



Curriculum Document				
Curriculum Code	Curriculum Title			
652201100	Toolmaker			
	Name	Email	Phone	Logo
Development Quality Partner	Toolmaking Association of South Africa /National Tooling Initiative Programme (TASA/NTIP)	plategan@ntipweb.co.za	012 663 9413	

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3. 652201100-PM-03, Construct and simulate a CAD 3D Model assembly, NQF Level 5, Credits 9	90
4. 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10	93
5. 652201100-PM-05, Operate a drill press, NQF Level 4, Credits 5	96
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8. 652201100-PM-08, Conduct basic turning chucking operations, NQF Level 3, Credits 10	111
9. 652201100-PM-09, Conduct advanced turning chucking operations, NQF Level 4, Credits 10	116
10. 652201100-PM-10, Conduct basic milling operations, NQF Level 3, Credits 10	121
11. 652201100-PM-11, Conduct advanced milling operations, NQF Level 4, Credits 10	126
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14. 652201100-PM-14, Conduct basic CNC milling operations, NQF Level 4, Credits 8	139
15. 652201100-PM-15, Conduct advanced CNC milling operations, NQF Level 5, Credits 27	144
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3. 652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10	192
4. 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10	194
5. 652201100-WM-05, Milling operations, NQF Level 4, Credits 15	196

6. 652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10	198
7. 652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35	200
8. 652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35	203
9. 652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35	206
10. 652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35	208
11. 652201100-WM-11, Quality assurance processes for verification of product conformance to specifications, NQF Level 5, Credits 13	210
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SECTION 1: CURRICULUM SUMMARY

1. Occupational Information

1.1 Associated Occupation

652201: Toolmaker

1.2 Occupation or Specialisation Addressed by this Curriculum

652201100: Toolmaker

1.3 Alternative Titles used by Industry

- None

2. Curriculum Information

2.1 Curriculum Structure

This qualification is made up of the following compulsory Knowledge and Practical Skill Modules:

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6
- 652201100-KM-04, Basic principles project management, NQF Level 4, Credits 6
- 652201100-KM-05, Project management, NQF Level 5, Credits 12
- 652201100-KM-06, Manufacturing economics, NQF Level 4, Credits 6
- 652201100-KM-07, Enterprise Resource Planning, NQF Level 4, Credits 6
- 652201100-KM-08, Basic Principles of plastics processing, NQF Level 4, Credits 6
- 652201100-KM-09, Plastics processing, NQF Level 5, Credits 14
- 652201100-KM-10, Basic principles of metal pressing, blanking and drawing processes, NQF Level 4, Credits 6
- 652201100-KM-11, Metal pressing, blanking and drawing processes, NQF Level 5, Credits 14
- 652201100-KM-12, Introduction to CAD, NQF Level 4, Credits 6
- 652201100-KM-13, CAD, NQF Level 5, Credits 14
- 652201100-KM-14, CNC Turning Theory, NQF Level 5, Credits 14
- 652201100-KM-15, CNC Milling Theory, NQF Level 5, Credits 14

Total number of credits for Knowledge Modules: 134

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5

- 652201100-PM-03, Construct and simulate a CAD 3D Model assembly, NQF Level 5, Credits 9
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-05, Operate a drill press, NQF Level 4, Credits 5
- 652201100-PM-06, Perform basic turning between Centres, NQF Level 3, Credits 12
- 652201100-PM-07, Perform advanced turning between Centres, NQF Level 4, Credits 15
- 652201100-PM-08, Conduct basic turning chucking operations, NQF Level 3, Credits 10
- 652201100-PM-09, Conduct advanced turning chucking operations, NQF Level 4, Credits 10
- 652201100-PM-10, Conduct basic milling operations, NQF Level 3, Credits 10
- 652201100-PM-11, Conduct advanced milling operations, NQF Level 4, Credits 10
- 652201100-PM-12, Conduct basic grinding operations, NQF Level 3, Credits 12
- 652201100-PM-13, Conduct advanced grinding operations, NQF Level 4, Credits 15
- 652201100-PM-14, Conduct basic CNC milling operations, NQF Level 4, Credits 8
- 652201100-PM-15, Conduct advanced CNC milling operations, NQF Level 5, Credits 27
- 652201100-PM-16, Conduct basic CNC turning operations, NQF Level 4, Credits 8
- 652201100-PM-17, Conduct advanced CNC turning operations, NQF Level 5, Credits 28
- 652201100-PM-18, Operate an EDM Plunge machine, NQF Level 5, Credits 15
- 652201100-PM-19, Operate an EDM wire erosion machine, NQF Level 5, Credits 15
- 652201100-PM-20, Manufacture a die, NQF Level 5, Credits 12
- 652201100-PM-21, Manufacture a Mould, NQF Level 5, Credits 9
- 652201100-PM-22, Plan for the tool/die/mould component and assembly manufacturing cycle, NQF Level 5, Credits 21
- 652201100-PM-23, Assess product manufacturing process and verify compliance, NQF Level 5, Credits 19

Total number of credits for Practical Skill Modules: 297

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-02, Drill press operations, NQF Level 4, Credits 10
- 652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10
- 652201100-WM-05, Milling operations, NQF Level 4, Credits 15
- 652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10
- 652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35
- 652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35

- 652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35
- 652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35
- 652201100-WM-11, Quality assurance processes for verification of product conformance to specifications, NQF Level 5, Credits 13
- 652201100-WM-12, Tool production processes to meet customer needs and specifications, NQF Level 5, Credits 20

Total number of credits for Work Experience Modules: 233

2.2 Entry Requirements

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

3. Assessment Quality Partner Information

Name of body: National Artisan Moderation Body (NAMB)

Address of body: Old Pretoria / Kempton Park Road Olifantsfontein 1665

Contact person name: Gerhard van Staden

Contact person work telephone number: 011 206 1015

4. Part Qualification Curriculum Structure

Part Qualifications

SAQA ID	Curriculum Code	Title	NQF Level	Credits
	652201100#01	Lathe Operator	3	104
	652201100#02	Milling Machine Operator	3	72
	652201100#03	Surface Grinding Operator	2	80
	652201100#04	CNC Milling Machinist	4	72
	652201100#05	CNC Turning Machinist	4	139
	652201100#06	EDM (electro discharge machining) Wire Operator	5	98
	652201100#07	EDM (electro discharge machining) Plunge Operator	5	98
	652201100#08	Manufacturing Workshop Assistant	2	58
	652201100#09	Tooling Machinist	5	457
	652201100#10	Tooling CAD Operator	4	67

Part Qualification 1:

Title:

Lathe Operator, NQF Level 3, Credits 104

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a Lathe Operator by implementing measurement, materials and safety (MMS) requirements and conducting conventional machining operations such as chucking, setting, operating, boring, facing, drilling, taper turning and threading.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5

Total number of credits for Knowledge Modules: 10

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-06, Perform basic turning between Centres, NQF Level 3, Credits 12
- 652201100-PM-07, Perform advanced turning between Centres, NQF Level 4, Credits 15
- 652201100-PM-08, Conduct basic turning chucking operations, NQF Level 3, Credits 10
- 652201100-PM-09, Conduct advanced turning chucking operations, NQF Level 4, Credits 10

Total number of credits for Practical Skill Modules: 69

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10

Total number of credits for Work Experience Modules: 25

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

- **Part Qualification Exit Level Outcome 1**

Conduct conventional machining operations including chucking, setting, operating, boring, facing, drilling, taper turning and threading.

Associated Assessment Criteria

- Benchwork and layout activities for conventional lathe machining operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Basic and advanced turning between Centres and turning chucking operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

Milling Machine Operator, NQF Level 3, Credits 72

Vertical

CNC Milling Machinist, NQF Level 4, Credits 148

Part Qualification 2:

Title:

Milling Machine Operator, NQF Level 3, Credits 72

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a Milling Machine Operator by implementing measurement, materials and safety (MMS) requirements and conducting conventional machining operations such as facing, boring, drilling, cutting, gear cutting, slotting.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5

Total number of credits for Knowledge Modules: 10

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-10, Conduct basic milling operations, NQF Level 3, Credits 10
- 652201100-PM-11, Conduct advanced milling operations, NQF Level 4, Credits 10

Total number of credits for Practical Skill Modules: 42

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5

- 652201100-WM-05, Milling operations, NQF Level 4, Credits 15

Total number of credits for Work Experience Modules: 20

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

- **Part Qualification Exit Level Outcome 2**

Conduct conventional machining operations such as facing, boring, drilling, cutting, slotting

Associated Assessment Criteria

- Benchwork and layout activities for milling operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Basic and advanced milling operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

Lathe Operator, NQF Level 3, Credits 104

Vertical

CNC Milling Machinist, NQF Level 4, Credits 148

Part Qualification 3:

Title:

Surface Grinding Operator, NQF Level 2, Credits 80

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a Surface Grinding Operator by implementing measurement, materials and safety (MMS) requirements and conducting slot grinding, chamfering, radii grinding and face grinding operations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6

Total number of credits for Knowledge Modules: 16

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12

- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-12, Conduct basic grinding operations, NQF Level 3, Credits 12
- 652201100-PM-13, Conduct advanced grinding operations, NQF Level 4, Credits 15

Total number of credits for Practical Skill Modules: 49

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10

Total number of credits for Work Experience Modules: 15

ENTRY REQUIREMENTS

- NQF Level 2 with Mathematics and Science

EXIT LEVEL OUTCOMES

• Part Qualification Exit Level Outcome 3

Conduct slot grinding, chamfering, radii grinding and face grinding operations.

