16

METALLURGY

WELDING AND FITTING

PROGRAM OF STUDY
5695

VOCATIONAL and TECHNICAL EDUCATION

Québec

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

WELDER AND FITTER

Direction générale de la formation professionnelle et technique

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INTRODUCTION

The *Welding and Fitting* program is designed on the basis of a framework for developing vocational education programs that calls for the participation of experts from the workplace and the field of education.

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

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

The duration of the program is 1800 hours, which includes 1110 hours spent on the specific competencies required to practise the trade and 690 hours on general competencies. The program of study is divided into 29 modules, which 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

SYNOPTIC TABLE

Number of modules: 29
Duration in hours: 1800
Credits: 120

Welding and Fitting
CODE: 5695

CODE		TITLE OF THE MODULE	HOURS	CREDITS*
801 712	1.	The Trade and the Training Process	30	2
801 722	2.	Occupational Health and Safety Rules	30	2
801 737	3.	Producing Sketches and Drawings	105	7
801 743	4.	Applying Concepts of Metallurgy	45	3
801 762	5.	Cutting Ferrous and Non-Ferrous Metals	30	2
801 776	6.	Using Cutting and Shaping Equipment	90	6
801 782	7.	Preparing Parts	30	2
801 792	8.	Applying the SMAW Process	30	2
801 807	9.	Welding Steel Parts Using the SMAW Process	105	7
801 757	10.	Interpreting Plans and Specifications	105	7
801 813	11.	Applying the GTAW Process	45	3
801 825	12.	Welding Steel Parts Using the GTAW Process	75	5
801 834	13.	Welding Aluminum Parts Using the GTAW Process	60	4
801 844	14.	Basic Assemblies	60	4
801 852	15.	Applying the GMAW Process	30	2
801 868	16.	Welding Steel Parts using the GMAW Process	120	8
801 874	17.	Welding Aluminum Parts Using the GMAW Process	60	4
801 884	18.	Simple Assemblies	60	4
801 891	19.	Applying the FCAW Process	15	1
801 908	20.	Welding Steel Parts Using the FCAW Process	120	8
801 912	21.	Applying the SAW, RW and PAW Processes	30	2
801 927	22.	Interpretation of Plans and Specifications for Complex Assemblies	105	7
801 935	23.	Assemblies of Medium Complexity	75	5
801 941	24.	Communication in the Workplace	15	1
801 958	25.	Complex Assemblies	120	8
801 963	26.	Modifying Assemblies	45	3
801 974	27.	Repairing Assemblies	60	4
801 981	28.	Using Job-Search Techniques	15	1
801 996	29.	Entering the Work Force	90	6

* 15 hours = 1 credit
This program leads to an SSVD in Welding and Fitting.

2. PROGRAM TRAINING GOALS

The training goals of the *Welding and Fitting* 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 welding and fitting activities—preparation, assembly, welding, repair and modification of parts—at an acceptable level of competence for entry into the job market.
- To prepare students to perform satisfactorily on the job by fostering:
  - the acquisition of the skills necessary for the interpretation of assembly plans and specifications, and for processes;
  - the acquisition of the skills necessary to make correct choices while performing tasks;
  - the acquisition of the skills necessary for the organization and planning of work;
  - a concern for communicating politely and effectively with superiors, colleagues and clients;
  - a constant concern for the strict application of occupational health and safety rules while performing tasks;
  - the reinforcement of habits of attention and detail when performing the different welding and fitting tasks, in particular during the preparation and assembly of parts;
  - the acquisition of the habit of constantly evaluating the quality of the work;
  - the reinforcement of habits of order and cleanliness.

To ensure integration into the job market.

- To familiarize students with the job market in general, and with the metallurgy sector and the trade of welding and fitting in particular.
- To familiarize students with the program, its requirements and organization, and the possibilities for further study.

To foster personal development and the acquisition of occupational knowledge.

- To foster independence, and a sense of initiative and responsibility in performing tasks.
- To foster the desire to succeed.
- To foster a concern for the quality of the finished products.
- To understand the underlying principles of the different techniques used (cutting, shaping, assembly and welding).
- To acquire good work methods and a sense of discipline.

To ensure job mobility.

- To help students acquire a solid basic education that ensures the versatility necessary for the performance of tasks.
- To help students increase their capacity to learn, seek information and do research.
- To help students develop a positive attitude toward technological change and new situations.
- To prepare students for a creative job search.
- To help students develop an accurate perception of the career prospects in the metallurgy sector.

3. COMPETENCIES

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

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

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

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

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

GRID OF LEARNING FOCUSES IN *WELDING AND FITTING*		FIRST-LEVEL OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	WORK PROCESS (major steps)							GENERAL COMPETENCIES (related to technology, subjects, personal development, etc.)														TOTALS	
SPECIFIC COMPETENCIES (directly related to the practice of the specific occupation)				Become familiar with the work to be done	Interpret drawings, specifications and processes	Prepare the material	Carry out technical operations	Verify the quality of the work	Store the equipment	Clean up the work area	Become aware of occupational health and safety rules	Produce sketches and drawings	Apply concepts of metallurgy	Cut ferrous and non-ferrous metals	Use cutting and shaping equipment	Apply the SMAW process	Interpret drawings and specifications	Apply the GTAW process	Apply the GMAW process	Apply the FCAW process	Apply the SAW, RW and PAW processes	Interpret drawings and specifications for complex assemblies	Communicate in the workplace	Use job-search techniques	NUMBER OF OBJECTIVES	DURATION (IN HOURS)
MODULES	MODULES										2	3	4	5	6	8	10	11	15	19	21	22	24	28		
	FIRST-LEVEL OCCUPATIONAL OBJECTIVES										S	S	B	B	B	B	B	B	B	B	B	B	S	B	14	
	DURATION										30	105	45	30	90	30	105	45	30	15	30	105	15	15		690
1	Determine their suitability for the trade and the training process	S	30	△	△	△	△	△	△	△	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
7	Prepare parts	B	30	▲	△	▲	▲	△	▲	▲	●	○	●	●	●		○					○	○			
9	Weld steel parts using the SMAW process	B	105	△	△	▲	▲	▲	▲	▲	●	○	○	●	●	●	○					○	○			
12	Weld steel parts using the GTAW process	B	75	△	▲	▲	▲	▲	▲	▲	●	○	○	●	○		●	●				○	○			
13	Weld aluminum parts using the GTAW process	B	60	△	▲	▲	▲	▲	▲	▲	●	○	○	●	○		●	●				○	○			
14	Produce basic assemblies	B	60	▲	▲	▲	▲	▲	▲	▲	●	○	●	●	●	●	●	●				○	○			
16	Weld steel parts using the GMAW process	B	120	△	▲	▲	▲	▲	▲	▲	●	○	○	●	○		●		●			○	○			
17	Weld aluminum parts using the GMAW process	B	60	△	▲	▲	▲	▲	▲	▲	●	○	○	●	○		●		●			○	○			
18	Produce simple assemblies	B	60	△	▲	▲	▲	▲	▲	▲	●	○	●	●	●		●		●			○	○			
20	Weld steel parts using the FCAW process	B	120	△	▲	▲	▲	▲	▲	▲	●	○	○	●	○		●			●		○	○			
23	Produce assemblies of medium complexity	B	75	▲	▲	▲	▲	▲	▲	▲	●	○	●	○	○		○		●	●	●	●	●			
25	Produce complex assemblies	B	120	▲	▲	▲	▲	▲	▲	▲	●	○	●	○	○	●	○	●	●	●	●	●	○			
26	Modify assemblies	B	45	▲	▲	▲	▲	▲	▲	▲	●	○	●	●	●	●	○	●	●	●	○	●	○			
27	Repair assemblies	B	60	▲	▲	▲	▲	▲	▲	▲	●	○	●	●	●	●	○	○	○	○	○	○	○			
29	Enter the work force	S	90	△	△	△	△	△	△	△	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
NUMBER OF OBJECTIVES		15																							29	
DURATION (IN HOURS)			1100																							1800

S: Situational objectives

B: Behavioural objective

△ Correlation between a step and a specific competency

▲ Correlation to be taught and evaluated

○ Correlation between a general and a specific competency

● Correlation to be taught and evaluated

4. GENERAL OBJECTIVES

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

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

- Determine their suitability for the trade and the training process.
- Become aware of occupational health and safety rules.
- Communicate in the workplace.
- Use job-search techniques.
- Enter the work force.

To develop in the students the competencies required for the interpretation of plans, specifications and procedures.

- Produce sketches and drawings.
- Interpret drawings and specifications.
- Interpret drawings and specifications for complex assemblies.

To develop in the students the competencies required for the understanding of concepts and principles essential to the practice of the trade.

- Apply concepts of metallurgy.
- Cut ferrous and non-ferrous metals.
- Use cutting and shaping equipment.

To develop in the students the competencies required to apply the various welding processes.

