould and die and perform maintenance tasks.	- Observance of appropriate technique for removing mould and die - Appropriate use of detergents and lubricants - Appropriate cleaning and storage - Relevance of information recorded on the progress card for the mould and die

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 locate, in the technical specifications, the information necessary for installing mouldings and dies (A):

1. Become aware of the importance of carefully reading the technical specifications related to the installation of moulds and dies.
2. Identify the distinctive characteristics of the moulds and dies to be installed.
3. Describe the distinctive characteristics of different injection moulding presses and extruders.
4. Define the terms associated with moulds and dies, and their installation on machines.

Before learning how to plan the work (B):

5. Recognize the difficulties related to the work to be done.
6. Realize the importance of handling moulds, dies and machines with care.

Before learning how to mount the mould and the die on a moulding machine (D):

7. Describe the possible consequences of the improper installation of a mould or die on a machine.
8. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust a mould's closing block (E):

9. Recognize different opening, closing and ejection sequences.

Before learning how to install the cooling and heating channels on the mould and die (F):

10. Identify the energy sources that power moulds and dies.

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 inspect the installation of the mould and die (G):

11. Become aware of the importance of sight, hearing and touch during inspection.

Before learning how to remove the mould and die and perform maintenance tasks (H):

12. List the precautions to take when removing and storing the mould and die.

MODULE 14: WET AND VENTILATED EXTRUSION

CODE: 870 148

Duration: 120 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **extrude pipes and profiles using wet and ventilated extrusion processes** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a complete extrusion set-up, including a cooling tank under vacuum or an air table
 - raw materials
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of extrusion methods and procedures
- Consideration of characteristics of raw materials
- Proper use of tools, instruments, equipment and accessories
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications, the information necessary for the work.

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions

B. Plan the work.

- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, measuring instruments, accessories and peripherals
- Accurate adjustment of die, if necessary
- Appropriate heating of extruder
- Preparation of raw materials in conformity with data provided
- Proper feeding of raw materials

C. Install the peripherals and accessories for:

- wet extrusion
- ventilated extrusion

- Proper mounting and adjustment of peripherals and accessories
- Proper alignment of peripherals
- Complete inspection of operation of peripherals and accessories

D. Adjust the extrusion parameters on:

- the extruder
- each peripheral

- Observance of:
 - adjustment techniques
 - procedure
- Adjustments in conformity with production instructions

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

E. Perform production operations:

- using wet extrusion

- Observance of technique for starting up the extruder
- Uniform flow of extrudate
- Synchronization of speed of peripherals
- Proper alignment of profile in each peripheral
- Observance of requirements:
 - water supply to cooling tank
 - level of vacuum
- Smooth and uniform surfaces of pipe or profile
- Supervision of process

- using ventilated extrusion

- Synchronization of speed of peripherals
- Proper alignment of profile in each peripheral
- Proper positioning of cooling system elements
- Smooth and uniform surfaces of pipe or profile
- Supervision of process

F. Inspect the product.

- Accurate measurements
- Complete inspection of conformity of product with technical specifications
- Determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the die
- Appropriate corrections made
- Relevant and accurate information recorded in the production report

**FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE**

**SPECIFICATIONS OF THE EXPECTED
BEHAVIOUR**

G. Shut down production.

SPECIFIC PERFORMANCE CRITERIA

- Observance of procedure for shutting down the extruder and peripherals
- Proper storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Proper handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to extrusion.
2. Describe the distinctive characteristics of wet extrusion and ventilated extrusion.
3. Define the terms associated with extrusion.

Before learning how to plan the work (B):

4. Become aware of the importance of planning to obtain quality work.
5. Realize the importance of handling raw materials with care.
6. Show concern for the economical use of materials.
7. Identify the peripherals used in wet extrusion and ventilated extrusion and describe their respective functions.

Before learning how to install the peripherals and accessories for:

- wet extrusion
- ventilated extrusion (C):

8. Show concern for careful, precise work.
9. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust the extrusion parameters on:

- the extruder
- each peripheral (D):

10. Imagine the wet extrusion and ventilated extrusion processes.
11. Describe the parameters related to wet extrusion and ventilated extrusion.
12. Recognize the effect of adjustments on production and the quality of the product.

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 perform production operations:

- using wet extrusion
- using ventilated extrusion (E):

13. Explain the principle of negative pressure (vacuum).
14. Recognize the importance of using the senses to detect operating problems.
15. Become aware of the importance of doing routine inspections throughout the production process.

Before learning how to inspect the product (F):

16. List the most common defects found when inspecting products made using wet extrusion and ventilated extrusion.
17. Associate defects with their causes.
18. Recognize the importance of adopting a critical attitude during inspection.