Associated Assessment Criteria

- Benchwork and layout activities for surface grinding operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Basic and advanced grinding operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

Manufacturing Workshop Assistant, NQF Level 2, Credits 58

Vertical

Lathe Operator, NQF Level 3, Credits 104

Milling Machine Operator, NQF Level 3, Credits 72

Part Qualification 4:

Title:

CNC Milling Machinist, NQF Level 4, Credits 148

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a CNC Milling Machinist by implementing measurement, materials and safety (MMS) requirements and conducting milling programming, milling setting and CNC milling operations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6
- 652201100-KM-04, Basic principles project management, NQF Level 4, Credits 6
- 652201100-KM-15, CNC Milling Theory, NQF Level 5, Credits 14

Total number of credits for Knowledge Modules: 36

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-14, Conduct basic CNC milling operations, NQF Level 4, Credits 8
- 652201100-PM-15, Conduct advanced CNC milling operations, NQF Level 5, Credits 27

Total number of credits for Practical Skill Modules: 57

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-05, Milling operations, NQF Level 4, Credits 15
- 652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35

Total number of credits for Work Experience Modules: 55

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

• Part Qualification Exit Level Outcome 4

Conduct milling programming, milling setting and CNC milling operations.

Associated Assessment Criteria

- Benchwork and layout activities for CNC milling operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- CNC milling operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

CNC Turning Machinist, NQF Level 4, Credits 104

Vertical

EDM (electro discharge machining) Wire Operator, NQF Level 5, Credits 98

EDM (electro discharge machining) Plunge Operator, NQF Level 5, Credits 98

Part Qualification 5:

Title:

CNC Turning Machinist, NQF Level 4, Credits 139

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a CNC Turning Machinist by implementing measurement, materials and safety (MMS) requirements and conducting turning programming, turning setting and CNC turning operations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6
- 652201100-KM-04, Basic principles project management, NQF Level 4, Credits 6
- 652201100-KM-15, CNC Turning Theory, NQF Level 5, Credits 14

Total number of credits for Knowledge Modules: 36

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5
- 652201100-PM-16, Conduct basic CNC turning operations, NQF Level 4, Credits 8
- 652201100-PM-17, Conduct advanced CNC turning operations, NQF Level 5, Credits 28

Total number of credits for Practical Skill Modules: 53

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10
- 652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35

Total number of credits for Work Experience Modules: 50

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

- **Part Qualification Exit Level Outcome 5**

Conduct turning programming, turning setting and CNC turning operations.

Associated Assessment Criteria

- Benchwork and layout activities for CNC turning operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- CNC turning operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

CNC Milling Machinist, NQF Level 4, Credits 148

Tooling CAD Operator, NQF Level 4, Credits 67

Vertical

EDM (electro discharge machining) Wire Operator, NQF Level 5, Credits 98

EDM (electro discharge machining) Plunge Operator, NQF Level 5, Credits 98

Part Qualification 6:

Title:

EDM (electro discharge machining) Wire Operator, NQF Level 5, Credits 98

Purpose:

The purpose of this part qualification is to prepare a learner to operate as an EDM Wire Operator by implementing measurement, materials and safety (MMS) requirements and conducting EDM wire programming, EDM wire setting and EDM wire operations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6

Total number of credits for Knowledge Modules: 16

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5
- 652201100-PM-19, Operate an EDM wire erosion machine, NQF Level 5, Credits 15

Total number of credits for Practical Skill Modules: 32

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10
- 652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35

Total number of credits for Work Experience Modules: 50

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

- **Part Qualification Exit Level Outcome 6**

Conduct EDM wire programming, EDM setting and wire and spark operations to make a tooling component

Associated Assessment Criteria

- EDM wire erosion operations are planned and conducted in accordance with task specifications and measurement, materials and safety (MMS) requirements
- Features of the component produced meet specifications, task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

EDM (electro discharge machining) Plunge Operator, NQF Level 5, Credits 98

Toolmaker, NQF Level 5, Credits 664

Vertical

National N Diploma: Engineering Studies NQF Level 6, SAQA Qual ID 67043

Part Qualification 7:

Title:

EDM (electro discharge machining) Plunge Operator, NQF Level 5, Credits 98

Purpose:

The purpose of this part qualification is to prepare a learner to operate as an EDM Plunge Operator by implementing measurement, materials and safety (MMS) requirements and conducting EDM plunge programming, EDM plunge setting and EDM plunge operations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5

- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6

Total number of credits for Knowledge Modules: 16

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5
- 652201100-PM-18, Operate an EDM Plunge machine, NQF Level 5, Credits 15

Total number of credits for Practical Skill Modules: 32

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10
- 652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35

Total number of credits for Work Experience Modules: 50

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

• Part Qualification Exit Level Outcome 7

Operate an EDM (Spark erosion) plunge machine and set the spark and electrode parameters to perform the required operations

Associated Assessment Criteria

- EDM plunge operations are planned and conducted in accordance with task specifications and measurement, materials and safety (MMS) requirements
- Features of the component produced meet specifications, task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

EDM (electro discharge machining) Wire Operator, NQF Level 5, Credits 98

Toolmaker, NQF Level 5, Credits 664

Vertical

National N Diploma: Engineering Studies NQF Level 6, SAQA Qual ID 67043

Part Qualification 8:

Title:

Manufacturing Workshop Assistant, NQF Level 2, Credits 58

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a Manufacturing Workshop Assistant by implementing measurement, materials and safety (MMS) requirements and conducting conventional drilling machine operations, tapping, counter sinking and counter boring.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6

Total number of credits for Knowledge Modules: 16

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-05, Operate a drill press, NQF Level 4, Credits 5

Total number of credits for Practical Skill Modules: 27

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-02, Drill press operations, NQF Level 4, Credits 10

Total number of credits for Work Experience Modules: 15

ENTRY REQUIREMENTS

- NQF Level 2 with Mathematics and Science

EXIT LEVEL OUTCOMES

- **Part Qualification Exit Level Outcome 8**

Conduct drill press operations using the required jigs and fixtures to meet task, measurement, materials and safety (MMS) requirements.

Associated Assessment Criteria

- Benchwork and layout activities for drilling operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Drilling operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

Surface Grinding Operator, NQF Level 2, Credits 80

Vertical

Lathe Operator, NQF Level 3, Credits 104

Milling Machine Operator, NQF Level 3, Credits 72

Part Qualification 9:

Title:

Tooling Machinist, NQF Level 5, Credits 457

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a Tooling Machinist by implementing measurement, materials and safety (MMS) requirements and conducting conventional milling, turning, grinding, drilling, machining operations, EDM operations, CNC turning and CNC milling operations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6
- 652201100-KM-04, Basic principles project management, NQF Level 4, Credits 6
- 652201100-KM-14, CNC Turning Theory, NQF Level 5, Credits 14
- 652201100-KM-15, CNC Milling Theory, NQF Level 5, Credits 14

Total number of credits for Knowledge Modules: 50

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-05, Operate a drill press, NQF Level 4, Credits 5
- 652201100-PM-06, Perform basic turning between Centres, NQF Level 3, Credits 12
- 652201100-PM-07, Perform advanced turning between Centres, NQF Level 4, Credits 15
- 652201100-PM-08, Conduct basic turning chucking operations, NQF Level 3, Credits 10
- 652201100-PM-09, Conduct advanced turning chucking operations, NQF Level 4, Credits 10
- 652201100-PM-10, Conduct basic milling operations, NQF Level 3, Credits 10
- 652201100-PM-11, Conduct advanced milling operations, NQF Level 4, Credits 10

- 652201100-PM-12, Conduct basic grinding operations, NQF Level 3, Credits 12
- 652201100-PM-13, Conduct advanced grinding operations, NQF Level 4, Credits 15
- 652201100-PM-14, Conduct basic CNC milling operations, NQF Level 4, Credits 8
- 652201100-PM-15, Conduct advanced CNC milling operations, NQF Level 5, Credits 27
- 652201100-PM-16, Conduct basic CNC turning operations, NQF Level 4, Credits 8
- 652201100-PM-17, Conduct advanced CNC turning operations, NQF Level 5, Credits 28
- 652201100-PM-18, Operate an EDM Plunge machine, NQF Level 5, Credits 15
- 652201100-PM-19, Operate an EDM wire erosion machine, NQF Level 5, Credits 15

Total number of credits for Practical Skill Modules: 222

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-02, Drill press operations, NQF Level 4, Credits 10
- 652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10
- 652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10
- 652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35
- 652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35
- 652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35
- 652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35

Total number of credits for Work Experience Modules: 185

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

• Part Qualification Exit Level Outcome 1

Conduct conventional machining operations including chucking, setting, operating, boring, facing, drilling, taper turning and threading.

Associated Assessment Criteria

- Benchwork and layout activities for conventional lathe machining operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Basic and advanced turning between Centres and turning chucking operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

- **Part Qualification Exit Level Outcome 2**

Conduct conventional machining operations such as facing, boring, drilling, cutting, slotting.