- Apply the SMAW process.
- Apply the GTAW process.
- Apply the GMAW process.
- Apply the FCAW process.
- Apply the SAW, RW and PAW processes.

To develop in the students the competencies required to prepare and weld metal parts.

- Prepare parts.
- Weld steel parts using the SMAW process.
- Weld steel parts using the GTAW process.
- Weld aluminum parts using the GTAW process.
- Weld steel parts using the GMAW process.
- Weld aluminum parts using the GMAW process.
- Weld steel parts using the FCAW process.

To develop in the students the competencies required to produce, modify and repair assemblies.

- Produce basic assemblies.
- Produce simple assemblies.
- Produce assemblies of medium complexity.
- Produce complex assemblies.
- Modify assemblies.
- Repair assemblies.

5. FIRST - AND SECOND-LEVEL OPERATIONAL OBJECTIVES

5.1 DEFINITION

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

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

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

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

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

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

- learning involving prerequisite knowledge

- learning involving competencies

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

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

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

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

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

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

5.2 HOW TO READ FIRST-LEVEL OPERATIONAL

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: 801 712 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
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.
- Assess their career choice.

LEARNING CONTEXT

PHASE 1: **Information on the Trade**

- Learning about the job market in metallurgy: types of companies that manufacture and process metal products, types of products manufactured, characteristics and constraints of various trades, job prospects, salaries, opportunities for promotion and starting new businesses.

- Learning about the nature and requirements of the trade (tasks, working conditions, evaluation criteria, standards that govern products and the application of techniques, rights and responsibilities of workers) through visits and interviews, or by consulting reference material.

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

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

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

- Discussing the skills, attitudes, aptitudes and knowledge required to practise the trade.
- Becoming familiar with the training process (program of study, means of evaluation, certification of studies).
- Identifying the characteristics of the welding and fitting program (the competencies to be developed, evaluation methods and certification).
- Discussing how the training program prepares them for work as welders and fitters.
- Sharing their initial reactions to the trade and the training process.

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

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

INSTRUCTIONAL GUIDELINES

The teacher should:

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

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

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

PHASE 2:

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

PHASE 3:

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

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before undertaking the activities of Phase 1:

1. Determine their suitability for the trade and the training process.
2. Locate information.
3. Determine a way of taking down and presenting facts.
4. Identify the main conditions required to start up a business.
5. Distinguish between task and job.
6. Explain what is meant by *entry-level qualifications*.
7. Differentiate among the various standards governing the field of welding and fitting.
8. Explain the main rules governing group discussions.

Before undertaking the activities of Phase 2:

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

Before undertaking the activities of Phase 3:

11. Describe the main elements included in a report in which they confirm their career choice.

MODULE 2: OCCUPATIONAL HEALTH AND SAFETY RULES

CODE: 801 722 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
become aware of occupational health and safety rules.

SPECIFICATIONS

- Recognize the importance of occupational health and safety rules in welding and fitting.
- Identify the hazards of the work and the occupational health and safety rules appropriate for those hazards.

LEARNING CONTEXT

PHASE 1: **Awareness of the Importance of Occupational Health and Safety Rules in Welding and Fitting**

- Participating in activities that permit the recognition of:
  • how many work accidents there are in welding and fitting
  • the main causes of accidents and diseases
  • the consequences of accidents or diseases
- Becoming familiar with the main legal provisions related to occupational health and safety in welding and fitting (legislation, regulations, rights and responsibilities, programs and procedures)
- Discussing the advantages of prevention and the main means of promoting occupational health and safety

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Information on the Hazards of Welding and Fitting Work and on the Occupational Health and Safety Rules Appropriate for Those Hazards**

- On the basis of the tasks and operations carried out in welding and fitting, identifying the sources of hazards for occupational health and safety
- Discussing the dangers, hazards and effects on health and safety related to each of the potential sources
- Discussing the characteristics and limits of the various means of prevention and protection available in welding and fitting

PHASE 3: **Summary of the Occupational Health and Safety Rules According to the Various Work Activities**

- Associating the health and safety rules to be applied given the hazards related to carrying out the tasks and operations of welding and fitting
- Producing a summary table of the occupational health and safety rules to be applied
- Discussing the corrective measures to be applied to improve the summary presented

INSTRUCTIONAL GUIDELINES

The teacher should:

- Make available all pertinent reference materials: analysis report on the work situation, laws, regulations, guides, accident statistics, symbols and pictograms for the identification of products and materials, etc.
- Encourage the students to engage in discussions and express their opinions.
- Encourage the students to acquire preventive reflexes in the execution of tasks and operations.
- Provide the students with specific information on the scope and limitations of health and safety rules and means of prevention and protection.
- Assist the students in evaluating their summaries of health and safety rules.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Do a rigorous analysis of the reference materials.
- Participate actively in the various suggested activities to demonstrate their understanding of the importance of health and safety rules.
- Express their views on the means they intend to use to promote occupational health and safety.

PHASE 2:

- Do a rigorous analysis of the reference materials.
- Participate actively in the various suggested activities to demonstrate their interest in the subjects being discussed.
- Produce thorough written notes of the information gathered.

PHASE 3:

- Produce a detailed summary of the health and safety rules to be applied according to the tasks and operations.
- Suggest means for improving the synthesis presented.

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: Awareness of the Importance of Occupational Health and Safety Rules in Welding and Fitting:

1. Search the reference materials for information on accidents and illnesses associated with welding and fitting.
2. Identify the characteristics of the normative and regulatory framework for occupational health and safety in welding and fitting.
3. Identify the rights and responsibilities of the various actors in occupational health and safety.

Before undertaking the activities of Phase 2: Information on the Hazards of Welding and Fitting Work and on the Occupational Health and Safety Rules Appropriate for Those Hazards:

4. Identify the main sources of information on the hazards of welding and fitting.
5. Interpret the main symbols and pictograms related to the products and material used in welding and fitting.
6. Recognize the hazards and the health and safety rules associated with:
   - products and materials (gas, solvents, metals, parts, etc.)
   - equipment (cylinders, torches, hoses, cutting and shaping equipment, welding equipment, storage and handling equipment, etc.)
   - work organization, procedures and methods (preparation of parts, assembly, welding, confinement, etc.)
   - the work environment (fumes, flammable materials, congestion, lighting, noise, dust, etc.).
7. Distinguish the characteristics and limitations of the various means of protection available.

MODULE 3: PRODUCING SKETCHES AND DRAWINGS

CODE: 801 737 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a simple plan and written instructions
- Using appropriate instruments
- On drawing paper
- Without reference materials

GENERAL PERFORMANCE CRITERIA

- Appropriate use of trigonometry formulas and drawing instruments
- Proper application of basic drawing techniques
- Clarity and accuracy of sketches and drawings

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Solve mathematics and trigonometry problems useful for fitting.	- Appropriate application of calculation methods - Precision of calculations
B. Draw geometrical shapes.	- Precision of shapes and dimensions
C. Draw, freehand, orthogonal projections.	- Accuracy of drawing - Precision of relationships among views - Observance of proportions
D. Draw the various views of a technical drawing.	- Appropriate choice of hatching symbols according to the material represented - Accuracy of relationships between views
E. Dimension a drawing.	- Observance of usual standards - Correct location of dimensions

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 solve mathematics and trigonometry problems useful for fitting (A):

1. Calculate the perimeters and surface areas of the main geometrical shapes.
2. Apply the calculation formulas for sines, cosines and tangents.

Before learning how to draw geometrical shapes (B):

3. Use the measurement units of the metric system and the imperial system.
4. Use various drawing instruments.
5. Recognize the conventional lines used in drawing.
6. Interpret the geometrical shapes used in drawing.
7. Differentiate among the methods of representing parts.

Before learning how to draw, freehand, orthogonal projections (C):

8. Differentiate among the views used in orthogonal projections.
9. Understand the importance of visualizing proportions.

Before learning how to draw the various views of a technical drawing (D):

10. Explain the principles of sectional views and the different sectional drawings.
11. Recognize the hatching symbols for different materials.
12. Draw an isometric view of an object.

Before learning how to dimension a drawing (E):

13. Recognize scales on a drawing.
14. Apply the principles for dimensioning in orthogonal projections.
15. Specify the types of annotations found on a technical drawing.

MODULE 4: APPLYING CONCEPTS OF METALLURGY

CODE: 801 743 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- With respect to commonly used metals
- Using the instructions provided by the teacher

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Accurate understanding of the thermal effects of welding and fitting

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Recognize the metals to be prepared and assembled.	- Appropriate application of techniques for identifying new and used metals
B. Determine the weldability of metals.	- Accurate association of base metals and the filler metals - Accurate understanding of constraints and thermal treatments
C. Control expansion and contraction.	- Correct choice of control techniques - Appropriate use of control techniques

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 recognize the metals to be prepared and assembled (A):

1. Identify the characteristics and properties of ferrous and non-ferrous metals.
2. Explain the importance of accurate identification of metals.
3. Explain the classification of metals according to their alloys.
4. Apply methods of identification of new and used metals.