Before learning how to shut down production (G):

19. Distinguish recyclables from non-recyclables.

MODULE 15: CONVENTIONAL INJECTION MOULDING

CODE: 870 168

Duration: 120 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **process raw materials using conventional injection moulding** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a conventional injection moulding press
 - an injection mould
 - peripherals and accessories
 - raw materials
 - tools
 - measuring instruments
 - a scientific calculator
 - personal safety gear
 - the necessary documentation

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of injection moulding methods and procedures
- Consideration of characteristics of raw materials
- Appropriate use of tools, instruments, equipment and accessories
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications, the information necessary for the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions

B. Plan the work.

- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, accessories and peripherals
- Accurate adjustments of mould, if necessary
- Preparation of raw materials in conformity with data provided
- Proper feeding of raw materials

C. Install the peripherals.

- Appropriate mounting and adjustment of the necessary peripherals
- Complete inspection of peripherals

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

- D. Adjust the injection parameters on:
- the conventional injection press
 - the mould
 - each peripheral

- E. Perform production operations.

- F. Inspect the moulded parts.

SPECIFIC PERFORMANCE CRITERIA

- Observance of:
 - adjustment techniques
 - procedure
- Adjustments in conformity with production instructions
- Observance of procedure for starting up the injection moulding press
- Accurate observations of condition of samples
- Determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the mould and peripherals
- Appropriate corrections made
- Supervision of process
- Accurate measurements
- Complete inspection of conformity of product with technical specifications
- Appropriate corrections made to parameters
- Relevant and accurate information recorded in the production report

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
G. Shut down production.	- Observance of procedure for shutting down the injection moulding press - Proper storage of: • tools • equipment • accessories - Report on irregularities observed, if applicable - Appropriate handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to conventional injection moulding.
2. Describe the distinctive characteristics of conventional injection moulding.
3. Define the main terms associated with injection moulding.

Before learning how to plan the work (B):

4. Become aware of the importance of planning to obtain quality work.
5. Realize the importance of handling raw materials with care.
6. Show concern for the economical use of materials.

Before learning how to install the peripherals (C):

7. Identify the peripherals used in injection moulding and describe their function.
8. Show concern for careful, precise work.
9. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust the injection parameters on:

- the conventional injection press
- the mould
- each peripheral (D):

10. Recognize the advantages of consulting technical manuals related to moulding methods.
11. Describe the injection moulding method.
12. Develop rational work methods.
13. Describe the parameters associated with injection moulding.
14. Recognize the effect of adjustments on production and the quality of the product.

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 perform production operations (E):

15. Describe the behaviour of matter in the injection moulding press.
16. Recognize the importance of using the senses to detect operating problems.
17. Become aware of the importance of doing routine inspections throughout the production process.

Before learning how to inspect the moulded parts (F):

18. List the most common defects found in moulded parts.
19. Realize the consequences of defects in the parts produced.
20. Associate defects with their causes.
21. Recognize the importance of adopting a critical attitude during inspection.

Before learning how to shut down production (G):

22. Explain the importance of recycling raw materials.
23. Distinguish between recyclables and non-recyclables.

MODULE 16: COMPUTER-AIDED INJECTION MOULDING

CODE: 870 178

Duration: 120 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **process raw materials using computer-aided injection moulding** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a computer-aided injection moulding press
 - an injection mould
 - peripherals and accessories
 - raw materials
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of injection moulding methods and procedures
- Consideration of characteristics of raw materials
- Proper use of tools, instruments, equipment and accessories
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications,
the information necessary for the work.

B. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions
- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, accessories and peripherals
- Accurate adjustments of mould, if necessary
- Preparation of raw materials in conformity with data provided
- Proper feeding of raw materials

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

C. Install the peripherals.

- Appropriate mounting and adjustment of:
 - mould heater
 - exhaustor
 - dye batcher
 - dryer
 - conveyor
 - robot, etc.
- Complete inspection of operation of peripherals

D. Enter the data related to the injection parameters.

- Observance of technique for using the software program
- Complete and accurate data
- Accurate interpretation of codes
- Conformity of adjustments with production instructions:
 - injection press
 - mould
 - peripherals

E. Perform production operations.

- Observance of procedure for starting up the injection moulding press
- Accurate observations of the condition of samples
- Determination of changes to be made to:
 - programming data
 - raw materials
 - the mould and peripherals
- Appropriate corrections made
- Supervision of process

**FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE**

**SPECIFICATIONS OF THE EXPECTED
BEHAVIOUR**

F. Inspect the moulded parts.

SPECIFIC PERFORMANCE CRITERIA

- Accurate measurements
- Complete inspection of conformity of product with technical specifications
- Appropriate corrections made to parameters
- Relevant and accurate information recorded in the production report

G. Shut down production.

- Observance of procedure for shutting down the injection moulding press and peripherals
- Proper storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Appropriate handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to computer-aided injection moulding.
2. Describe the distinctive characteristics of computer-aided injection moulding.
3. Define the main terms associated with computer-aided injection moulding.

Before learning how to plan the work (B):

4. Become aware of the importance of planning to obtain quality work.
5. Show concern for handling raw materials with care.
6. Show concern for the economical use of materials.

Before learning how to install the peripherals (C):

7. Show concern for careful, precise work.
8. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to enter the data related to the injection parameters (D):

9. Recognize the advantages of consulting technical manuals related to moulding methods.
10. Develop rational work methods.