Associated Assessment Criteria

- Benchwork and layout activities for milling operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Basic and advanced milling operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

- **Part Qualification Exit Level Outcome 3**

Conduct slot grinding, chamfering, radii grinding and face grinding operations.

Associated Assessment Criteria

- Benchwork and layout activities for surface grinding operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Basic and advanced grinding operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

- **Part Qualification Exit Level Outcome 4**

Conduct milling programming, milling setting and CNC milling operations.

Associated Assessment Criteria

- Benchwork and layout activities for CNC milling operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- CNC milling operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

- **Part Qualification Exit Level Outcome 5**

Conduct turning programming, turning setting and CNC turning operations.

Associated Assessment Criteria

- Benchwork and layout activities for CNC turning operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- CNC turning operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

- **Part Qualification Exit Level Outcome 6**

Conduct EDM wire programming, EDM setting and wire and spark operations to make a tooling component

Associated Assessment Criteria

- EDM wire erosion operations are planned and conducted in accordance with task specifications and measurement, materials and safety (MMS) requirements
- Features of the component produced meet specifications, task, measurement, materials and safety (MMS) requirements

• **Part Qualification Exit Level Outcome 7**

Operate an EDM (Spark erosion) plunge machine and set the required spark and electrode parameters to perform the required operations

Associated Assessment Criteria

- EDM plunge operations are planned and conducted in accordance with task specifications and measurement, materials and safety (MMS) requirements
- Features of the component produced meet specifications, task, measurement, materials and safety (MMS) requirements

• **Part Qualification Exit level Outcome 88**

Conduct drill press operations using the required jigs and fixtures to meet task, measurement, materials and safety (MMS) requirements.

Associated Assessment Criteria

- Benchwork and layout activities for drilling operations are planned and conducted in accordance with specifications and measurement, materials and safety (MMS) requirements
- Drilling operations are performed in accordance with task, measurement, materials and safety (MMS) requirements

ARTICULATION

Horizontal

EDM (electro discharge machining) Plunge Operator, NQF Level 5, Credits 98

EDM (electro discharge machining) Wire Operator, NQF Level 5, Credits 98

Toolmaker, NQF Level 5, Credits 664

Vertical

National N Diploma: Engineering Studies NQF Level 6, SAQA Qual ID 67043

Part Qualification 10:

Title:

Tooling CAD Operator, NQF Level 4, Credits 67

Purpose:

The purpose of this part qualification is to prepare a learner to operate as a CAD Operator to undertake modelling, production of drawings, assembly and simulations.

Applicable Modules (Rules of Combination)

Knowledge Modules:

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6
- 652201100-KM-12, Introduction to CAD, NQF Level 4, Credits 6
- 652201100-KM-13, CAD, NQF Level 5, Credits 14

Total number of credits for Knowledge Modules: 36

Practical Skill Modules:

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5
- 652201100-PM-03, Construct and simulate a CAD 3D Model assembly, NQF Level 5, Credits 9

Total number of credits for Practical Skill Modules: 26

This qualification also requires the following Work Experience Modules:

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5

Total number of credits for Work Experience Modules: 5

ENTRY REQUIREMENTS

- NQF Level 4 with Mathematics and Science

Or

- N3 Engineering Studies with Mathematics and Engineering Science

EXIT LEVEL OUTCOMES

Part Qualification Exit level Outcome 10

Use CAD to produce a model and drawings, assemble and simulate.

Associated Assessment Criteria

- Computer Aided Design Models are generated to specification using appropriate software and in accordance with supplied information including concept ideas/parts/sketches
- An assembly is created from existing parts, additional part is created and an assembly is constructed and simulated in accordance with task instructions and specifications

ARTICULATION

Horizontal

CNC Turning Machinist, NQF Level 4, Credits 139

CNC Milling Machinist, NQF Level 4, Credits 148

Vertical

EDM (electro discharge machining) Wire Operator, NQF Level 5, Credits 98

EDM (electro discharge machining) Plunge Operator, NQF Level 5, Credits 98

SECTION 2: OCCUPATIONAL PROFILE

1. Occupational Purpose

Manufactures, modifies and repairs tools, dies, jigs, fixtures, moulds and other precision parts and equipment to fine tolerances used in various production disciplines.

2. Occupational Tasks

- Assist, advise and plan for product development, tool/ die/mould design, production processes, equipment and material, including machining components and assembly (NQF Level 5)
- Assess process planning, process adjustment, quality control and inspection (NQF Level 5)
- Oversee, and execute tool/die/ mould parts production processes (NQF Level 5)
- Assemble, test, debug and quality assurance of the tool/ die/mould and related operational and maintenance processes (NQF Level 5)

3. Occupational Task Details

3.1. Assist, advise and plan for product development, tool/ die/mould design, production processes, equipment and material, including machining components and assembly (NQF Level 5)

Unique Product or Service:

Product development planning

Occupational Responsibilities:

- Implement measurement, materials and safety (MMS) requirements
- Plan for the tool/die/mould component and assembly manufacturing cycle
- Plan and conduct benchwork and layout activities
- Make a CAD 3D Model
- Construct and simulate a CAD 3D Model assembly

Occupational Contexts:

- Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures

3.2. Assess process planning, process adjustment, quality control and inspection (NQF Level 5)

Unique Product or Service:

Machining processes and procedures for quality certified component

Occupational Responsibilities:

- Assess product manufacturing process and verify compliance

Occupational Contexts:

- Quality assurance processes for verification of product conformance to specifications

3.3. Oversee, and execute tool/die/ mould parts production processes (NQF Level 5)

Unique Product or Service:

Complete tool/die/mould part production processes

Occupational Responsibilities:

- Operate a drill press
- Perform basic turning between Centres
- Perform advanced turning between Centres
- Conduct basic turning chucking operations
- Conduct advanced turning chucking operations
- Conduct basic milling operations
- Conduct advanced milling operations
- Conduct basic grinding operations
- Conduct advanced grinding operations
- Conduct basic CNC milling operations
- Conduct advanced CNC milling operations
- Conduct basic CNC turning operations
- Conduct advanced CNC turning operations
- Operate an EDM Plunge machine
- Operate an EDM wire erosion machine

Occupational Contexts:

- Drill press operations
- Procedures for turning between Centres
- Procedures for chucking operations
- Milling operations
- Procedures for surface grinding operations
- CNC milling operations
- Procedures for CNC turning operations
- EDM Plunge operations
- EDM wire operations

3.4. Assemble, test, debug and quality assurance of the tool/ die/mould and related operational and maintenance processes (NQF Level 5)**Unique Product or Service:**

Produce a certified tool and product to meet production and customer specifications for optimum production

Occupational Responsibilities:

- Manufacture a die
- Manufacture a Mould

Occupational Contexts:

- Tool production processes to meet customer needs and specifications

SECTION 3: CURRICULUM COMPONENT SPECIFICATIONS

SECTION 3A: KNOWLEDGE MODULE SPECIFICATIONS

List of Knowledge Modules for which Specifications are included

- 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5
- 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5
- 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6
- 652201100-KM-04, Basic principles project management, NQF Level 4, Credits 6
- 652201100-KM-05, Project management, NQF Level 5, Credits 12
- 652201100-KM-06, Manufacturing economics, NQF Level 4, Credits 6
- 652201100-KM-07, Enterprise Resource Planning, NQF Level 4, Credits 6
- 652201100-KM-08, Basic Principles of plastics processing, NQF Level 4, Credits 6
- 652201100-KM-09, Plastics processing, NQF Level 5, Credits 14
- 652201100-KM-10, Basic principles of metal pressing, blanking and drawing processes, NQF Level 4, Credits 6
- 652201100-KM-11, Metal pressing, blanking and drawing processes, NQF Level 5, Credits 14
- 652201100-KM-12, Introduction to CAD, NQF Level 4, Credits 6
- 652201100-KM-13, CAD, NQF Level 5, Credits 14
- 652201100-KM-14, CNC Turning Theory, NQF Level 5, Credits 14
- 652201100-KM-15, CNC Milling Theory, NQF Level 5, Credits 14

1. 652201100-KM-01, Introduction to measurement, machining and safety, NQF Level 2, Credits 5

1.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the theory and principles of measurement, the features of different types of materials worked with, theories of machining, maintenance and safe use of machines during manufacturing. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 6.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-01-KT01: Measurement (20%)
- KM-01-KT02: Materials (20%)
- KM-01-KT03: Safety (20%)
- KM-01-KT04: Introduction to machining and machine tools (20%)
- KM-01-KT05: Machine and equipment maintenance (20%)

1.2 Guidelines for Topics

1.2.1. KM-01-KT01: Measurement (20%)

Topic elements to be covered include:

- KT0101 Introduction to mathematics and its use in industry
- KT0102 Measuring instruments
- KT0103 Semi precision and precision measurement
- KT0104 General care of measuring instruments

Internal Assessment Criteria and Weight

- IAC0101 Define maths symbols, definitions, multiplication, division and general specifications
- IAC0102 Solve addition, subtraction, multiplication and division mathematics problems using whole numbers and with the aid of using a pocket calculator
- IAC0103 Discuss the importance of the correct measuring instruments selection for the application
- IAC0104 Interpret and explain measurement readings
- IAC0105 Perform various calculations to reflect an understanding of the use of mathematics in the tooling industry
- IAC0106 Identify and discuss various types of measuring instruments and their functions
- IAC0107 Discuss the concept of precision measurements and its impact on toolmaking
- IAC0108 Explain the importance of general care of tools and measuring instruments and possible consequences of not cleaning and caring for it