Before learning how to determine the weldability of metals (B):

5. Describe the main crystalline structures of iron.
6. Distinguish the three basic solid solutions that constitute carbon steels.
7. Explain the effects of heat on metals.
8. Describe the thermal treatments used most in welding.
9. List the main factors that determine the weldability of ferrous and non-ferrous metals.
10. Determine the variables that influence the choice of welding process.
11. Compare the physical properties of ferrous and non-ferrous metals according to the effect they have on weldability.

Before learning how to control expansion and contraction (C):

12. Understand the effects of expansion and contraction of metals on their conductivity and ductility.
13. Take measures to reduce the effects of expansion and contraction.
14. Detect distortions and breaks in metals.

MODULE 5: CUTTING FERROUS AND NON-FERROUS METALS

CODE: 801 762 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
cut ferrous and non-ferrous metals
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following written instructions on the materials, the dimensions of the pieces and the bevels
- Using a manual plasma cutter and manual and semi-automatic oxyacetylene cutter
- While doing cuts on structural shapes, pipes and plates of various thicknesses

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Compliance with the instructions
- Proper use of tools and equipment
- Appropriate application of various cutting techniques

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Prepare the metal.	- Choice and application of appropriate cleaning techniques - Appropriate use of measuring and tracing instruments - Accuracy of cut lines traced on the metal - Correct positioning of the parts according to the cuts to be made
B. Set up the welding machines.	- Correct choice of accessories
C. Make straight, curved and angled cuts using the oxyacetylene process.	- Proper settings and appropriate adjustment of the machines - Cleanliness and precision of the cuts
D. Make straight, curved and angled cuts using the plasma process.	- Proper settings and appropriate adjustment of the machines - Cleanliness and precision of the cuts
E. Clean the cuts.	- Appropriate choice and application of cleaning techniques
F. Evaluate the quality of the cuts.	- Accurate detection of imperfections - Validity of the suggested corrective measures
G. Store the equipment.	- In the appropriate places
H. Clean up the work area.	- Cleanliness of the 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 prepare the metal (A):

1. Distinguish the characteristics and functions of the different methods of cutting and gouging.
2. Wear individual protective equipment.
3. Check the protective devices.
4. Apply cleaning techniques related to preparation of the metal.
5. Describe the different ways to avoid wasting materials.
6. Use measurement and tracing instruments.
7. Trace the cut lines.
8. Recognize the metals to be cut.
9. Distinguish the different operations for preparing structural shapes and plates.

Before learning how to set up the welding machines (B):

10. Identify the combustible gases and the combustive gas used in oxyacetylene cutting.
11. Identify the types of manual cutting tips.
12. Describe the basic principle of oxyacetylene cutting.
13. Explain the operation of cutting tips.
14. Identify the gases used in plasma cutting.
15. Describe the basic principle of plasma cutting.
16. Explain the operation of a plasma torch.
17. Select cutting tips according to the type and thickness of the metal to be cut.
18. Apply standards and rules of safety related to setting up welding machines.

Before learning how to make straight, curved and angled cuts using the oxyacetylene process (C):

19. Adjust the settings.
20. Use the various cutting techniques.

Before learning how to clean the cuts (E):

21. Describe the characteristics and functions of the techniques for cleaning cuts.

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 evaluate the quality of the cuts (F):

22. Describe the qualities and defects of a cut.
23. Explain the various factors that cause imperfections in a cut.

MODULE 6: USING CUTTING AND SHAPING EQUIPMENT

CODE: 801 776 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
use cutting and shaping equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions provided by the teacher
- Using various machine tools for cutting and shaping
- On mild steel plates

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the order of operations
- Observance of work techniques
- Conformity of the part with the instructions

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Prepare the work.	- Appropriate choice of equipment according to the work to be done - Appropriate planning of the order of operations - Accuracy of calculations - Precise adjustment of the machine tools
B. Carry out the cutting and shaping operations.	- Precision in carrying out the operations - Sharpness of cuts and shapes - Maximum reduction of waste of material
C. Program a digital control press brake using the procedure for inputting the data codes.	- Observance of the procedure for inputting data - Proper choice of settings according to the part to be shaped
D. Carry out bending operations using a digital control press brake.	- Conformity of shapes with the required specifications - Observance of instructions for using the press brake
E. Store the equipment.	- In the appropriate places
F. Clean up the work area.	- Cleanliness of the 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 prepare the work (A):

1. Apply prevention and protection procedures related to the use of cutting and shaping equipment.
2. Explain the operation and procedure for adjusting press brakes.
3. Explain the operation and procedure for adjusting a squaring shear.
4. Explain the operation of plate bending rollers.
5. Explain the operation of a band saw.
6. Explain the operation of a cutting-off machine.
7. Explain the operation and procedure for adjusting a combination machine for structural shapes.
8. Explain the operation and procedure for method of adjusting bending machines for structural shapes.
9. Explain the operation of a drill press.
10. Explain the operation of a chamfering machine.
11. Explain the operation of grinders.
12. Explain the operation of the manual tools used in welding and fitting.

Before learning how to program a digital control press brake using the procedure for inputting the data codes (C) and carry out bending operations using a digital control press brake (D):

13. Explain the procedure for inputting the data codes on a digital control press brake.

MODULE 7: PREPARING PARTS

CODE: 801 782 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using an assembly plan
- Using case studies related to producing assemblies
- Using measuring and tracing instruments
- Use cutting and shaping equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Conformity with the plan and the instructions
- Proper use of tools and equipment
- Attention to the success of each stage in the preparation

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be done.	- Accurate interpretation of instructions related to safety - Accurate interpretation of plans and specifications
B. Prepare the metal.	- Accurate identification of the metals - Cleaning, tracing and positioning appropriate for the parts
C. Prepare the tools and equipment.	- Appropriate choice and installation of accessories - Proper adjustment of the equipment - Careful checking of the equipment and safety devices
D. Carry out the cutting and shaping of the parts.	- Proper use of the equipment - Observance of proper method
E. Check that the parts conform to the plans and specifications.	- Accurate checking of dimensions and angles
F. Store the equipment.	- In the appropriate places
G. Clean up the work area.	- Cleanliness of the 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 become familiar with the work to be done (A):

1. Explain the safety measures to be taken at each stage in the preparation of the parts.
2. Describe the different methods of communicating instructions in the workplace.

Before learning how to prepare the metal (B) prepare the tools and equipment (C) and carry out the cutting and shaping of the parts (D):

3. Explain the methods for positioning the parts.
4. Describe the methods of tracing.

Before learning how to check that the parts conform to the plans and specifications (E):

5. Describe the method for checking the parts.

MODULE 8: APPLYING THE SMAW PROCESS

CODE: 801 792 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply the SMAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using cases representative of the welding work done in the workplace
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of standards for the classification of electrodes
- Proper handling of machines and accessories
- Appropriate application of the process according to needs

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose the welding machines.	- Appropriate choice of machines according to the application
B. Select the filler metals.	- Correct choice of filler metal according to: - the base metal - the chemical and mechanical properties of the metals
C. Choose the welding accessories.	- Correct choice of accessories according to the application
D. Set up welding machines.	- Logical order for set-up procedure - Correct positioning of accessories
E. Adjust the settings on the welding machines.	- Appropriate settings for the machines according to the work to be done
F. Make a weld bead.	- Appropriate application of welding techniques - Observance of control factors
G. Store the equipment.	- In the appropriate places
H. Clean up the work area.	- Cleanliness of the 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 chose the welding machines (A):

1. Distinguish the characteristics and functions of the SMAW process.
2. Know the concepts of electricity that are useful in applying the SMAW process.
3. Distinguish the characteristics and functions of the different SMAW welding machines.

Before learning how to select the filler metals (B):

4. Explain the characteristics and functions of the flux covering of an electrode core.
5. Explain the classifications of electrodes.

Before learning how to choose the welding accessories (C):

6. Identify the accessories for SMAW welding machines.

Before learning how to set up the welding machines (D):

7. Determine the stages in setting up a SMAW welding machine.

Before learning how to adjust the settings on the welding machines (E):

8. Explain the factors that determine the settings.

Before learning how to make a weld bead (F):

9. Explain the control factors related to doing the weld.
10. Observe the behaviour of the arc and the weld pool when the welding is being done.