Before learning how to perform production operations (E):

11. Show concern for doing routine inspections throughout the production process.

MODULE 17: LABORATORY TESTS

CODE: 870 192

Duration: 30 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform laboratory tests** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- In a laboratory
- Using:
 - technical specifications
 - samples
 - the necessary equipment and accessories
 - tools
 - measuring instruments
 - products
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Conformity with test standards
- Methodical, careful work
- Accurate calculations
- Ability to solve problems and work in a team

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications, the information necessary for the laboratory tests.

B. Plan the work.

C. Prepare the samples and equipment.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - drawings
 - instructions
 - particular requirements of the client, if applicable
 - standards

- Determination of tests to be performed
- Proper choice of:
 - work method
 - sampling
 - equipment
 - tools
 - measuring instruments
 - products
- Determination of logical sequence of operations

- Conformity with standards related to the packaging of samples
- Proper use of tools and equipment
- Proper installation of accessories
- Complete inspection of:
 - calibration of devices
 - their operation
- Adequate adjustment of test parameters

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| D. Inspect and classify the samples. | <ul style="list-style-type: none"> - Accurate and detailed observations of condition of samples - Proper use of measuring instruments - Accurate measurements - Accurate identification of samples |
| E. Perform tests in accordance with the particular requirements of the client to determine: <ul style="list-style-type: none"> • fluidity (viscosity) index • density • tensile strength • shock resistance • hardness | <ul style="list-style-type: none"> - Rigorous observance of technique for each test - Proper positioning of samples, in accordance with the tests performed - Observance of operating method of conventional and computerized apparatus - Observance of time limits - Accurate observations recorded - Complete compilation of test results |
| F. Produce a report. | <ul style="list-style-type: none"> - Appropriate data processing: <ul style="list-style-type: none"> • test results • particular observations - Accurate interpretation of results |
| G. Tidy up the work station. | <ul style="list-style-type: none"> - Storage of apparatus and instruments in conformity with manufacturers' standards - Proper cleaning of: <ul style="list-style-type: none"> • apparatus • instruments • tools • accessories - Cleanliness of work area |

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 locate, in the technical specifications, the information necessary for the laboratory tests (A):

1. Become aware of the importance of carefully reading the technical specifications related to laboratory tests.
2. Explain the purpose of standards.
3. Become aware of the importance of being attentive to the client's requirements.
4. Recognize the standards and specifications related to various raw materials.

Before learning how to plan the work (B):

5. Become aware of the importance of planning in order to organize work efficiently.

Before learning how to prepare the samples and equipment (C):

6. Show concern for quality work.
7. Recognize the purpose of packaging samples.

Before learning how to inspect and classify the samples (D):

8. Show concern for a precise and detailed observation of the samples.

Before learning how to produce a report (F):

9. Appreciate the importance of correctly recording data.
10. Develop rational work methods.
11. Show concern for checking their calculations.
12. Realize the importance of clear, precise information in the report.

MODULE 18: MINOR MAINTENANCE OF MACHINES, PERIPHERALS AND ACCESSORIES

CODE: 870 203

Duration: 45 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform minor maintenance operations on machines, peripherals and accessories** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a moulding machine and its peripherals
 - machine tools
 - tools
 - measuring instruments
 - accessories
 - products
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Proper use of equipment, tools, accessories and measuring instruments
- Accurate calculations
- Organized, methodical work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work station

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

- A. Locate, in the technical specifications and manufacturers' manuals, the information necessary for the maintenance of machines, peripherals and accessories.
- B. Visually inspect machines, peripherals and accessories.
- C. Plan the work.
- D. Disassemble the minor components of machines, peripherals and accessories.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information in the:
 - technical specifications
 - maintenance manuals
- Accurate interpretation of information
- Accurate evaluation of the condition of:
 - parts
 - pipes and connections
 - hydraulic, pneumatic and electrical components
- Accurate interpretation of results of inspection
- Conformity with instructions
- Proper choice of work methods in accordance with the type of maintenance required
- Determination of logical sequence of operations
- Proper choice of:
 - equipment
 - tools
 - accessories
 - measuring instruments
 - products
- Verification of availability of spare parts, if applicable
- Observance of disassembly techniques
- Accurate identification of location of disassembled parts

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

E. Perform maintenance operations on machines, peripherals and accessories, such as:

- cleaning

- Proper use of cleaning products
- Cleanliness of machine, peripherals and accessories

- doing minor repairs and making minor modifications

- Proper use of products
- Observance of techniques
- Repair or modification in conformity with:
 - instructions
 - the desired result

- lubricating and applying preservatives

- Proper application of lubricants and preservatives in the appropriate places

- topping off fluids

- Levels in conformity with requirements

F. Reassemble the minor components of the machines, peripherals and accessories.

- Observance of assembly techniques
- Accurate positioning of components
- Precise adjustments
- Proper operation of:
 - moving and stationary parts
 - heat regulation
 - hydraulic and pneumatic components
 - electrical circuits

G. Produce a maintenance report.

- Accurate, concise information recorded
- Appropriate recommendation of required follow-up

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 locate, in the technical specifications and manufacturers' manuals, the information necessary for the maintenance of machines, peripherals and accessories (A):

1. Become aware of the importance of carefully reading the technical specifications and manufacturers' manuals related to the maintenance of machines, peripherals and accessories.
2. Define the terms associated with the maintenance of machines and equipment.
3. Describe the content of a maintenance record.