(Weight 20%)

1.2.2. KM-01-KT02: Materials (20%)

Topic elements to be covered include:

- KT0201 Types, classification and properties of materials
- KT0202 Types and classification of metals
- KT0203 Manufacturing processes for metals
- KT0204 Heat treatment terminology and processes

Internal Assessment Criteria and Weight

- IAC0201 Identify and define types of materials in manufacturing, their different uses, classifications and properties
- IAC0202 Provide the reasons for why metal is one of the most important engineering material
- IAC0203 Classify metals and identify their properties
- IAC0204 Explain how metals are used in different manufacturing processes
- IAC0205 Explain the concept of heat treatment and reasons for use
- IAC0206 Explain the concept of hardness testing and identify different testing methods

(Weight 20%)

1.2.3. KM-01-KT03: Safety (20%)

Topic elements to be covered include:

- KT0301 General safety
- KT0302 Safety in the workplace
- KT0303 Lockout
- KT0304 Material safety data sheet
- KT0305 Fires

Internal Assessment Criteria and Weight

- IAC0301 Explain different causes of injuries in the workplace and how to handle these situations
- IAC0302 Explain what are blood borne pathogens, their causes and prevention
- IAC0303 Identify possible safety hazards in the workplace
- IAC0304 Identify and explain the safety signs in the workplace
- IAC0305 Explain the important components of a workplace safety procedure
- IAC0306 Explain the concept of lock-out and its importance for a safe workplace
- IAC0307 Explain what is a material safety data sheet and its importance in the workplace
- IAC0308 Explain the type of fires that can occur in the workplace, possible causes and ways of dealing with them

(Weight 20%)

1.2.4. KM-01-KT04: Introduction to machining and machine tools (20%)

Topic elements to be covered include:

- KT0401 Machining
- KT0402 Terminology in machining
- KT0403 Machine tools
- KT0404 The role of computer assistance during development, design and manufacturing

Internal Assessment Criteria and Weight

- IAC0401 Discuss the main purpose of machining and the importance of the machining process in the manufacturing environment with reference to cost and volumes
- IAC0402 Discuss the advantages of machining
- IAC0403 Define and explain the concepts of Cutting, Abrasive processes and Non-traditional machining processes
- IAC0404 Discuss the different types of machine tools and their uses
- IAC0405 Discuss the importance of computer aided development, design and manufacturing within the tooling industry

(Weight 20%)

1.2.5. KM-01-KT05: Machine and equipment maintenance (20%)

Topic elements to be covered include:

- KT0501 Maintenance on equipment and machines
- KT0502 Preventive and corrective maintenance
- KT0503 Causes of malfunctions
- KT0504 Cutting fluids

Internal Assessment Criteria and Weight

- IAC0501 Describe the processes and reasons for maintenance
- IAC0502 Identify the components of a maintenance strategy
- IAC0503 Discuss the reasons for malfunctions on machines, how to identify it and provide solutions or preventive measures for possible malfunctions
- IAC0504 Identify and explain the different cutting fluids, their properties and reasons for their use
- IAC0505 Discuss the relationship between safety hazard and cutting fluids

(Weight 20%)

1.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

1.4 Exemptions

- None

2. 652201100-KM-02, Principles and concepts of drawings, NQF Level 2, Credits 5

2.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the theory and principles of reading and interpreting drawings. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 6.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-02-KT01: Views (35%)
- KM-02-KT02: Sheet sizes and implementation of scales (10%)
- KM-02-KT03: Line types, letters and symbols (25%)
- KM-02-KT04: Dimensions and tolerances (30%)

2.2 Guidelines for Topics

2.2.1. KM-02-KT01: Views (35%)

Topic elements to be covered include:

- KT0101 Types of views
- KT0102 First angle projection
- KT0103 Third angle projection
- KT0104 Section views
- KT0105 Isometric view
- KT0106 Interpretation of views

Internal Assessment Criteria and Weight

- IAC0101 Describe, read and interpret various types of views for various applications
- IAC0102 Explain first angle projection in terms of the specific views and their impact of an interpretation of a drawing
- IAC0103 Explain third angle projection in terms of the specific views and their impact of an interpretation of a drawing
- IAC0104 Explain views with sectional cuts in terms of the specific views and their impact of an interpretation of a drawing
- IAC0105 Describe an isometric view in terms of the specific views and their impact of an interpretation of a drawing
- IAC0106 Draw a freehand sketch from a component to reflect interpretation of a specific view of a component

(Weight 35%)

2.2.2. KM-02-KT02: Sheet sizes and implementation of scales (10%)

Topic elements to be covered include:

- KT0201 ISO sheet sizes
- KT0202 Drawing scales

Internal Assessment Criteria and Weight

- IAC0201 Explain different ISO sheet sizes and their uses
- IAC0202 Explain drawing scales and its uses in manufacturing

(Weight 10%)

2.2.3. KM-02-KT03: Line types, letters and symbols (25%)

Topic elements to be covered include:

- KT0301 Line types
- KT0302 Line thicknesses
- KT0303 Symbols

Internal Assessment Criteria and Weight

- IAC0301 Read and interpret lines, letters and symbols
- IAC0302 Explain application and uses of different line thicknesses
- IAC0303 Explain application and uses of different line types
- IAC0304 Explain various symbols including surface finish symbols, heat treatment symbols, welding symbols and tolerance symbols

(Weight 25%)

2.2.4. KM-02-KT04: Dimensions and tolerances (30%)

Topic elements to be covered include:

- KT0401 Dimensions
- KT0402 Tolerance limits
- KT0403 Tolerance symbols

Internal Assessment Criteria and Weight

- IAC0401 Explain the concepts of dimensioning, tolerance and its applications
- IAC0402 Explain upper and lower tolerance limits and their impact on machining
- IAC0403 Explain the concept of nominal dimensions and its impact on machining activities
- IAC0404 Explain different tolerance symbols, fits and their applications

(Weight 30%)

2.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification

- Trainer/learner ratio 1:30

Legal Requirements:

- None

2.4 Exemptions

- None

3. 652201100-KM-03, Introduction to Project management, NQF Level 3, Credits 6

3.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of project uniqueness, their different phases, differences between functional and projects organisations, project definition and roles and responsibilities of different project stakeholders and project management benefits. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 10 days.

The learning will enable learners to demonstrate an understanding of:

- KM-03-KT01: The nature of projects and projects management (20%)
- KM-03-KT02: Project Lifecycles and Phases (20%)
- KM-03-KT03: Structuring the organization for project work (20%)
- KM-03-KT04: Initiating and defining the project (20%)
- KM-03-KT05: Identifying works, responsibility and roles (20%)

3.2 Guidelines for Topics

3.2.1. KM-03-KT01: The nature of projects and projects management (20%)

Topic elements to be covered include:

- KT0101 Types of projects
- KT0102 Characteristics of projects
- KT0103 Project management processes
- KT0104 Project management benefits

Internal Assessment Criteria and Weight

- IAC0101 Describe different types of projects and provide examples
- IAC0102 Describe terms such as project, deliverable, stakeholder, programme, portfolio, project management, due date, work package and activity
- IAC0103 Describe project characteristics and provide at least one illustration of the concept of a project hierarchy
- IAC0104 Identify and describe the five project management groups of processes
- IAC0105 Discuss the benefits and challenges of project management
- IAC0106 Discuss commitment, goals and estimates as concepts used within project management

(Weight 20%)

3.2.2. KM-03-KT02: Project Lifecycles and Phases (20%)

Topic elements to be covered include:

- KT0201 Planning project in phases
- KT0202 Project management methodologies
- KT0203 Estimating costs and durations

- KT0204 Concurrent Engineering

Internal Assessment Criteria and Weight

- IAC0201 Explain the aim and value of breaking up the project lifecycle into phases
- IAC0202 Explain how the project lifecycle differs from the product lifecycle by providing examples
- IAC0203 Describe how a phased project approach could be utilised to control a project and to reduce project risks
- IAC0204 Describe the terms: front-end loading, milestone, project phase, rolling wave planning, progressive elaboration, feasibility study, business case, fast tracking, baseline plan and defects liability period
- IAC0205 Discuss what are guidelines for project closeout and important items to be verified
- IAC0206 Discuss the critical aspects in project management methodologies
- IAC0207 Describe the different types of estimates and how they differ
- IAC0208 Explain the principles of concurrent engineering and the benefits of this approach

(Weight 20%)

3.2.3. KM-03-KT03: Structuring the organization for project work (20%)

Topic elements to be covered include:

- KT0301 Basic structures
- KT0302 The matrix structure
- KT0303 Project offices and project support offices

Internal Assessment Criteria and Weight

- IAC0301 Describe the differences among the functional, pure project and matrix structures and provide a graphical illustration of each
- IAC0302 Explain how projects are performed within a functional structure
- IAC0303 Indicate the advantages and disadvantages of the functional, pure project and matrix structures
- IAC0304 Indicate the different situations that would favour the use of the functional, pure project and matrix structures
- IAC0305 Describe the relative power of the project manager in each of the structures
- IAC0306 Describe the differences between a "strong" and a "weak" matrix structure
- IAC0307 Explain the term "project support office"