MODULE 9: WELDING STEEL PARTS USING THE SMAW PROCESS

CODE: 801 807 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
weld steel parts using the SMAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a welding process
- According to standards for welding 1GF butt joints
- On mild steel plates a minimum of 200 mm in length
- Using E48018 electrodes

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding process
- Observance of the set time limit
- Correct application of the SMAW process

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Assemble mild steel plates in preparation for welding: • tee joints (6.4 mm and 9.6 mm x 300 mm) • lap joints (6.4 mm x 300 mm) • 1GF butt joints (9.6 mm X 300 mm)	- Correct choice and appropriate use of the equipment - Proper preparation of the pieces - Proper installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds
B. Weld tee joints and lap joints in the horizontal, vertical and overhead positions using mild steel electrodes.	- Appropriate parameter settings - Proper application of welding techniques - Good quality of welding
C. Weld 1GF butt joints in the flat position using mild steel electrodes.	- Appropriate parameter settings - Proper application of welding techniques - Good quality of welding
D. Weld tee joints and lap joints in the horizontal position using stainless steel electrodes.	- Appropriate parameter settings - Proper application of welding techniques - Good quality of welding
E. Visually evaluate the quality of the welds.	- Accurate detection of any defects - Correct evaluation of the quality of the welds
F. Analyze the qualities of the 1GF butt joint welding using a bend test.	- Observance of preparation and evaluation standards
G. Store the equipment.	- In the appropriate places
H. Clean up the work area.	- Cleanliness of the 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 assemble mild steel plates to prepare to weld:

- **tee joints (6.4 mm and 9.6 mm x 300 mm)**
- **lap joints (6.4 mm x 300 mm)**
- **1GF butt joints (9.6 mm X 300 mm) (A):**

1. Take the safety measures required for SMAW welding operations.
2. Describe the steps in assembling the parts.
3. Explain the importance of tack welding.
4. Tack weld the tee joints, lap joints and butt joints.

Before learning how to weld tee joints and lap joints in the horizontal, vertical and overhead positions using mild steel electrodes (B):

5. Describe the qualities of a well-executed weld.
6. Describe the causes of welding defects and suggest appropriate corrective measures.

Before learning how to visually evaluate the quality of the welds (E):

7. Detect the defects in a weld.
8. Know the requirements and tolerances that apply in the evaluation of welds.

Before learning how to analyze the qualities of the 1GF butt joint welding using a bend test (F):

9. Explain the standards for preparation and evaluation related to bend tests.

MODULE 10: INTERPRETING DRAWINGS AND SPECIFICATIONS

CODE: 801 757 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
interpret drawings and specifications
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using perspective drawings and sectional views
- Using an orthographic drawing
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Correct interpretation of the information
- Use of correct terminology
- Accuracy and thoroughness of reading

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret welding symbols.	- Correct interpretation of welding symbols
B. Interpret a welding process.	- Correct interpretation of the welding process
C. Verify the information in the assembly plan and specifications.	- Accurate verification of the information - Systematic detection of errors - Checking of conformity of the drawing to the 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 interpret welding symbols (A):

1. Distinguish the types of assembly (joints) and preparations.
2. Distinguish the welding symbols.
3. Detect the errors in the drawings.

Before learning how to interpret a welding process (B):

4. Read the information contained in a welding process.

Before learning how to check the information in the assembly plan and specifications (C):

5. Interpret the details given in the title block.
6. Distinguish the characteristics and functions of an assembly plan and specifications.
7. Associate the detailed views with the complete drawing.
8. Identify the parts on a drawing using a log sheet.
9. Interpret the dimensions, annotations and symbols on an assembly drawing.
10. Recognize errors on an assembly drawing.

MODULE 11: APPLYING THE GTAW PROCESS

CODE: 801 813 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply the GTAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using cases representative of the welding work done in the workplace
- During the application of the GTAW and GTAW-P processes
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the standards for the classification of filler rods and electrodes
- Correct handling of machines and accessories
- Correct application of the process according to need

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose the welding machines.	- Correct choice of machines according to the application
B. Select the filler metal	- Correct choice of filler metal according to: - the base metal - the chemical and mechanical properties of the metals
C. Choose the non-consumable electrodes.	- Correct choice of electrodes according to the base metal and the desired characteristics
D. Select the shielding gases.	- Correct choice of gases according to: - the base metal - the desired characteristics
E. Select the welding accessories.	- Appropriate choice of accessories according to the application
F. Set up the welding machines.	- Logical order of steps - Correct positioning of accessories
G. Adjust the settings on the welding machines.	- Appropriate settings according to the work to be done
H. Make a weld bead.	- Appropriate application of welding techniques - Appropriate application of control factors
I. Store the equipment.	- In the appropriate places
J. Clean up the work area.	- Cleanliness of the 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 chose the welding machines (A):

1. Distinguish the characteristics and functions of the GTAW and GTAW-P processes.
2. Know the concepts of electricity that are useful in applying the GTAW process.
3. Distinguish the characteristics and functions of the different GTAW welding machines.

Before learning how to select the filler metals (B):

4. Explain the characteristics of the filler rods.

Before learning how to choose the non-fusing electrodes (C):

5. Identify the different categories of non-fusing electrodes.

Before learning how to select the shielding gases (D):

6. Explain the characteristics of shielding gases.

Before learning how to select the welding accessories (E):

7. Identify the accessories for GTAW and GTAW-P welding machines.

Before learning how to set up the welding machines (F):

8. Determine the steps for setting up GTAW welding machines.

Before learning how to adjust the settings on the welding machines (G):

9. Explain the factors that determine the settings.

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 a weld bead (H):

10. Explain the control factors related to welding using the GTAW process.
11. Observe the behaviour of the arc and the weld pool when using the GTAW process and the GTAW-P process.

MODULE 12: WELDING STEEL PARTS USING THE GTAW PROCESS

CODE: 801 825 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
weld steel parts using the GTAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a welding process
- On mild steel plates a minimum of 150 mm in length

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding process
- Observance of the set time limit
- Correct application of the GTAW process

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the welding process	- Accuracy of the interpretation
B. Assemble mild steel and stainless steel plates (1.6 mm x 300 mm) to prepare to weld: • butt joints • lap joints • corner joints	- Correct choice and appropriate use of the equipment - Appropriate preparation of the pieces - Appropriate installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds
C. Weld butt joints in the flat, horizontal and vertical positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Appropriate use of purge for stainless steel - Good quality of welding
D. Weld lap joints and corner joints in the horizontal and vertical positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
E. Weld butt joints in the vertical position using the GTAW-P process.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
F. Visually evaluate the quality of the welds.	- Accurate detection of any defects - Correct evaluation of the quality of the welds
G. Store the equipment.	- In the appropriate places
H. Clean up the work area.	- Cleanliness of the 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 assemble mild steel and stainless steel plates (1.6 mm x 300 mm) to prepare to weld:

- **butt joints**
- **lap joints**
- **corner joints (B):**

1. Take the safety measures required for GTAW welding operations.
2. Explain the sequence of tack welds to be carried out.
3. Do the tack welding of the butt, lap and corner joints.

Before learning how to weld butt joints in the flat, horizontal and vertical positions (C):

4. Describe the qualities of a well-executed weld.
5. Describe the causes of welding defects and suggest appropriate corrective measures.
6. Make a weld bead with purge.

Before learning how to weld butt joints in the vertical position using the GTAW-P process (E):

7. Adjust the setting for the pulsation.

Before learning how to visually evaluate the quality of the welds (F):

8. Detect the defects in a weld.
9. Know the requirements and tolerances that apply in the evaluation of welds.

MODULE 13: WELDING ALUMINUM PARTS USING THE GTAW PROCESS

CODE: 801 834 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
weld aluminum parts using the GTAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a welding process
- On aluminum plates a minimum of 150 mm in length

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding technique
- Observance of the set time limit
- Correct application of the GTAW process

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the welding process	- Accuracy of the interpretation
B. Assemble aluminum parts (1.6 mm x 300 mm) to prepare to weld: • butt joints • lap joints • corner joints	- Correct choice and appropriate use of the equipment - Appropriate cleaning of the parts - Appropriate preparation of the parts - Appropriate installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds
C. Weld butt joints in the flat, horizontal and vertical positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
D. Weld lap joints and corner joints in the horizontal and vertical positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
E. Visually evaluate the quality of the welds.	- Accurate detection of any defects - Correct evaluation of the quality of the welds
F. Store the equipment.	- In the appropriate places
G. Clean up the work area.	- Cleanliness of the 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 assemble aluminum parts (1.6 mm x 300 mm) to prepare to weld:

- **butt joints**
- **lap joints**
- **corner joints (B):**

1. Explain the tack welding sequence to be applied.
2. Do the tack welding of the butt, lap and corner joints.

Before learning how to weld butt joints in the flat, horizontal and vertical positions (C):

3. Describe the qualities of a well-executed weld.
4. Describe the causes of welding defects and suggest appropriate corrective measures.