Before learning how to visually inspect machines, peripherals and accessories (B):

4. Recognize the main elements and parts of various machines and peripherals.
5. Be familiar with the operating principles of elements and parts of machines.

Before learning how to plan the work (C):

6. Become aware of the importance of planning in order to organize work efficiently.
7. Develop organized work methods.

Before learning how to disassemble the minor components of machines, peripherals and accessories (D):

8. Recognize the precautions to take during disassembly.
9. Show concern for using the proper tools.
10. Show concern for precise work.

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 perform maintenance operations on machines, peripherals and accessories, such as:

- cleaning
- doing minor repairs and making minor modifications
- lubricating and applying preservatives
- topping off fluids (E):

11. Explain the effect of regular maintenance on the lifespan of machines and equipment.
12. Recognize the advantages of developing a sense of mechanics.
13. Become aware of the value of machines and equipment.

Before learning how to reassemble the minor components of the machines, peripherals and accessories (F):

14. Recognize the precautions to take during reassembly.

Before learning how to produce a maintenance report (G):

15. List the qualities of a good maintenance report.
16. Identify different types of maintenance reports.

MODULE 19: JOB SEARCH TECHNIQUES

CODE: 870 211

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 **use job search techniques.**

SPECIFICATIONS

During this module, the students will:

- Plan a job search.
- Prepare documents for their job search.
- Realize the importance of planning their job search.

LEARNING CONTEXT

PHASE 1: Planning the Job Search

- Learning about the steps in the job search process.
- Learning about the organizations and sources of information that can be consulted during the job search.
- Learning about employers' hiring criteria depending on the type of company.
- Drawing up a list of potential employers.
- Discussing the attitudes and behaviour to adopt in an interview.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: Job Search Techniques

- Planning the steps in their job search.
- Writing a résumé and a cover letter.
- Putting together a portfolio on the work they have done during training and as part of their personal growth.
- Preparing for an interview or participating in a simulated selection interview.
- Attending simulated selection interviews.
- Discussing in a group various means of ensuring follow-up of the job search.

PHASE 3: Evaluation of Job Search Techniques

- Identifying their strengths and weaknesses with respect to each of the means used.
- During a group discussion, stating their observations concerning the simulated selection interviews.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide documentation.
- Assist students in their job search and thought process.
- Encourage the students to share their opinions and express themselves.
- Explain how to use reference materials.
- Provide students with models of résumés, letters of introduction and portfolios.
- Set up simulated selection interviews.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Consult sources of information.
- Participate in group discussions.

PHASE 2:

- Draw up a schedule for the steps involved in the job search.
- Produce the necessary documents.
- Participate in the suggested activities.

PHASE 3:

- Comment on their progress.

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. Define the concept of a creative job search.
2. Describe the attitudes necessary for a successful job search.
3. Define their interests and values.

Before undertaking the activities of Phase 2:

4. Demonstrate the advantages of gathering information about a company before attending an interview there.
5. Appreciate the importance of preparing for an interview.
6. Become aware of the importance of the image a candidate presents during an interview.

MODULE 20: ENTERING THE WORK FORCE

CODE: 870 226

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:

- Look for a practicum position.
- Perform tasks in the workplace.
- Apply the skills acquired during training.
- Communicate with company personnel and their supervisors.

LEARNING CONTEXT

PHASE 1: Preparing for the Practicum

- Establishing criteria for selecting potential practicum positions.
- Listing the companies likely to hire trainees.
- Taking steps to obtain a practicum position.
- Confirming their practicum position.
- Learning about the rules and policies regarding practicums in the company.

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: Observing and Performing Tasks in the Workplace

- Observing the workplace.
- Observing moulding machine set-up operators as they perform various tasks.
- Performing different trade-related tasks associated with the training.
- Following occupational health and safety rules.
- Interacting with colleagues and supervisors.
- Enquiring about the satisfaction of the person responsible for the practicum in the company.
- Noting their observations in their log.

PHASE 3: Evaluating the Experience

- Submitting a report on their practicum including: their attendance record, the work organization, the tasks performed, the techniques and equipment used, their communication with the team and their observance of occupational health and safety rules.
- Participating in discussions with instructors, those responsible for the practicum in the company or other trainees:
 - discussing their observations, the problems encountered, etc.
 - identifying the aspects of the trade that resemble the training received, as well as those that differ
 - evaluating their entry into the work force

FIRST-LEVEL OPERATIONAL OBJECTIVE SITUATIONAL OBJECTIVE

INSTRUCTIONAL GUIDELINES

The teacher should:

- Enter into and maintain a cooperative relationship with the companies.
- Help students find a practicum position.
- Provide students with the necessary documentation at the preparation stage.
- Ensure that the companies allow students to perform the necessary activities during the practicum.
- Provide students with support and supervision.
- Intervene when necessary.
- Provide students with an outline for the report.