(Weight 20%)

3.2.4. KM-03-KT04: Initiating and defining the project (20%)

Topic elements to be covered include:

- KT0401 The project management plan

- KT0402 The scope statement
- KT0403 Developing a scope statement
- KT0404 Controlling changes to the scope
- KT0405 Configuration management

Internal Assessment Criteria and Weight

- IAC0401 Explain the reasons for project planning, components of a project management plan and necessity to involve stakeholders
- IAC0402 Demarcate the boundaries of a project by defining inclusions and exclusions
- IAC0403 Develop, document and present a scope statement for a project
- IAC0404 Discuss guidelines to minimise scope creep in a project
- IAC0405 Identify and explain the key elements of a change control system
- IAC0406 Explain concepts used in project management including project charter, stakeholder analysis, project scope statement, scope baseline, project management plan, master schedule, change control system and change control board

(Weight 20%)

3.2.5. KM-03-KT05: Identifying works, responsibility and roles (20%)

Topic elements to be covered include:

- KT0501 The work breakdown structure definition and purpose
- KT0502 Work breakdown structure design and representations
- KT0503 Work breakdown structures and estimating direct costs
- KT0504 Assigning responsibilities for work

Internal Assessment Criteria and Weight

- IAC0501 Describe the purposes and benefits of work breakdown structures (WBS)
- IAC0502 Explain how a WBS relates to subcontracting of work and reporting relationships
- IAC0503 Discuss the requirements for a traceability matrix

(Weight 20%)

3.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

3.4 Exemptions

- None

4. 652201100-KM-04, Basic principles project management, NQF Level 4, Credits 6

4.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the importance of managing time, perform schedules and network analysis, control a project, utilising work authorisation systems and manage project quality. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 10 days.

The learning will enable learners to demonstrate an understanding of:

- KM-04-KT01: Project Time Management (20%)
- KM-04-KT02: Advanced Scheduling and Network analysis (20%)
- KM-04-KT03: Project Control (20%)
- KM-04-KT04: Work Authorisation Systems (20%)
- KM-04-KT05: Project Quality Management (20%)

4.2 Guidelines for Topics

4.2.1. KM-04-KT01: Project Time Management (20%)

Topic elements to be covered include:

- KT0101 The importance of scheduling
- KT0102 Gantt charts
- KT0103 Network diagrams
- KT0104 The critical path and float
- KT0105 Project resources
- KT0106 The workload on resources
- KT0107 Multiple projects

Internal Assessment Criteria and Weight

- IAC0101 Explain why project scheduling is essential
- IAC0102 Differentiate between mandatory, discretionary and external dependencies
- IAC0103 Develop a network diagram for a project including time estimates
- IAC0104 Perform forward pass and backward pass calculations to determine (i) early and late start and finish dates, as well as (II) float and (III) free float of all activities as well as (iv) the critical path for projects that have to be completed within the shortest possible time
- IAC0105 Explain the importance of knowing what activities are critical
- IAC0106 Produce a Gantt chart
- IAC0107 Differentiate between milestones, events and activities
- IAC0108 Explain the reasons for and the principle of resource levelling
- IAC0109 Give guidelines for managing multiple, concurrent projects
- IAC0110 Explain the terms "lag" and "lead" and how lag differs from float
- IAC0111 Explain the basics of project portfolios and managing multiple projects

(Weight 20%)

4.2.2. KM-04-KT02: Advanced Scheduling and Network analysis (20%)

Topic elements to be covered include:

- KT0201 The PERT method
- KT0202 Trading off cost and time
- KT0203 Critical chain project scheduling
- KT0204 Reserves and reserves in schedules
- KT0205 Parkinson's law
- KT0206 Project buffers and reduced duration
- KT0207 Buffers
- KT0208 Critical chain and computer software

Internal Assessment Criteria and Weight

- IAC0201 Explain the basic principles of the PERT method
- IAC0202 Use the time-cost trade-off technique to develop alternative schedules for a simple project
- IAC0203 Use the critical chain method to schedule a project
- IAC0204 Explain why people responsible for project activities should not commit themselves to the duration of their activities
- IAC0205 Explain the purpose of feeding buffers
- IAC0206 Provide reasons for how feeding buffers provide stability and predictability during project execution
- IAC0207 Describe the differences between the critical chain and the critical path

(Weight 20%)

4.2.3. KM-04-KT03: Project Control (20%)

Topic elements to be covered include:

- KT0301 The control process
- KT0302 The Earned Value approach
- KT0303 Control-the critical chain way
- KT0304 Interpersonal aspects of control

Internal Assessment Criteria and Weight

- IAC0301 Describe the steps in the project control process
- IAC0302 Determine the appropriate frequency and method for project reporting within your work environment
- IAC0303 Distinguish between situations where contingency reserves should be used and situations where they should not be used

- IAC0304 Calculate the Schedule Variances, Time variances and Cost Variances of a project
- IAC0305 Calculate the SPI and CPI of a project
- IAC0306 Explain how buffer status is used to control project duration when the critical chain method is used

(Weight 20%)

4.2.4. KM-04-KT04: Work Authorisation Systems (20%)

Topic elements to be covered include:

- KT0401 Work Authorisation system
- KT0402 Designing a WA form and system
- KT0403 Pitfalls in the use of WA systems

Internal Assessment Criteria and Weight

- IAC0401 Explain the use and benefits of a Work Authorization (WA) system
- IAC0402 Explain how a WA system supplements other project management information systems
- IAC0403 Describe the requirements for a WA system
- IAC0404 Identify possible pitfalls of work authorization systems and give guidelines on how to prevent them
- IAC0405 Explain why contingency reserves should be built in only at project-level authorisations

(Weight 20%)

4.2.5. KM-04-KT05: Project Quality Management (20%)

Topic elements to be covered include:

- KT0501 Project quality concepts and principles
- KT0502 Common quality activities - basics
- KT0503 Planning for quality
- KT0504 Quality assurance
- KT0505 Quality control

Internal Assessment Criteria and Weight

- IAC0501 Define the different concepts used in project management including Quality, Quality Control, Quality Assurance, Quality Planning, Fitness for purpose, Inspection and test, Specifications
- IAC0502 Explain the role of quality in projects
- IAC0503 Discuss the approach to be followed when planning and setting up the quality system for a project

- IAC0504 Explain the value of quality on projects
- IAC0505 Provide elementary plans and schedules for the quality processes in a project
- IAC0506 Draft an (activity) quality plan and checklist
- IAC0507 Provide a list of typical quality tools and techniques that are commonly used on projects

(Weight 20%)

4.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

4.4 Exemptions

- None

5. 652201100-KM-05, Project management, NQF Level 5, Credits 12

5.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of project cost management, project management and ISO 9001, project human resources management, aspects of labour law for the project manager, project communication management, project risk management, project manager and the law of contracts, project procurement management. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 10 days.

The learning will enable learners to demonstrate an understanding of:

- KM-05-KT01: Project cost management (15%)
- KM-05-KT02: Project Management and ISO 9001 (10%)
- KM-05-KT03: Project Human Resources Management (15%)
- KM-05-KT04: Aspects of Labour Law for the project manager (10%)
- KM-05-KT05: Project communication management (10%)
- KM-05-KT06: Project risk management (10%)
- KM-05-KT07: Project Manager and the Law of Contracts (15%)
- KM-05-KT08: Project procurement management (15%)

5.2 Guidelines for Topics

5.2.1. KM-05-KT01: Project cost management (15%)

Topic elements to be covered include:

- KT0101 Definition of project cost management
- KT0102 Economic feasibility
- KT0103 Additional actors that influence project cost
- KT0104 Resource identification and planning
- KT0105 Estimating cost
- KT0106 Budgeting of estimated cost
- KT0107 The control of project cost
- KT0108 Retention money, guarantees and project close-out

Internal Assessment Criteria and Weight

- IAC0101 Define the concept of cost management on projects
- IAC0102 Analyse the typical cost management activities on a project
- IAC0103 Evaluate the factors affecting the economic feasibility of a project
- IAC0104 Discuss other significant activities and factors that influence costs during a project
- IAC0105 Broadly identify and plan the resources needed for a project
- IAC0106 Discuss the activities involved in the cost-estimating phase and produce a basic cost estimate on a straight-forward project

- IAC0107 Formulate a basic budget for cost allocation and control purposes and evaluate the outcomes of the cost control process
- IAC0108 Discuss the concepts of retention money guarantees and closed out

(Weight 15%)

5.2.2. KM-05-KT02: Project Management and ISO 9001 (10%)

Topic elements to be covered include:

- KT0201 Fundamental principles of ISO 9001
- KT0202 Benefits of using ISO 9001 in projects
- KT0203 Disadvantages of installing and maintaining a system like ISO 9001:2000
- KT0204 Management approach to setting up ISO 9001:2000 system
- KT0205 Terms and definitions of the standards

Internal Assessment Criteria and Weight

- IAC0201 Explain the approach to quality management that is followed by the ISO 9000 family of standards and discuss its benefits
- IAC0202 Explain the importance of identifying the processes that are needed for or applicable to that organization's quality management system relative to the products and or services it delivers to its customers
- IAC0203 Describe how to design a formal quality management system that will address the processes that influence quality in your organization
- IAC0204 Explain the correct approach to designing and drafting functional user friendly procedures that describe and specify the best practices that have an influence on quality
- IAC0205 Describe the basics of the process of quality auditing