Before learning how to visually evaluate the quality of the welds (E):

5. Detect the defects in a weld.
6. Know the requirements and tolerances that apply in the evaluation of welds.

MODULE 14: BASIC ASSEMBLIES

CODE: 801 844 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Referring to assembly drawings and specifications and welding processes
- Using SMAW and GTAW electric arc welding machines
- Assembling mild metal pieces

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding processes
- Appropriate application of the assembly and welding techniques
- Compliance of the assemblies with the plans, specifications and requirements

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be done.	- Correct interpretation of the oral and written instructions
B. Interpret the plans, specifications and processes.	- Accuracy of the interpretation

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
C. Lift and handle the materials	- Observance of occupational health and safety standards - Proper choice of equipment - Accurate evaluation of loads - Determination of centres of gravity - Minimizing movements - Appropriate anchor points
D. Prepare the parts.	- Correct choice and appropriate application of the preparation techniques - Observance of the dimensions, in keeping with the tolerances - Accurate identification of the parts using the log sheet - Accuracy and cleanliness of the cuts
E. Assemble and tack weld the parts.	- Observance of the proper order of assembly - Assembly and tack welding according to the requirements
F. Do the welds required.	- Appropriate parameter settings - Quality of the welds according to: - the requirements - control of expansion and contraction
G. Carry out the finishing work on the assembly.	- Correct choice and application of cleaning and finishing techniques - Quality of the finishing work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
H. Evaluate the quality of the assembly.	- Correct use of tools and proper application of verification techniques - Accurate detection of defects in the assembly - Validity of the corrective measures suggested
I. Store the equipment.	- In the appropriate places
J. Clean up the work area.	- Cleanliness of the 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 become familiar with work to be done (A):

1. Distinguish the different ways of transmitting instructions on producing basic assemblies in industry.

Before learning how to interpret plans, specifications and processes (B):

2. Interpret the annotations and the order of assembly.

Before learning how to assemble and tack weld the parts (E):

3. Identify the different assembly techniques.
4. Apply thermal and mechanical assembly techniques.
5. Explain the different orders for assembly.

Before learning how to carry out the finishing work on the assembly (E):

6. Distinguish the characteristics and functions of the different cleaning and finishing techniques.
7. Use the cleaning and finishing equipment.

Before learning how to evaluate the quality of the assembly (E):

8. Distinguish the characteristics and functions of the tools and instruments used to assess the quality of assemblies.
9. Recognize defects in the assemblies.
10. Apply techniques for verifying the assemblies.
11. Identify the corrective measures to be applied according to the defects in the assembly.

MODULE 15: APPLYING THE GMAW PROCESS

CODE: 801 852 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply the GMAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using cases representative of the welding work done in the workplace
- During the application of the GMAW and GMAW-P processes
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the standards for the classification of filler rods and electrodes
- Correct handling of machines and accessories
- Correct application of the process according to need

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose the welding machines.	- Correct choice of machines according to the application
B. Select the filler metals.	- Correct choice of filler metal according to: - the base metal - the chemical and mechanical properties of the metals
C. Select the shielding gases.	- Correct choice of gases according to: - the base metal - the desired characteristics
D. Select the welding accessories.	- Appropriate choice of accessories according to the application
E. Set up the welding machines.	- Logical order of steps - Correct positioning of accessories
F. Adjust the settings on the welding machines.	- Appropriate parameter settings according to the work to be done
G. Make a weld bead.	- Appropriate application of welding techniques - Observance of the control factors
H. Store the equipment.	- In the appropriate places
I. Clean up the work area.	- Cleanliness of the 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 chose the welding machines (A):

1. Distinguish the characteristics and functions of the GMAW and GMAW-P processes.
2. Know the concepts of electricity that are useful in applying the GMAW process.
3. Distinguish the characteristics and functions of the different GMAW welding machines.

Before learning how to select the filler metals (B):

4. Explain the classification of filler metals for the GMAW process.

Before learning how to select the shielding gases (C):

5. Explain the characteristics of different shielding gases.
6. Apply the different transfer methods.

Before learning how to select the welding accessories (D):

7. Identify the accessories for GMAW and GMAW-P welding machines.

Before learning how to set up the welding machines (E):

8. Determine the steps for setting up a GMAW welding machine.

Before learning how to adjust the settings on the welding machines (F):

9. Determine the transfer methods.
10. Explain the control factors related to welding using the GMAW process.
11. Observe the behaviour of the arc and the weld pool when welding is being done using the GMAW process.

MODULE 16: WELDING STEEL PARTS USING THE GMAW PROCESS

CODE: 801 868 **Duration: 120 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
weld steel parts using the GMAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a welding process
- Referring to the standards for welding 2GF butt joints
- On mild steel plates a minimum of 200 mm in length

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding process
- Observance of the set time limit
- Correct application of the GMAW process

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the welding process	- Accuracy of the interpretation
B. Assemble mild steel plates in preparation for welding: • 1GF and 2GF butt joints (9.6 mm x 300 mm) • butt joints (1.6 and 3.2 mm x 300 mm) • lap joints (1.6 and 6.4 mm x 300 mm) • corner joints (1.6 and 3.2 mm x 300 mm) • tee joints (1.6 and 6.4 mm x 300 mm) • small structural shapes on plates.	- Correct choice of equipment and its appropriate use - Appropriate preparation of the pieces - Appropriate installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds
C. Assemble stainless steel plates 1.6 mm x 300 mm to prepare to weld: • lap joints • tee joints.	- Correct choice and appropriate use of the equipment - Accuracy and cleanliness of the cuts - Appropriate installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds
D. Weld butt joints: • 1.6 and 3 mm x 300 mm in the flat, horizontal and vertical positions • 9.6 mm x 300 mm in the flat (1GF) and horizontal (2GF) positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
E. Weld mild steel lap joints, corner joints and tee joints in the horizontal and vertical positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
F. Weld structural shapes from pieces of mild steel on vertically mounted plates	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
G. Weld lap joints and tee joints from pieces of stainless steel in the horizontal and vertical positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
H. Visually evaluate the quality of the welds.	- Accurate detection of defects in the assembly - Correct evaluation of the quality of the welds
I. Analyze the qualities of the 2GF butt joints using a bend test.	- Observance of preparation and evaluation standards
J. Store the equipment.	- In the appropriate places
K. Clean up the work area.	- Cleanliness of the 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 assemble mild steel plates to prepare to weld:

- **1GF and 2GF butt joints (9.6 mm x 300 mm)**
- **butt joints (1.6 and 3.2 mm x 300 mm)**
- **lap joints (1.6 and 6.4 mm x 300 mm)**
- **corner joints (1.6 and 3.2 mm x 300 mm)**
- **tee joints (1.6 and 6.4 mm x 300 mm)**
- **small structural shapes on plates (B):**

1. Take the safety measures required for GMAW welding operations.
2. Explain the sequence of tack welds to be applied.
3. Tack weld butt, lap and corner joints, and small structural shapes on plates.

Before learning how to weld butt joints:

- **1.6 and 3 mm x 300 mm in the flat, horizontal and vertical positions**
- **9.6 mm x 300 mm in the flat (1GF) and horizontal (2GF) positions (D):**

4. Describe the qualities of a well-executed weld.
5. Describe the causes of welding defects and suggest appropriate corrective measures.

Before learning how to visually evaluate the quality of the welds (H):

6. Detect the defects in a weld.
7. Know the requirements and tolerances that apply in the evaluation of welds.

MODULE 17: WELDING ALUMINUM PARTS USING THE GMAW PROCESS

CODE: 801 874 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
weld aluminum parts using the GMAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a welding process
- On aluminum plates a minimum of 200 mm in length

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding process
- Observance of the set time limit
- Correct application of the GMAW process

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the welding process	- Accuracy of the interpretation
B. Assemble aluminum plates in preparation for welding: • lap joints (1.6, 3.2 and 6.4 mm x 300 mm) • corner joints (3.2 and 6.4 mm x 300 mm) • tee joints (3.2 and 6.4 mm x 300 mm) • small structural shapes on plates	- Correct choice of equipment and its appropriate use - Appropriate cleaning of the pieces - Appropriate preparation of the pieces - Appropriate installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds
C. Weld lap, corner and tee joints in the horizontal and vertical positions, and weld small structural shapes on vertically mounted plates.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
D. Weld lap joints 1.6 mm x 300 mm in the horizontal and vertical positions using the GMAW-P process.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
E. Visually evaluate the quality of the welds.	- Accurate detection of any defects - Correct evaluation of the quality of the welds
F. Store the equipment.	- In the appropriate places
G. Clean up the work area.	- Cleanliness of the 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 assemble aluminum plates in preparation for welding:

- **lap joints (1.6, 3.2 and 6.4 mm x 300 mm)**
- **corner joints (3.2 and 6.4 mm x 300 mm)**
- **tee joints (3.2 and 6.4 mm x 300 mm)**
- **small structural shapes on plates (B):**

1. Explain the sequence of tack welds to be applied.
2. Tack weld lap joints, corner joints, tee joints and small structural shapes on plates.