PARTICIPATION CRITERIA

PHASE 1:

- Look for a practicum position.
- Inform the instructor of the results of the search and of the agreement made with the company.

PHASE 2:

- Observe and perform trade-related tasks.
- Communicate with the person responsible for the practicum in the company.

PHASE 3:

- Submit a written report of the practicum in which they discuss the above-mentioned aspects, as well as the comments of the person responsible for the practicum in the company.
- Participate in the evaluation of the practicum.

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 search for a practicum position.
2. List the attitudes necessary for a creative search for a practicum position.
3. Describe their interests, expectations and apprehensions with respect to the practicum.

Before undertaking the activities of Phase 2:

4. Describe the observations to be noted during the practicum.
5. Appreciate the importance of adopting a positive attitude and communicating effectively during the practicum.
6. Recognize the importance of following company rules.
7. Appreciate the importance of adopting a conscientious attitude throughout the practicum.

Before undertaking the activities of Phase 3:

8. Show concern for producing a good practicum report.
9. List the criteria for self-evaluation.

MODULE 21: DRY EXTRUSION¹

CODE: 870 155

Duration: 75 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **extrude profiles using the dry extrusion process** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a complete extrusion set-up, including a dry extrusion sizing table
 - raw materials
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

¹This module is optional. See Synoptic Table, p. 7.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of extrusion method and procedure
- Consideration of characteristics of raw materials
- Proper use of tools, instruments, equipment and accessories
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications, the information necessary for the work.

B. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions
- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, accessories and peripherals
- Accurate adjustments of die, if necessary
- Appropriate heating of extruder
- Preparation of raw materials in conformity with data provided
- Proper feeding of charging hopper

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

C. Install the peripherals and accessories.

- Appropriate mounting and adjustment of:
 - sizing tools
 - sizing table
 - conveyor
 - cutting attachment
 - take-up unit
 - accessories, etc.
- Proper alignment of peripherals
- Complete inspection of operation of peripherals

D. Adjust the extrusion parameters on:

- the extruder
- each peripheral

- Observance of:
 - adjustment techniques
 - procedure
- Adjustments in conformity with production instructions

E. Perform production operations using dry extrusion.

- Observance of procedure for starting up the extruder
- Uniform delivery of extrudate
- Synchronization of speed of peripherals
- Proper alignment of moving and stationary parts of sizing tools
- Observance of requirements:
 - water circulation in the sizing tools
 - intensity of the vacuum in each of the sizing tools
- Smooth and uniform surfaces of profile
- Supervision of process

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

F. Inspect the product.

SPECIFIC PERFORMANCE CRITERIA

- Smooth, uniform profiles
- Complete inspection of conformity of product with technical specifications
- Determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the die
- Appropriate corrections made
- Relevant and accurate information recorded in the production report

G. Shut down production.

- Observance of procedure for shutting down the extruder and peripherals
- Proper storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Appropriate handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to extrusion.
2. Describe the distinctive characteristics of dry extrusion.

Before learning how to plan the work (B):

3. Identify the peripherals used in dry extrusion and describe their function.

Before learning how to install the peripherals and accessories (C):

4. Show concern for careful, precise work.
5. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust the extrusion parameters on:

- the extruder
- each peripheral (D):

6. Imagine the dry extrusion process.
7. Describe the parameters specific to dry extrusion.
8. Recognize the effect of adjustments on production and the quality of the product.
9. Explain the effects of vacuum in dry extrusion.

Before learning how to perform production operations using dry extrusion (E):

10. Recognize the importance of using the senses to detect operating problems.
11. Become aware of the importance of doing routine inspections throughout the production process.

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 inspect the product (F):

12. List the most common defects found when inspecting dry extruded products.
13. Associate defects with their causes.
14. Recognize the importance of adopting a critical attitude during inspection.

MODULE 22: EXTRUSION BLOW MOULDING¹

CODE: 870 187

Duration: 105 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **process plastics using extrusion blow moulding** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a complete extrusion blow moulding set-up, with parison programmer
 - raw materials
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

¹This module is optional. See Synoptic Table, p. 7.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of extrusion blow moulding method and procedure
- Consideration of characteristics of raw materials
- Proper use of tools, instruments, equipment and accessories
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications,
the information necessary for the work.

B. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions
- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, measuring instruments, accessories and peripherals
- Accurate adjustments of die, mould and machine components, if necessary
- Appropriate preparation of:
 - machine
 - hydraulic circuit
- Preparation of raw materials in conformity with data provided
- Proper feeding of charging hopper

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

C. Install the peripherals and accessories.

- Proper mounting and adjustment of peripherals and accessories
- Proper alignment of peripherals
- Complete inspection of operation of peripherals
- Cleanliness of machine, peripherals and accessories

D. Adjust the extrusion parameters on:

- the extruder
- the parison programmer
- the mould
- the blow nozzle
- the peripherals

- Observance of adjustment techniques in accordance with equipment used:
 - conventional equipment
 - computerized equipment
- Adjustments in conformity with production instructions

E. Perform production operations.

- Observance of procedure for starting up the extruder blow moulder
- Uniform thickness of parison
- Synchronization of moulding cycle sequences
- Accurate observation of condition of samples
- Determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the mould or die
 - machine components
- Appropriate corrections made
- Supervision of process

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

F. Inspect the product.

SPECIFIC PERFORMANCE CRITERIA

- Accurate measurements
- Complete inspection of conformity of product with technical specifications
- Appropriate corrections made
- Relevant and accurate information recorded in the production report

G. Shut down production.

- Observance of procedure for shutting down the extruder blow moulder and peripherals
- Proper storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Appropriate handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to extrusion blow moulding.
2. Describe the distinctive characteristics of extrusion blow moulding.
3. Define the terms associated with extrusion blow moulding.

Before learning how to plan the work (B):

4. Identify the peripherals used in extrusion blow moulding and describe their function.

Before learning how to install the peripherals and accessories (C):

5. Show concern for careful, precise work.
6. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust the extrusion parameters on:

- the extruder
- the parison programmer
- the mould
- the blow nozzle
- the peripherals (D):

7. Imagine the extrusion blow moulding process.
8. Describe the parameters associated with extrusion blow moulding.
9. Recognize the effect of adjustments on production and the quality of the product.

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 perform production operations (E):

10. Recognize the importance of using the senses to detect operating problems.
11. Become aware of the importance of doing routine inspections throughout the production process.

Before learning how to inspect the product (F):

12. List the most common defects found when inspecting blow moulding extruded products.
13. Associate defects with their causes.
14. Recognize the importance of adopting a critical attitude during inspection.

MODULE 23: PREPARING RUBBER COMPOSITIONS¹

CODE: 870 236

Duration: 90 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **prepare rubber compositions** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - formulae
 - raw materials
 - a Banbury internal mixer
 - an open mill
 - measuring instruments
 - data sheets
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

¹This module is optional. See Synoptic Table, p. 7.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of mixing process
- Consideration of characteristics of raw materials
- Proper use of instruments and equipment
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|--|
| A. Describe the additives used in rubber compositions. | <ul style="list-style-type: none"> - Recognition of main categories of additives - Appropriate differentiation of additives according to their: <ul style="list-style-type: none"> • origin • characteristics • effects on the physical properties of the finished product |
| B. Explain how vulcanization works. | <ul style="list-style-type: none"> - Accurate explanation of: <ul style="list-style-type: none"> • the role of vulcanizing agents • the constraints of vulcanization on manufacturing processes |
| C. Locate, in the technical specifications, the information necessary for the preparation of the rubber composition. | <ul style="list-style-type: none"> - Thorough identification of the required information - Accurate interpretation of: <ul style="list-style-type: none"> • formula • instructions |

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| D. Plan the work. | <ul style="list-style-type: none"> - Conformity with instructions - Determination of logical sequence of operations - Proper choice of measuring instruments |
| E. Weigh the ingredients. | <ul style="list-style-type: none"> - Proper choice of ingredients - Observance of quantities required and tolerances - Accurate recording of actual weight on data sheet |
| F. Make adjustments to: <ul style="list-style-type: none"> • the internal mixer • the open mill | <ul style="list-style-type: none"> - Observance of: <ul style="list-style-type: none"> • adjustment methods • adjustment sequence - Adjustments in conformity with production instructions |
| G. Perform mixing operations using the: <ul style="list-style-type: none"> • internal mixer • open mill | <ul style="list-style-type: none"> - Observance of sequences for: <ul style="list-style-type: none"> • incorporating ingredients • operating the machine - Observance of established temperatures and mixing times |
| H. Inspect the composition. | <ul style="list-style-type: none"> - Complete inspection of composition: <ul style="list-style-type: none"> • homogeneity • vulcanization • viscosity - Accurate interpretation of results - Recording of information on sheet |

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
I. Shut down production.	- Observance of procedure for shutting down the internal mixer and open mill - Proper storage of: • tools • equipment • accessories - Report on irregularities observed, if applicable - Appropriate handling of rejects

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 describe the additives used in rubber compositions (A):

1. Become aware of the complexity of the composition of rubbers.
2. Describe the purpose of additives.

Before learning how to explain how vulcanization works (B):

3. Become aware of the impact of minimal quantities of vulcanizing agents.

Before learning how to locate, in the technical specifications, the information necessary for the preparation of the rubber composition (C):

4. Become aware of the importance of carefully reading the technical specifications related to the composition.

Before learning how to plan the work (D):

5. Describe the internal mixer and the open mill, their components and their functions.

Before learning how to weigh the ingredients (E):

6. Recognize the importance of weighing the additives precisely.

Before learning how to make adjustments to:

- the internal mixer
- the open mill (F):

7. Imagine the mixing process.

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 inspect the composition (H):

8. Become aware of the importance of the quality of the composition with respect to the other moulding operations.
9. List the most common errors made in rubber compositions.
10. Recognize the importance of adopting a critical attitude during inspection.