(Weight 10%)

5.2.3. KM-05-KT03: Project Human Resources Management (15%)

Topic elements to be covered include:

- KT0301 Human resources management processes applied during the project life cycle
- KT0302 Project manager's role as key to project success
- KT0303 Teams, group dynamics and team performance
- KT0304 Building high performance teams
- KT0305 Motivation in projects
- KT0306 Dealing with stress in projects
- KT0307 Conflict management in a project environment
- KT0308 Negotiation in project environments
- KT0309 Leadership, power and politics in projects
- KT0310 Managing change in projects

Internal Assessment Criteria and Weight

- IAC0301 Identify the people (stakeholders) in the project environment, their roles and responsibilities
- IAC0302 Describe the importance of human resource management during the project lifecycle
- IAC0303 Explain the process of obtaining "the right people, for the right project at the right time and keeping them right" during the project lifecycle
- IAC0304 Explain the project team development phases and group dynamics in each phase
- IAC0305 Discuss the roles, characteristics and competencies of a successful project manager and leader
- IAC0306 Discuss the barriers to team effectiveness and evaluate methods of and criteria to improving the project team's performance
- IAC0307 Describe the techniques that could be used to motivate people in the project environment
- IAC0308 Discuss the impact of stress and conflict on project performance
- IAC0309 Describe the different conflict resolution techniques and when to use each
- IAC0310 Explain how you would negotiate successfully in the project environment and the importance of power and politics in such an environment
- IAC0311 Describe leadership styles applied during the project lifecycle
- IAC0312 Discuss applying the principles of change management in the project environment

(Weight 15%)

5.2.4. KM-05-KT04: Aspects of Labour Law for the project manager (10%)

Topic elements to be covered include:

- KT0401 Contract of employment
- KT0402 Appointment of employees
- KT0403 Drafting of contract of employment
- KT0404 Promotion of fair labour relations

Internal Assessment Criteria and Weight

- IAC0401 Describe the role and function of labour law
- IAC0402 Discuss what is a contract of employment and the critical clauses usually contained in a contract of employment
- IAC0403 Describe the minimum and maximum terms and conditions prescribed in terms of the Basic Conditions of Employment Act
- IAC0404 Discuss the critical aspects of the Basic Conditions of Employment Act
- IAC0405 Discuss unfair discrimination and affirmative action as provided for in the Employment Equity Act

- IAC0406 Describe the notions of unfair dismissal on grounds of misconduct, incapacity, incompetence and operational requirements in terms of the Labour Relations Act
- IAC0407 Describe the dispute resolution mechanism and procedures for a labour dispute

(Weight 10%)

5.2.5. KM-05-KT05: Project communication management (10%)

Topic elements to be covered include:

- KT0501 Definition of project management communication
- KT0502 Planning project communication
- KT0503 Information distribution
- KT0504 Performance reporting
- KT0505 Project closure - final reporting

Internal Assessment Criteria and Weight

- IAC0501 Discuss the importance of effective project communication and the critical components of a basic communication model
- IAC0502 Discuss various communication constraints and ways to address them
- IAC0503 Discuss the requirements for effective communication and the communication management plan
- IAC0504 Discuss performance reporting and the tools used for performance reporting
- IAC0505 Discuss the importance and procedures for project closure reporting

(Weight 10%)

5.2.6. KM-05-KT06: Project risk management (10%)

Topic elements to be covered include:

- KT0601 Defining risk and risk management
- KT0602 Risk management standards and approaches
- KT0603 Probability and uncertainty
- KT0604 Project risk management process

Internal Assessment Criteria and Weight

- IAC0601 Discuss the steps of a general project risk management process and explain the meaning of each step
- IAC0602 Analyse and discuss various techniques to identify risks for projects
- IAC0603 Quantify project risks in terms of probability and consequence, and determine the risk value of each risk event
- IAC0604 Analyse and prioritise risk events, select critical risks and develop effective responses to the critical risks
- IAC0605 Discuss how risks should be controlled during project execution

(Weight 10%)

5.2.7. KM-05-KT07: Project Manager and the Law of Contracts (15%)

Topic elements to be covered include:

- KT0701 Contract definition and legal obligation
- KT0702 The Consumer Protection Act
- KT0703 Conclusion of contracts
- KT0704 Contractual capacity
- KT0705 Legality
- KT0706 Physical possibility
- KT0707 Formalities
- KT0708 Good faith and constitutionality
- KT0709 Contents of contracts
- KT0710 Breach of contracts
- KT0711 Termination of contracts

Internal Assessment Criteria and Weight

- IAC0701 Analyse the term contract and discuss the requirements for any valid contract
- IAC0702 Explain the effect of the Consumer Protection Act 68 of 2008 on the supply of goods and services
- IAC0703 Explain the nature and function of a RFP, MOU, LOI, an order, a quote and an invoice
- IAC0704 Distinguish between options and preferential rights
- IAC0705 Analyse and explain the influence of error, misrepresentation, undue influence and duress on a contract
- IAC0706 Discuss the concept of 'unconscionable conduct' (Consumer Protection Act)
- IAC0707 Describe the parties to a contract, powers of attorney and when the capacity to conclude a contract is lacking
- IAC0708 Explain the effect of illegality on a contract, especially related to the Consumer Protection Act
- IAC0709 Describe the formalities prescribed by law for certain contracts and explain the effect of non-compliance on the validity of the contract, and Contractual amendment / Change Variation Order
- IAC0710 Distinguish between essentialia, naturalia and incidentalialia in a contract
- IAC0711 Discuss how ownership of property is transferred and how risk is passed from seller to buyer in the event of a purchase-and-sale contract
- IAC0712 Distinguish between conditions and terms (or time periods)

- IAC0713 Discuss different forms of breach of contract and the remedies in law available to parties prejudiced by breach of contract
- IAC0714 Describe the requirements that have to be met before a contract may be cancelled
- IAC0715 Explain any other remedies that might be added to the contract by agreement, as well as the effect of these remedies on the contractual relationship
- IAC0716 Discuss the scope of the Conventional Penalties Act regarding penalty clauses
- IAC0717 Describe the ways in which contracts may terminate

(Weight 15%)

5.2.8. KM-05-KT08: Project procurement management (15%)

Topic elements to be covered include:

- KT0801 Procurement planning
- KT0802 Procurement methods
- KT0803 Contract types and payment arrangements
- KT0804 Contractual risk transfer and risk management
- KT0805 Standard contracts
- KT0806 Solicitation planning
- KT0807 Solicitation
- KT0808 Source selection
- KT0809 Contract management and contract close-out

Internal Assessment Criteria and Weight

- IAC0801 Discuss different contract types with related procurement methods Identify and discuss contractual risk and formulate a risk transfer and a risk enforcement mechanism
- IAC0802 Construct a source selection value model, with appropriate qualification, critical and differentiation evaluation factors
- IAC0803 Analyse procurement procedures that are fair, equitable and transparent, and will result in a cost-effective and competitive contract

(Weight 15%)

5.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator

- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

5.4 Exemptions

- None

6. 652201100-KM-06, Manufacturing economics, NQF Level 4, Credits 6

6.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of defining economics and the causes behind economic problems, different types of economics, microeconomics, macroeconomics, functional cost analysis and cost benefit analysis, production. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 10 days.

The learning will enable learners to demonstrate an understanding of:

- KM-06-KT01: Defining economics (5%)
- KM-06-KT02: Branches of economics: Nature of economic science (5%)
- KM-06-KT03: Microeconomics (20%)
- KM-06-KT04: Macroeconomics (20%)
- KM-06-KT05: Functional cost analysis and cost benefit analysis (20%)
- KM-06-KT06: Production and tool costing and estimation (30%)

6.2 Guidelines for Topics

6.2.1. KM-06-KT01: Defining economics (5%)

Topic elements to be covered include:

- KT0101 Economics description
- KT0102 Manufacturing on economic systems
- KT0103 Different definitions of economics
- KT0104 Economic Problems

Internal Assessment Criteria and Weight

- IAC0101 Define the concept of economics and discuss the difference between economics and manufacturing
- IAC0102 Discuss the effect of manufacturing under all types of economic systems
- IAC0103 Classify the groups of economics definitions, discuss the main economic problems faced by society and their main causes

(Weight 5%)

6.2.2. KM-06-KT02: Branches of economics: Nature of economic science (5%)

Topic elements to be covered include:

- KT0201 Branches of economics
- KT0202 Managerial economics
- KT0203 Managerial economics scope
- KT0204 Nature of managerial economics
- KT0205 Functional aspects of decision making

Internal Assessment Criteria and Weight

- IAC0201 Identify and discuss the various branches / types of economics
- IAC0202 Identify and discuss the important fields of study that falls under managerial economics
- IAC0203 Discuss the characteristics of managerial economics and the steps in the process of managerial decision making
- IAC0204 Discuss functional aspects of decision making

(Weight 5%)

6.2.3. KM-06-KT03: Microeconomics (20%)

Topic elements to be covered include:

- KT0301 Defining Microeconomics
- KT0302 Elasticity
- KT0303 The mathematical definition of elasticity
- KT0304 Elasticity variations
- KT0305 Micro-economics uses and limitations