Before learning how to weld lap, corner and tee joints in the horizontal and vertical positions, and weld small structural shapes on vertically mounted plates (C):

3. Describe the qualities of a well-executed weld.
4. Describe the causes of welding defects and suggest appropriate corrective measures.

Before learning how to weld lap joints 1.6 mm x 300 mm in the horizontal and vertical positions using the GMAW-P process (D):

5. Set the pulsation parameters.

Before learning how to visually evaluate the quality of the welds (E):

6. Detect the defects in a weld.
7. Know the requirements and tolerances that apply in the evaluation of welds.

MODULE 18: SIMPLE ASSEMBLIES

CODE: 801 884 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
produce simple assemblies
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Referring to assembly drawings and specifications and welding processes
- Using GMAW welding machines
- Assembling mild metal parts

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding processes
- Appropriate application of the assembly and welding techniques
- Compliance of the assemblies with the plans, specifications and requirements

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the plans, specifications and processes.	- Accuracy of the interpretation

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Prepare the parts.	- Correct choice and appropriate application of the preparation techniques - Observance of the dimensions, in keeping with the tolerances - Accurate identification of the parts using the log sheet - Accuracy and cleanliness of the cuts
C. Assemble and tack weld the parts.	- Observance of the proper order of assembly - Assembly and tack welding according to the requirements
D. Do the welds required.	- Appropriate parameter settings - Quality of the welds according to: - the requirements - control of expansion and contraction
E. Carry out the finishing work on the assembly.	- Correct choice and application of cleaning and finishing techniques - Quality of the finishing work
F. Evaluate the quality of the assembly.	- Correct use of tools and proper application of verification techniques - Accurate detection of defects in the assembly - Validity of the corrective measures suggested
G. Store the equipment.	- In the appropriate places
H. Clean up the work area.	- Cleanliness of the 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 assemble and tack weld the parts (C):

1. Apply the tack welding technique using the GMAW process.

Before learning how to carry out the finishing work on the assembly (E):

2. Distinguish the characteristics and functions of the different cleaning and finishing techniques.
3. Use the cleaning and finishing equipment.

Before learning how to evaluate the quality of the assembly (F):

4. Distinguish the characteristics and functions of the tools and instruments used to assess the quality of assemblies.
5. Recognize defects in the assemblies.
6. Apply techniques for verifying the assemblies.
7. Identify the corrective measures to be applied according to the defects in the assembly.

MODULE 19: APPLYING THE FCAW PROCESS

CODE: 801 891 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply the FCAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using cases representative of the welding work done in the workplace
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the standards for the classification of flux-cored wires
- Correct handling of machines and accessories
- Correct application of the process according to need

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose the welding machines.	- Correct choice of machines according to the application
B. Select the filler metals.	- Correct choice of filler metal according to: - the base metal - the chemical and mechanical properties of the metals
C. Select the shielding gases.	- Correct choice of gases according to: - the base metal - the desired characteristics
D. Select the welding accessories.	- Appropriate choice of accessories according to the application
E. Set up the welding machines.	- Logical order of steps - Correct positioning of accessories
F. Set parameters and adjust the welding machines.	- Appropriate setting of parameters according to the work to be done
G. Make a weld bead.	- Appropriate application of welding techniques - Observance of the control factors
H. Store the equipment.	- In the appropriate places
I. Clean up the work area.	- Cleanliness of the 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 chose the welding machines (A):

1. Distinguish the characteristics and functions of the FCAW process (with and without shielding gas) and the MCAW process.
2. Know the concepts of electricity that are useful in applying the FCAW process.
3. Distinguish the characteristics and functions of the different welding machines (FCAW).

Before learning how to select the filler metals (B):

4. Explain the classification of filler metals in the FCAW process.

Before learning how to select the shielding gases (C):

5. Distinguish the shielding gases according to their characteristics.
6. Apply a transfer method.

Before learning how to select the welding accessories (D):

7. Identify the accessories for welding machines (FCAW).

Before learning how to carry out making a weld bead (E):

8. Explain the control factors related to doing the weld using the FCAW process.
9. Observe the behaviour of the arc and the weld pool when welding is being done using the FCAW process.

MODULE 20: WELDING STEEL PARTS USING THE FCAW PROCESS

CODE: 801 908 **Duration: 120 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
weld steel parts using the FCAW process
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using a welding process
- Referring to the standards for welding 3GF butt joints
- On mild steel plates a minimum of 200 mm in length

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of the welding process
- Observance of the set time limit
- Correct application of the FCAW process

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the welding process	- Accuracy of the interpretation
B. Assemble mild steel plates in preparation for welding: • 1GF, 2GF and 3GF butt joints (19 mm x 300 mm) • lap joints (6.4 and 9.6 mm x 300 mm) • tee joints (6.4 and 9.6 mm x 300 mm) • large structural shapes on plates	- Correct choice and appropriate use of the equipment - Appropriate preparation of parts - Appropriate installation of plates according to the type of assembly - Correct dimensions, location, and sequence for tack welds

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
C. Weld butt joints in the flat (1GF), horizontal (2GF) and vertical (3GF) positions.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
D. Weld lap joints and tee joints in the horizontal and vertical positions and large structural shapes on vertically mounted plates.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
E. Weld tee joints 9.6 mm x 300 mm using the MCAW process in the horizontal position.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
F. Weld tee joints 9.6 mm x 300 mm using the self-shielded FCAW process in the horizontal position.	- Appropriate parameter settings - Appropriate application of welding techniques - Good quality of welding
G. Visually evaluate the quality of the welds.	- Accurate detection of defects in the assembly - Correct evaluation of the quality of the welds
H. Analyze the qualities of the 3GF butt joint weld using a bend test.	- Observance of preparation and evaluation standards
I. Store the equipment.	- In the appropriate places
J. Clean up the work area.	- Cleanliness of the 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 assemble mild steel plates in preparation for welding:
- **1GF, 2GF and 3GF butt joints (19 mm x 300 mm)**
- **lap joints (6.4 and 9.6 mm x 300 mm)**
- **tee joints (6.4 and 9.6 mm x 300 mm)**
- **large structural shapes on plates (B):**

1. Take the safety measures required for FCAW welding operations.
2. Explain the sequence of tack welds to be applied.
3. Tack weld butt, lap and corner joints, and large structural shapes on plates.

Before learning how to weld butt joints in the flat (1GF), horizontal (2GF) and vertical (3GF) positions (C):

4. Describe the qualities of a well-executed weld.
5. Describe the causes of welding defects and suggest appropriate corrective measures.

Before learning how to visually evaluate the quality of the welds (G):

6. Detect the defects in a weld.
7. Know the requirements and tolerances that apply in the evaluation of welds.

MODULE 21:APPLYING THE SAW, RW AND PAW PROCESSES

CODE: 801 912 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply the SAW, RW and PAW processes
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using cases representative of the welding work done in the workplace
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Correct application of the processes according to need
- Observance of the standards for the classification of filler metals, gases, fluxes and electrodes

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose the process.	- Correct choice of the process according to needs
B. Choose the welding machines.	- Correct choice of machines according to the application
C. Select the filler metals and fluxes for the SAW process.	- Correct choice of filler metal and flux according to: - the base metal - the chemical and mechanical properties of the metals
D. Adjust the RSW, SAW and PAW welding machine in accordance with the established parameters.	- Setting corresponding to the correct parameters
E. Select the gases, filler metals and electrodes for the PAW process.	- Correct choice of gases, filler metals and electrodes according to: - the base metal - the desired characteristics
F. Choose the welding accessories.	- Appropriate choice of accessories according to the application
G. Store the equipment.	- In the appropriate places
H. Clean up the work area.	- Cleanliness of the 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 chose the process (A):

1. Distinguish the characteristics and functions of the SAW, RW and PAW processes.
2. Know the concepts of electricity that are useful in applying the SAW, RW and PAW processes.

Before learning how to chose the welding machines (B):

3. Distinguish the characteristics and functions of the different welding machines (SAW, RW and PAW).
4. Observe the behaviour of the arc and the weld pool when welding is being done using the SAW, RSW and PAW processes.

Before learning how to select the filler metals and fluxes for the SAW process (C):

5. Explain the classifications of metals, wires and wire-flux combinations for the SAW process.

Before learning how to select the gases, the filler metals and the electrodes for the PAW process (E):

6. Explain the classifications of gases, the filler metals and the electrodes for the PAW process.

Before learning how to select the welding accessories (F):

7. Identify the accessories for SAW, RSW and PAW welding machines.

MODULE 22: INTERPRETATION OF DRAWINGS AND SPECIFICATIONS FOR COMPLEX ASSEMBLIES

CODE: 801 927 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
interpret drawings and specifications for complex assemblies
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using industrial assembly drawings (excluding drawings of metal building structures)
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Accuracy of the interpretation of an industrial drawing
- Appropriate use of terminology
- Accuracy and thoroughness of reading

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the symbols and the welding process.	- Correct interpretation of the symbols and the welding process
B. Verify the information.	- Accurate verification of the information - Verification of consistency of drawing with the specifications
C. Draw up the list of materials.	- Comprehensive list of materials - Accurate calculation of the mass and cost of basic materials
D. Determine the order of assembly.	- Proper determination of the order according to the assembly to be produced

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 symbols and the welding process (A):

1. Distinguish the characteristics of the drawings and specifications used in the manufacture and transformation of metal parts.
2. Read the information in drawings and specifications for complex assemblies.