MODULE 24: EXTRUSION OF RUBBER¹

CODE: 870 246

Duration: 90 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **process rubbers by extrusion** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a complete extrusion set-up, including a vulcanization oven
 - raw materials
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

¹This module is optional. See Synoptic Table, p. 7.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of extrusion and vulcanization methods and procedures
- Consideration of characteristics of raw materials
- Proper use of tools, instruments and equipment
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications,
the information necessary for the work.

B. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions
- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, measuring instruments and peripherals
- Accurate adjustments of die and machine components, if necessary
- Proper preparation of:
 - the extruder
 - the vulcanization oven
- Proper feeding of raw materials

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

C. Install the peripherals and the vulcanization oven.

- Proper mounting and adjustment of peripherals and vulcanization oven
- Proper alignment of peripherals and vulcanization oven
- Complete inspection of peripherals
- Cleanliness of machine, peripherals and oven

D. Adjust the extrusion and vulcanization parameters on:

- the extruder
- the vulcanization oven

- Observance of:
 - adjustment methods
 - procedure
- Adjustments in conformity with data provided

E. Perform production operations.

- Observance of procedure for starting up the extruder
- Uniform delivery of extrudate
- Synchronization of extrusion speeds with outgoing conveyors
- Accurate evaluation of vulcanization outcome
- Accurate observations of condition of samples
- Determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the die
 - machine components
- Appropriate corrections made
- Supervision of process

**FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE**

**SPECIFICATIONS OF THE EXPECTED
BEHAVIOUR**

F. Inspect the product.

SPECIFIC PERFORMANCE CRITERIA

- Accurate measurements
- Complete inspection of conformity of product with technical specifications
- Appropriate corrections made
- Relevant and accurate information recorded in the production report

G. Shut down production.

- Observance of procedure for shutting down the extruder and peripherals
- Proper storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Appropriate handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to extrusion and vulcanization.
2. Describe the distinctive characteristics of extrusion and vulcanization.
3. Define the terms associated with extrusion and vulcanization.

Before learning how to plan the work (B):

4. Identify the peripherals used in rubber extrusion and describe their function.

Before learning how to install the peripherals and the vulcanization oven (C):

5. Show concern for careful, precise work.
6. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust the extrusion and vulcanization parameters on:

- the extruder
- the vulcanization oven (D):

7. Imagine the extrusion and vulcanization process.
8. Describe the parameters associated with extrusion and vulcanization.
9. Recognize the impact of adjustments on production and the quality of the product.

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 perform production operations (E):

10. Recognize the importance of using the senses to detect operating problems.
11. Become aware of the importance of doing routine inspections throughout the production process.

Before learning how to inspect the product (F):

12. List the most common defects found when inspecting rubber parts made using the extrusion and vulcanization process.
13. Associate defects with their causes.
14. Recognize the importance of adopting a critical attitude during inspection.

MODULE 25: ROTATIONAL MOULDING¹

CODE: 870 255

Duration: 75 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **process raw materials using rotational moulding** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a rotational moulding machine with oven and cooling station
 - raw materials
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation
 - a scientific calculator

¹This module is optional. See Synoptic Table, p. 7.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of rotational moulding method and procedure
- Consideration of characteristics of raw materials
- Proper use of tools, instruments, equipment and accessories
- Accurate calculations
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical specifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Locate, in the technical specifications, the information necessary for the work.

B. Plan the work.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions
- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools, measuring instruments, accessories and peripherals
- Accurate adjustments of mould components
- Proper balancing of machine arms
- Preparation of raw materials in conformity with data provided
- Proper feeding of raw materials

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|--|
| <p>C. Install the peripherals and accessories.</p> | <ul style="list-style-type: none"> - Proper mounting and adjustment of: <ul style="list-style-type: none"> • cooling jig • cooling station • finishing tools - Proper alignment of peripherals - Complete inspection of peripherals and accessories |
| <p>D. Adjust the parameters related to:</p> <ul style="list-style-type: none"> • moulding • cooling • finishing | <ul style="list-style-type: none"> - Observance of: <ul style="list-style-type: none"> • adjustment methods • procedure - Adjustments in conformity with production instructions |
| <p>E. Perform production operations:</p>

<ul style="list-style-type: none"> • moulding

 • cooling | <ul style="list-style-type: none"> - Observance of procedure for starting up the machine - Uniform delivery of raw materials
 - Complete inspection of: <ul style="list-style-type: none"> • parameters • balancing of arms • ventilation of mould - Appropriate corrections made
 - Proper choice of cooling methods: <ul style="list-style-type: none"> • air • water spray and mist - Supervision of cooling phase: <ul style="list-style-type: none"> • rotation ratios • cycle times • development of cooling - Proper corrections made |

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

F. Finish the parts.

- Observance of techniques
- Observance of tolerances
- Finish in conformity with specifications

G. Inspect the product.

- Complete inspection of conformity of product with specifications
- Accurate measurements
- Observance of tolerances
- Accurate determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the mould
 - the cooling jig
 - finishing tools
- Accurate corrections made
- Relevant and accurate information recorded in the report

H. Shut down production.

- Observance of procedure for shutting down the machine and peripherals
- Appropriate storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Appropriate handling of rejects

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 locate, in the technical specifications, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to rotational moulding.
2. Describe the distinctive characteristics of rotational moulding.
3. Define the terms associated with rotational moulding.