Internal Assessment Criteria and Weight

- IAC0301 Define and discuss microeconomics and related fields of study
- IAC0302 Discuss the mathematical definition of elasticity
- IAC0303 Describe the factors affecting the elasticity of demand for a good
- IAC0304 Explain and provide the formula for: income elasticity of demand; price elasticity of demand; point-price elasticity ; arc elasticity ; cross price elasticity of demand; price elasticity of supply
- IAC0305 Interpret price elasticity coefficients
- IAC0306 Discuss the relationship between PED and total revenue for any good
- IAC0307 Tabularise the uses vs the disadvantages of microeconomics

(Weight 20%)

6.2.4. KM-06-KT04: Macroeconomics (20%)

Topic elements to be covered include:

- KT0401 Defining macroeconomics
- KT0402 Macroeconomics concepts
- KT0403 Output and income
- KT0404 Inflation
- KT0405 Deflation
- KT0406 Macroeconomic policies
- KT0407 Aggregate demand-aggregate supply (macroeconomic model)
- KT0408 Investment saving/Liquidity preference - Money supply (macroeconomic model)

- KT0409 Macroeconomics uses and disadvantages
- KT0410 Microeconomics vs macroeconomics

Internal Assessment Criteria and Weight

- IAC0401 Discuss the concept of macroeconomics
- IAC0402 Discuss ways of measuring unemployment, causes and types of unemployment
- IAC0403 Discuss the concepts of production possibility frontier and output gap concept (negative and positive)
- IAC0404 Discuss the concepts of inflation and deflation including how it is calculated, types, the main causes and the effects
- IAC0405 Discuss the uses and disadvantages of macroeconomic and what differentiates it from microeconomics

(Weight 20%)

6.2.5. KM-06-KT05: Functional cost analysis and cost benefit analysis (20%)

Topic elements to be covered include:

- KT0501 Functional cost analysis and cost benefit analysis applications
- KT0502 Budget types
- KT0503 Functional cost analysis
- KT0504 Cost analysis advantages and disadvantages

Internal Assessment Criteria and Weight

- IAC0501 Discuss the reason for the method behind functional cost analysis (FCA) and cost benefit analysis (CBA)
- IAC0502 Discuss different budget types
- IAC0503 Discuss reasons for conducting a cost analysis and an objective matrix
- IAC0504 Explain the importance of generating a report

(Weight 20%)

6.2.6. KM-06-KT06: Production and tool costing and estimation (30%)

Topic elements to be covered include:

- KT0601 Production theory
- KT0602 Production factors
- KT0603 Product: Total, Average and Marginal
- KT0604 Diminishing returns
- KT0605 Specifying the production function
- KT0606 Quality
- KT0607 Stock control
- KT0608 Factors to consider when determining tool costing and estimation

- KT0609 Calculations of tool costing and estimation

Internal Assessment Criteria and Weight

- IAC0601 Discuss different the production approaches and critical factors in production
- IAC0602 Discuss the terms fixed factor of production, total physical product; average physical product and marginal physical product and diminishing returns
- IAC0603 Discuss production function specification with reference to functional form and graphic form
- IAC0604 Discuss the difference between quality control and quality assurance
- IAC0605 Discuss stock control and provide available options
- IAC0606 Calculate basic costs for cutting a square hole and produce a cost calculation

(Weight 30%)

6.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

6.4 Exemptions

- None

7. 652201100-KM-07, Enterprise Resource Planning, NQF Level 4, Credits 6

7.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of enterprise Resource Planning as a system that integrates all data and processes used by an organization into one unified system. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 10 days.

The learning will enable learners to demonstrate an understanding of:

- KM-07-KT01: Enterprise resource planning (25%)
- KM-07-KT02: ERP implementation and strategy (25%)
- KM-07-KT03: Feasibility analysis (25%)
- KM-07-KT04: ERP in manufacturing and software (25%)

7.2 Guidelines for Topics

7.2.1. KM-07-KT01: Enterprise resource planning (25%)

Topic elements to be covered include:

- KT0101 Function of ERP
- KT0102 Characteristics of an ERP system
- KT0103 Available solutions
- KT0104 Audit objectives in an ERP environment
- KT0105 ERP system Architecture
- KT0106 Batch controlled and online systems
- KT0107 Distributed data processing
- KT0108 Integrated systems
- KT0109 Databases
- KT0110 Connectivity to plant floor information

Internal Assessment Criteria and Weight

- IAC0101 Discuss the function of an ERP system and identify the important trends shaping ERP's continuing evolution
- IAC0102 Discuss the characteristics of an ERP system and the difference between an ERP and a non-ERP system
- IAC0103 Analyse available ERP solutions and the possible causes of failure of a successful ERP implementation
- IAC0104 Discuss approaches to enhance the success of ERP implementation, controls over ERP systems and components of an ERP system architecture
- IAC0105 Describe the terms batch-controlled system, online systems and distributed data processing systems
- IAC0106 Define databases and the use of a database management system

- IAC0107 Describe the terms systems integrator and enterprise appliance transaction modules (EATM)

(Weight 25%)

7.2.2. KM-07-KT02: ERP implementation and strategy (25%)

Topic elements to be covered include:

- KT0201 ERP Implementation methodology
- KT0202 Basic steps of structured methodologies
- KT0203 Risk assessment
- KT0204 ERP life cycle
- KT0205 ERP implementation strategy

Internal Assessment Criteria and Weight

- IAC0201 Discuss the basic steps of structured methodologies
- IAC0202 Describe risk assessment in the ERP environment
- IAC0203 Discuss the risks and functions of a risk analysis in an ERP environment
- IAC0204 Discuss the two broad areas auditing in an ERP environment
- IAC0205 Discuss the functions of internal control
- IAC0206 Discuss the ERP life cycle model

(Weight 25%)

7.2.3. KM-07-KT03: Feasibility analysis (25%)

Topic elements to be covered include:

- KT0301 Feasibility analysis aim
- KT0302 Three main areas a feasibility study should examine
- KT0303 Feasibility analysis details
- KT0304 Feasibility factors
- KT0305 Performing a feasibility study

Internal Assessment Criteria and Weight

- IAC0301 Discuss the aims and objectives of a feasibility study and the main areas that should be examined by a feasibility study
- IAC0302 Discuss what should be included in a feasibility analysis and describe the various feasibility factors

(Weight 25%)

7.2.4. KM-07-KT04: ERP in manufacturing and software (25%)

Topic elements to be covered include:

- KT0401 Connection between ERP and manufacturing

- KT0402 Computer Aided Drawing/Computer Aided Manufacturing
- KT0403 Materials Requirement Planning (MRP)
- KT0404 Bill of materials
- KT0405 Closed loop Material Requirement Planning
- KT0406 Distribution Requirements Planning
- KT0407 Just In Time (JIT) and Kanban
- KT0408 Production data management
- KT0409 Made-to-order and make-to-stock
- KT0410 Software examples

Internal Assessment Criteria and Weight

- IAC0401 Discuss the business and IT priorities of both process and discrete manufacturing
- IAC0402 Analyse the major areas under consideration by the process industry when focusing on integrating business applications with the plant floor
- IAC0403 Explain the role played by CAD/CAM in the manufacturing environment
- IAC0404 Describe the major benefits advanced CD systems provide to designers
- IAC0405 Discuss the concepts of Materials requirement planning, bill of material, closed-loop MRP; distribution requirements planning; Just in time and Kanban
- IAC0406 Discuss the need and benefits for product data management
- IAC0407 Describe the value of data management, process management, work management, workflow management and work history management

(Weight 25%)

7.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

7.4 Exemptions

- None

8. 652201100-KM-08, Basic Principles of plastics processing, NQF Level 4, Credits 6

8.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the processing, development, and manufacturing of plastics products. A good understanding of the machinery and tools used to manufacture these plastic products will also be gained. The learning contact time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-08-KT01: The introduction to plastics technology (20%)
- KM-08-KT02: Preparation process of plastics (20%)
- KM-08-KT03: The Calendering process (20%)
- KM-08-KT04: Extrusion (20%)
- KM-08-KT05: Injection moulding (20%)

8.2 Guidelines for Topics

8.2.1. KM-08-KT01: The introduction to plastics technology (20%)

Topic elements to be covered include:

- KT0101 Classification of plastics
- KT0102 Temperature behaviour and the processing of plastics
- KT0103 Properties that affect processing in plastics

Internal Assessment Criteria and Weight

- IAC0101 Identify and explain the different types of plastics which fall under thermoplasts, thermosets and elastomers
- IAC0102 Explain and differentiate between physical state, molecular structure and processing of plastics
- IAC0103 Explain processing through mass, density filling factors and plastics flow behaviours

(Weight 20%)

8.2.2. KM-08-KT02: Preparation process of plastics (20%)

Topic elements to be covered include:

- KT0201 Size reduction
- KT0202 Mixing
- KT0203 Platification
- KT0204 Pelletising
- KT0205 Storage and transport

Internal Assessment Criteria and Weight

- IAC0201 Define the processing steps that are necessary to transform plastics raw material into workable plastics moulding material

- IAC0202 List the different types and shapes of PVC
- IAC0203 Define the process of reducing the size of solid items by mechanical means
- IAC0204 List the different machines to be used in size reduction
- IAC0205 List the different machines to be used in the mixing process
- IAC0206 Define the mixing processes as used to create all the different types of PVC's
- IAC0207 Make use of tables to differentiate between the mixing and kneading machines