Before learning how to draw up the list of materials (C):

3. Observe the conventions regarding the description of materials.
4. Calculate the dimensions and mass of the parts.
5. Number the pieces listed in the drawing.
6. Calculate the cost of the basic materials.

Before learning how to determine the order of assembly (D):

7. Distinguish the possible steps of assembly (for the entire assembly and the sub-assemblies).
8. Identify the advantages and disadvantages of each possibility.

MODULE 23: ASSEMBLIES OF MEDIUM COMPLEXITY

CODE: 801 935 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
produce assemblies of medium complexity
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using drawings and specifications for complex assemblies
- Using welding processes
- Using GMAW and FCAW electric arc welding machines
- Assembling mild steel parts

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of welding processes
- Appropriate application of assembly and welding techniques
- Compliance of the components with the drawings, the specifications and the requirements according to the assembly

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be done.	- Correct interpretation of messages of a technical nature - Correct interpretation of the quality standards to be observed - Accurate perception of the operations to be carried out as part of the work team

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Interpret the plans, specifications and processes.	- Accuracy of the interpretation - Appropriate representation of each component of the assembly
C. Prepare the parts.	- Observance of requirements
D. Assemble and tack weld the parts.	- Observance of the proper order of assembly - Assembly and tack welding according to the requirements - Appropriate use of jigs
E. Do the welds required.	- Proper establishment of parameters - Quality of the welds according to: - the requirements - control of expansion and contraction
F. Carry out the finishing work on the assembly.	- Correct choice and application of cleaning and finishing techniques - Quality of the finishing work
G. Evaluate the quality of the assembly.	- Correct use of tools and proper application of verification techniques - Accurate detection of defects in the assembly with respect to: - quality standards - the constraints of the assembly - Validity of the corrective measures suggested
H. Store the equipment.	- In the appropriate places
I. Clean up the work area.	- Cleanliness of the 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 become familiar with work to be done (A):

1. Describe the characteristics of the work teams in producing assemblies.

Before learning how to interpret plans, specifications and processes (B):

2. Relate the information to the components of the assembly to be produced.

Before learning how to prepare the parts (C):

3. Explain the use of jigs.

Before learning how to assemble and tack weld the parts (E):

4. Apply the tack welding technique using the FCAW process.

Before learning how to carry out the finishing work on the assembly (F):

5. Distinguish the characteristics and functions of the different cleaning and finishing techniques.
6. Use the cleaning and finishing equipment.

Before learning how to evaluate the quality of the assembly (G):

7. Distinguish the characteristics and functions of the tools and instruments used to assess the quality of assemblies.
8. Recognize defects in the assemblies.
9. Apply techniques for verifying the assemblies.
10. Identify the corrective measures to be applied according to the defects in the assembly.

MODULE 24: COMMUNICATION IN THE WORKPLACE

CODE: 801 941 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

To demonstrate the required competency, the students must
communicate in the workplace
in accordance with the following conditions, criteria and specifications.

SPECIFICATIONS

By the end of this module, the student will:

- Know different aspects of communication and teamwork in the workplace.
- Apply communication techniques in the workplace.
- Become aware of their capacity to communicate and work as part of a team.

LEARNING CONTEXT

PHASE 1: **Awareness of the different aspects of communication and teamwork in the workplace**

- Becoming aware of the importance of communication in workplace.
- Recognizing the forms of communication and the characteristics of teamwork related to carrying out welding and fitting tasks.
- Becoming aware of the characteristics of the process of personal communication.
- Becoming aware of the various obstacles to effective communication.
- Identifying the characteristics of effective teamwork.
- Discussing the main problems that hinder teamwork.
- Participating in a group discussion on the observations made during the above activities.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PHASE 2: **Application of communication techniques in the workplace**

- Participating in activities that permit the practice of different techniques of communication: decoding of verbal and non-verbal messages, active listening, reformulation, reflection and expression techniques.
- Participating in activities that bring out the essential elements of a message of a technical nature.
- Participating in activities leading to the making of decisions and the establishment of consensus in a group.
- Making written observations throughout all these activities.

PHASE 3: **Evaluation of their capacity to communicate in a work group**

- Preparing a report on their weak points and strong points in the area of communication and the new abilities acquired during this module.
- Comparing the behaviours, skills, and attitudes required for teamwork with their own current behaviours, skills, and attitudes.
- Presenting the results of their assessment, indicating the measures to be taken to improve their capacity to communicate and to work in a team.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Emphasize situations or case studies that are representative of the workplace.
- Create a climate of trust and openness.
- Encourage the exchange of points of view by using appropriate techniques to lead the discussion.
- Ensure that all students have opportunities to express themselves and participate.
- Ensure that respect for others is maintained during exchanges of points of view.
- Assist students with their self-evaluation by providing them with questionnaire and analysis charts.

PARTICIPATION CRITERIA

PHASE 1:

- Doing a thorough analysis of the reference material.
- Participating actively in the different activities proposed by showing an interest in the subjects being discussed.

PHASE 2:

- Participating actively in each group activity.
- Making a conscientious effort to play their role in the learning situations.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PHASE 3:

- Producing a thorough report on the skills acquired in the course of the module, and their strengths and weaknesses.
- Accepting to share this report constructively with the other students
- Presenting the results of their analysis and the means to be taken to improve how they communicate and take part in a work team.

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, Awareness of the different aspects of communication and teamwork in the workplace:

1. Explain the general rules governing a proper group discussion.
2. Realize the importance of teamwork to carry out activities efficiently.
3. Understand the notions of quality of life and job satisfaction.

Before undertaking the activities of Phase 2, Application of communication techniques in the workplace:

4. Distinguish the roles and responsibilities of the various individuals in the workplace.
5. Understand the principles underlying techniques for reformulation and reflection.
6. Distinguish the general principles of group dynamics.

MODULE 25: COMPLEX ASSEMBLIES

CODE: 801 958 **Duration: 120 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
produce complex assemblies
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using drawings and specifications for complex assemblies
- Using appropriate welding machines and processes
- Assembling mild steel parts
- Without using reference material

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Appropriate application of assembly and welding techniques
- Compliance of the components with the drawings, the specifications and the requirements according to the assembly

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be done.	- Correct interpretation of oral and written instructions - Accurate identification of the characteristics of the assembly and the desired qualities
B. Interpret the plans and specifications.	- Accuracy of the interpretation

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
C. Prepare the parts.	- Appropriate choice and application of preparation techniques - Observance of dimensions in keeping with the tolerances - Accurate identification of the parts
D. Assemble and tack weld each component.	- Proper fabrication of a jig - Observance of the proper order of assembly - Assemble and tack weld according to the requirements
E. Do the welds required for each component.	- Appropriate choice and application of welding processes - Quality of welds according to: - the requirements - control of expansion and contraction
F. Carry out the final assembly of all the components.	- Observance of the proper order of assembly - Appropriate choice and application of welding processes - Conformity of the assembly with the desired characteristics and qualities
G. Carry out the finishing work on the assembly.	- Correct choice and application of cleaning and finishing techniques - Quality of the finishing work
H. Evaluate the quality of the assembly.	- Accurate detection of any defects in the assembly - Validity of the corrective measures suggested

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
I. Store the equipment.	- In the appropriate places
J. Clean up the work area.	- Cleanliness of the 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 interpret plans and specifications (B):

1. Discuss the advantages and disadvantages of different orders of assembly.

Before learning how to assemble and tack weld each component (D):

2. Use techniques for the fabrication of jigs.

Before learning how to carry out the finishing work on the assembly (G):

3. Distinguish the characteristics and functions of the different cleaning and finishing techniques.
4. Use the cleaning and finishing equipment.