Before learning how to plan the work (B):

4. Become aware of the importance of planning in order to organize work efficiently.
5. Realize the importance of handling raw materials with care.
6. Show concern for the economical use of materials.
7. Identify the peripherals used in rotational moulding and describe their function.

Before learning how to install the peripherals and accessories (C):

8. Show concern for careful, precise work.
9. Become aware of the importance of doing routine inspections throughout the installation process.

Before learning how to adjust the parameters related to:

- moulding
- cooling
- finishing (D):

10. Explain the basic principle of rotational moulding.
11. Imagine the rotational moulding process.
12. Describe the parameters associated with rotational moulding.
13. Recognize the impact of adjustments on production and the quality of the product.

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 perform production operations:

- moulding
- cooling (E):

14. Recognize the importance of using the senses to detect operating problems.
15. Become aware of the importance of doing routine inspection throughout production.
16. Describe crystallization, agglomeration and crosslinking.

Before learning how to finish the parts (F):

17. List the secondary operations related to finishing.

Before learning how to inspect the product (G):

18. List the most common defects found when inspecting products made using rotational moulding.
19. Associate defects with their causes.
20. Recognize the importance of adopting a critical attitude during inspection.

Before learning how to shut down production (H):

21. Explain the importance of recycling raw materials.
22. Distinguish between recyclables and non-recyclables.

MODULE 26: THERMOFORMING¹

CODE: 870 267

Duration: 105 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **process raw materials using thermoforming** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following instructions
- Using:
 - a production drawing
 - a plug-assist or air-assist vacuum thermoforming machine
 - raw materials in sheet form
 - tools
 - measuring instruments
 - personal safety gear
 - the necessary documentation

¹This module is optional. See Synoptic Table, p. 7.

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of thermoforming method and procedure
- Consideration of characteristics of raw materials
- Proper use of tools, instruments and equipment
- Methodical, careful work
- Observance of time limits
- Ability to solve problems and work in a team
- Cleanliness of work area
- Product in conformity with technical estimates

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

- A. Locate, in the technical estimates, the information necessary for the work.

- B. Plan the work.

- C. Adjust the thermoforming parameters on the press.

SPECIFIC PERFORMANCE CRITERIA

- Thorough identification of the required information
- Accurate interpretation of:
 - production drawing
 - production instructions

- Conformity with instructions
- Determination of logical sequence of operations
- Proper choice of tools and accessories
- Proper adjustments of:
 - mould
 - accessories
- Proper inspection of machine
- Inspection of conformity of raw materials with data provided

- Observance of adjustment methods in accordance with equipment used
- Observance of sequence of operations
- Adjustments in conformity with production instructions

FIRST-LEVEL OPERATIONAL OBJECTIVE BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

D. Perform production operations.

- Observance of procedure for starting up the press
- Accurate observations of condition of samples
- Determination of changes to be made to:
 - parameter adjustments
 - raw materials
 - the mould
- Appropriate corrections made
- Supervision of procedure

E. Inspect the moulded parts.

- Accurate measurements
- Complete inspection of conformity of parts with technical specifications
- Proper corrections made, if applicable
- Relevant and accurate information recorded in the report

F. Shut down production.

- Observance of procedure for shutting down the thermoforming press
- Proper storage of:
 - tools
 - equipment
 - accessories
- Report on irregularities observed, if applicable
- Appropriate treatment of rejects

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 locate, in the technical estimates, the information necessary for the work (A):

1. Become aware of the importance of carefully reading the technical specifications related to thermoforming.
2. Describe the distinctive characteristics of air-assist, plug-assist and vacuum thermoforming.
3. Define the terms associated with thermoforming.

Before learning how to plan the work (B):

4. Become aware of the importance of planning in order to organize work efficiently.
5. Become aware of the importance of doing routine inspections on the press before beginning production.
6. Realize the importance of handling raw materials with care.
7. Show concern for the economical use of materials.

Before learning how to adjust the thermoforming parameters on the press (C):

8. Show concern for careful, precise work.
9. Imagine the thermoforming process.
10. Develop rational work methods.
11. Describe the parameters associated with thermoforming.
12. Recognize the effect of adjustments on production and the quality of the product.
13. Describe the behaviour of raw materials in thermoforming.

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 perform production operations (D):

14. Recognize the importance of using the senses to detect operating problems.
15. Become aware of the importance of doing routine inspections throughout the production process.

Before learning how to inspect the moulded parts (E):

16. List the most common defects found in products made using thermoforming.
17. Realize the consequences of defects in parts.
18. Associate defects with their causes.
19. Recognize the importance of adopting a critical attitude during product inspection.

Before learning how to shut down production (F):

20. Explain the importance of recycling raw materials.
21. Differentiate between recyclable and non-recyclable raw materials.