MODULE 26: MODIFYING ASSEMBLIES

CODE: 801 963 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using drawings, assembly specifications and welding processes
- Assembling mild steel parts
- Using appropriate welding and cutting machines

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of welding processes
- Appropriate application of assembly and welding techniques
- Conformity of the assemblies with the drawings, the specifications and the modifications

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA

A. Become familiar with the modifications to be done.	- Correct interpretation of:
	  - the modifications required
	  - the production sequence to observe
	  - the methods and constraints related to making the modifications

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Interpret the plans, specifications and processes.	- Accuracy of the interpretation
C. Prepare the parts.	- Close inspection of the parts to be modified - Correct choice and appropriate application of preparation techniques - Accurate identification of parts
D. Disassemble the parts.	- Observance of the proper order of disassembly - Absence of broken parts
E. Make the modifications on each of the parts.	- Observance of the proper order of production - Appropriate application of methods for making the modifications - Replacement and transformation of the parts in accordance with the established dimensions and tolerances
F. Assemble and tack weld the parts.	- Observance of the proper order of assembly - Assemble and tack weld in accordance with the requirements
G. Do the welds required.	- Appropriate parameter settings - Quality of welds according to: - the requirements - control of expansion and contraction
H. Carry out the finishing work on the assembly.	- Correct choice and application of cleaning and finishing techniques - Quality of the finishing work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
I. Evaluate the quality and conformity of the modifications.	- Accurate detection of any defects in the assembly, considering the modification, if any - Validity of the corrective measures suggested
J. Store the equipment.	- In the appropriate places
K. Clean up the work area.	- Cleanliness of the 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 become familiar with the modifications to be done (A):

1. Distinguish the different types of modifications that can be made to assemblies.
2. Describe the characteristics of the different methods of making modifications and sequences of production.
3. Explain how to determine the feasibility of a modification.
4. Distinguish the different ways of transmitting instructions on the modification of assemblies.

Before learning how to interpret plans, specifications and processes (B):

5. Interpret the annotations related to the modifications.

Before learning how to prepare the parts (C):

6. Inspect the parts to be modified to verify the tolerances and the identifications.
7. Describe the different preparation techniques that are used in the modification of assemblies.

Before learning how to disassemble parts (D):

8. Explain the safety hazards associated with disassembling parts.
9. Interpret a disassembly process.
10. Explain the precautions to take so as not to damage the assembly.

Before learning how to make the modifications on each of the parts (E):

11. Apply different methods of making the modifications.

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 carry out the finishing work on the assembly (H):

12. Distinguish the characteristics and functions of the different cleaning and finishing techniques.
13. Use the cleaning and finishing equipment.

Before learning how to evaluate the quality and accuracy of the modifications (I):

14. Recognize any defects in the modified assembly that can be attributed to the preparation, assembly or welding.
15. Determine the corrective measures to be taken according to the defects.

MODULE 27: REPAIRING ASSEMBLIES

CODE: 801 974 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using drawings, assembly specifications and welding processes
- Using mild steel and aluminum assemblies
- Using appropriate welding machines, in particular a SMAW electric arc welding machine

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety standards
- Observance of welding processes
- Appropriate application of assembly and welding techniques
- Compliance of the assemblies with the drawings, the specifications and the required repairs

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA

A. Become familiar with the repairs to be made.	- Correct interpretation of:
	  - the repairs required
	  - the repair procedures
	  - the degree of difficulty of the work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Interpret the plans, specifications and processes.	- Accurate identification of the base metal - Close verification of the processes to be applied and the application procedures
C. Prepare the parts.	- Close inspection of the parts to be repaired - Proper cleaning of the parts
D. Make the repairs.	- Observance of the repair procedures - Appropriate application of techniques of: - cutting - bevelling - gouging - shaping
E. Assemble and tack weld the parts.	- Observance of the proper order of assembly - Assembly and tack welding in accordance with the requirements
F. Do the welds required.	- Appropriate parameter settings - Quality of the welds according to: - the requirements - control of expansion and contraction
G. Clean the parts.	- Correct choice and application of cleaning techniques

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
H. Evaluate the quality and conformity of the repairs.	- Accurate detection of any defects in the assembly with respect to the required repairs - Validity of the corrective measures suggested
I. Store the equipment.	- In the appropriate places
J. Clean up the work area.	- Cleanliness of the 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 become familiar with the repairs to be made (A):

1. Distinguish among the different types of repairs that can be made to assemblies.
2. Interpret the different repair procedures.
3. Explain the difficulties related to the repair of assemblies.
4. Distinguish the different ways of transmitting instructions on the repair of assemblies.

Before learning how to interpret plans, specifications and processes (B):

5. Interpret the annotations related to repairs.
6. Explain the different verifications to be done on the assembly when interpreting plans, specifications and procedures.

Before learning how to prepare the parts (C):

7. Inspect the parts to be repaired to check the tolerances and the identifications.
8. Describe the different preparation techniques that are used in the repair of assemblies.

Before learning how to make the required repairs (D):

9. Apply different repair techniques.

Before learning how to carry out the cleaning of the parts (G):

10. Distinguish the characteristics and functions of the different cleaning techniques.

Before learning how to evaluate the quality and conformity of the assembly (H):

11. Explain the different verifications to be made on a repaired assembly.
12. Recognize any defects in the repaired assembly.
13. Determine the corrective measures to take according to the defects.

MODULE 28: USING JOB-SEARCH TECHNIQUES

CODE: 801 981 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
use job-search techniques
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Based on actual or potential jobs in the field of welding and fitting
- Using learning contexts
- Using appropriate reference materials

GENERAL PERFORMANCE CRITERIA

- Observance of the presentation standards for written documents
- Realistic approach to the job search according to the requirements of the labour market
- Quality of the oral and written communication

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Write a résumé.	- Relevance of the information presented - Clarity and neatness of the text - Observance of grammar and spelling rules
B. Write a covering letter to an employer.	- Relevance of the text to the job being applied for - Observance of the presentation standards for a covering letter
C. Undergo a simulated job interview.	- Observance of the rules regarding personal appearance and suitable behaviour in an interview - Relevance of answers and contributions

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 write a résumé (A):

1. State the purpose of the résumé and its advantages.
2. Indicate the qualities of a well-prepared résumé.
3. Write a personal summary of one's experience.

Before learning how to prepare a covering letter for an employer (B):

4. Explain the standards for writing a covering letter.
5. Indicate the qualities of a well-prepared covering letter.

Before learning how to undergo a simulated job interview (C):

6. Understand the importance of preparing for an interview.
7. Do research on the establishments to which they are applying.
8. Analyze the selection criteria for the position being applied for.
9. Identify the rules of personal appearance and suitable behaviour to observe during an interview.

MODULE 29: ENTERING THE WORK FORCE

CODE: 801 996 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

To demonstrate the required competency, the students must
enter the work force
in accordance with the following conditions, criteria and specifications.

SPECIFICATIONS

By the end of this module, the student will:

- Be familiar with the realities of practising the trade.
- Integrate the knowledge, skills, attitudes and habits acquired in training.
- Become aware of the various changes in perception resulting from the practicum.

LEARNING CONTEXT

PHASE 1: **Preparing for a Practicum**

- Becoming aware of information and applications related to the practicum.
- Identifying establishments likely to accept student welders.
- Becoming aware of the physical organization of the establishment.

PHASE 2: **Participation in Activities in a Work Environment**

- Observing the work situation: types of products made and techniques used, internal structure and working conditions, occupational health and safety, interpersonal relations, etc.
- Joining the work team.
- Observing, participating in or performing various work-related tasks.
- Writing brief reports summarizing their observations on the work environment and the duties they performed at the establishment.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PHASE 3: **Comparing Pre- and Post-Practicum Views**

- Establishing relationships between their activities in the work environment and the knowledge they acquired during training.
- Discussing the accuracy of their views of the trade before and after the practicum: work environment, trade practices, etc.
- Discussing the effects of the experience on their choice of a future job: aptitudes, tastes, and interests.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide students with the means of making sound choices regarding where they do their practicums.
- Maintain close ties between the school and the establishment.
- Ensure that students are able to observe and perform work-related tasks.
- Ensure that student welders are under constant supervision by the establishments.
- Ensure that students receive guidance when necessary.
- Provide support when difficulties or problems arise.
- Encourage students to take part in discussions.

PARTICIPATION CRITERIA

PHASE 1:

- Make efforts to understand the practical organization of the practicum and responsibilities given to them.

PHASE 2:

- Respect the establishment's policies on work schedules and the activities they are authorized to perform as student welders.
- Apply occupational health and safety standards in effect in the establishment.
- Participate actively in performing work-related tasks.
- Seek information regularly on specific aspects of the methods and techniques applied, and the tools being used.
- Conscientiously write brief reports on their observations concerning work-related tasks.

PHASE 3:

- Discuss with other students their experience in the work environment.

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, Preparing for a Practicum:

1. List the steps in planning the search for a practicum opening.
2. Explain the importance of the practicum in the training and in searching for a job.
3. List the rules to follow during the practicum.

Before undertaking the activities of Phase 2, Participation in Activities in a Work Environment:

4. Describe the behaviour to be adopted in a work environment.
5. Describe the aspects to be noted in writing during a practicum.

Before undertaking the activities of Phase 3, Comparing Pre- and Post-Practicum Views:

6. List their aptitudes, tastes and interests that relate to the trade.
7. Describe the requirements of a work environment.

Éducation

Québec

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