(Weight 20%)

8.2.3. KM-08-KT03: The Calendering process (20%)

Topic elements to be covered include:

- KT0301 Plastic compounds for calendering
- KT0302 Construction of the calender
- KT0303 Construction of a calender train and processing method

Internal Assessment Criteria and Weight

- IAC0301 Identify all the different equipment needed in the calendering process
- IAC0302 Identify and explain the continuous type plasticising units that are used in the manufacturing of granulates and also to feed calenders
- IAC0303 Identify and explain all the different calender configurations
- IAC0304 Identify and explain all the different plastics compounds of the calendering process
- IAC0305 Define all the parts in schematics of a calender

(Weight 20%)

8.2.4. KM-08-KT04: Extrusion (20%)

Topic elements to be covered include:

- KT0401 Plastics material used in extrusion
- KT0402 The extruder
- KT0403 Processing steps in extrusion
- KT0404 Extrusion dies
- KT0405 Post - extrusion process
- KT0406 Extrusion lines

Internal Assessment Criteria and Weight

- IAC0401 Explain and define the extrusion process
- IAC0402 Explain the principle of an extrusion plant through schematics and illustrations
- IAC0403 List the most popular thermoplasts used for the extrusion and name some of products that can be produced
- IAC0404 Explain the extruder by making use of a schematic

- IAC0405 Explain all the different extrusion dies and the different screws used
- IAC0406 Explain what happens after the extrusion process

(Weight 20%)

8.2.5. KM-08-KT05: Injection moulding (20%)

Topic elements to be covered include:

- KT0501 Plastics material used in injection moulding
- KT0502 Injection unit
- KT0503 Processing steps in injection moulding
- KT0504 Injection moulds
- KT0505 Split line and flashes

Internal Assessment Criteria and Weight

- IAC0501 Define the injection moulding process
- IAC0502 Explain the principle of the injection unit through schematics and illustrations
- IAC0503 Identify and discuss the most popular thermoplasts used for the injection moulding and give indication of products that can be produced
- IAC0504 Explain the injection mould by making use of a schematic
- IAC0505 Explain and demonstrate a split line and flashes

(Weight 20%)

8.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

8.4 Exemptions

- None

9. 652201100-KM-09, Plastics processing, NQF Level 5, Credits 14

9.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the processing, development, and manufacture of plastics products. A good understanding of the machinery and tools used to manufacture these plastic products will also be gained. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 25 days.

The learning will enable learners to demonstrate an understanding of:

- KM-09-KT01: Extrusion blow moulding (25%)
- KM-09-KT02: Injection moulding, injection blow moulding, thermoplast foam moulding (25%)
- KM-09-KT03: Machining and cutting of plastics (15%)
- KM-09-KT04: Surface finishing of plastics (20%)
- KM-09-KT05: Mould manufacture and polishing (15%)

9.2 Guidelines for Topics

9.2.1. KM-09-KT01: Extrusion blow moulding (25%)

Topic elements to be covered include:

- KT0101 Extrusion parison dies
- KT0102 Blowing unit
- KT0103 Blow moulds
- KT0104 Blow moulding machines
- KT0105 Extrusion stretch blow moulding

Internal Assessment Criteria and Weight

- IAC0101 Determine and discuss what is an extrusion parison, how it flows and its purpose
- IAC0102 Analyse the different parts of a blowing unit and explain their functions within an extrusion blow moulding process
- IAC0103 Discuss the different parts and compositions of blow moulds, how it operates and its composition
- IAC0104 Analyse and discuss what happens during the process stages of stretch blow moulding

(Weight 25%)

9.2.2. KM-09-KT02: Injection moulding, injection blow moulding, thermoplast foam moulding (25%)

Topic elements to be covered include:

- KT0201 Injection Moulding
- KT0202 Injection blow moulding
- KT0203 Foam moulding of thermoplasts

- KT0204 Gas assisted injection moulding (GAIM)
- KT0205 Multi-component injection moulding

Internal Assessment Criteria and Weight

- IAC0201 Explain the difference between injection blow moulding and injection blow moulding
- IAC0202 Explain composite of the thermoplasts
- IAC0203 Evaluate and discuss the process of GAIM and how it impacts the moulding of parts and tools
- IAC0204 Explain the impacts of the different components of the injection mould

(Weight 25%)

9.2.3. KM-09-KT03: Machining and cutting of plastics (15%)

Topic elements to be covered include:

- KT0301 Machining conditions
- KT0302 Machining methods

Internal Assessment Criteria and Weight

- IAC0301 Discuss all the different machining techniques to machine plastics in industry and how it is dealt with
- IAC0302 Explain what role temperature play in producing a plastic part
- IAC0303 Explain how a method of machining used, can influence the outcome of parts as well as the tool

(Weight 15%)

9.2.4. KM-09-KT04: Surface finishing of plastics (20%)

Topic elements to be covered include:

- KT0401 Polishing
- KT0402 Metallising
- KT0403 Flocking
- KT0404 Printing
- KT0405 Embossing

Internal Assessment Criteria and Weight

- IAC0401 Explain the polishing process and its influences on the quality of the final product
- IAC0402 Explain with examples of the flocking and metallising process
- IAC0403 Analyse the advantages and disadvantages of flocking and metallising
- IAC0404 Explain the processes of printing and painting
- IAC0405 Analyse the main differences between printing and painting

- IAC0406 Explain the process of embossing and how it is achieved under certain circumstances

(Weight 20%)

9.2.5. KM-09-KT05: Mould manufacture and polishing (15%)

Topic elements to be covered include:

- KT0501 Introduction
- KT0502 Mould Components
- KT0503 Terminology used in mould manufacture

Internal Assessment Criteria and Weight

- IAC0501 Explain on the basis of the plastics process how an injection mould is machined and assembled
- IAC0502 Explain how the processes of shrinkage work
- IAC0503 Discuss how shrinkage works and can be calculated on a product against the mould
- IAC0504 Identify and discuss all the different parts and its uses
- IAC0505 Identify and explain the terminology used in the manufacturing of moulds

(Weight 15%)

9.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

9.4 Exemptions

- None

10. 652201100-KM-10, Basic principles of metal pressing, blanking and drawing processes, NQF Level 4, Credits 6

10.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of disassembling and reassembling a tool. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-10-KT01: Introduction to basics metal stamping (10%)
- KM-10-KT02: Types of presses (20%)
- KM-10-KT03: Bending and drawing (35%)
- KM-10-KT04: Types of press tools (35%)

10.2 Guidelines for Topics

10.2.1. KM-10-KT01: Introduction to basics metal stamping (10%)

Topic elements to be covered include:

- KT0101 Metal stamping: Cutting, Bending and Drawing
- KT0102 Safety

Internal Assessment Criteria and Weight

- IAC0101 Explain the basic processes of metal stamping, i.e. forming, shearing, piercing, blanking, bending, forming and deep drawing tools
- IAC0102 Explain the basic concepts of the following tools: blanking, drawing, piercing, bending and progression
- IAC0103 Tools
- IAC0104 Explain what is die clearance, burr and drawing dies
- IAC0105 Explain how safety and regulatory concerns affect selection
- IAC0106 Briefly explain where the metal processing is being used and why referring to specific examples in industry
- IAC0107 Explain the influence of different types of materials on the stamping etc. process

(Weight 10%)

10.2.2. KM-10-KT02: Types of presses (20%)

Topic elements to be covered include:

- KT0201 Hydraulic presses
- KT0202 Mechanical presses
- KT0203 Servo presses

Internal Assessment Criteria and Weight

- IAC0201 Explain the processes of what happens during the different pressing operations
- IAC0202 Explain the different forming operations that take place

- IAC0203 Discuss the tonnage and how it influences the selection of a press
- IAC0204 Explain how a hydraulic press operates
- IAC0205 Describe how a mechanical press work
- IAC0206 Explain how servo presses are being used in the industry

(Weight 20%)

10.2.3. KM-10-KT03: Bending and drawing (35%)

Topic elements to be covered include:

- KT0301 V bending
- KT0302 Wipe bending
- KT0303 Rotary bending
- KT0304 Deep drawing / Shallow drawing
- KT0305 Ironing
- KT0306 Forming

Internal Assessment Criteria and Weight

- IAC0301 Explain the process of V-bending by using diagrams
- IAC0302 Identify all the different shapes of bending presses
- IAC0303 Explain wipe and rotary bending
- IAC0304 Explain with examples curling and the coining process
- IAC0305 Identify and explain the different types of drawing and ironing processes
- IAC0306 Explain how forming is being used in the industry

(Weight 35%)

10.2.4. KM-10-KT04: Types of press tools (35%)

Topic elements to be covered include:

- KT0401 One hit dies
- KT0402 Progressive dies
- KT0403 Transfer dies

Internal Assessment Criteria and Weight

- IAC0401 Explain the process of One hit dies
- IAC0402 Explain the function of a progressive dies including 'pitch' or 'feed' pilots and intermediate release
- IAC0403 Explain various types of transfer dies and their uses in industries

(Weight 35%)

10.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

10.4 Exemptions

- None

11. 652201100-KM-11, Metal pressing, blanking and drawing processes, NQF Level 5, Credits 14

11.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the operation of a Die Tool. All the different processes to get the best quality Die Tool product by concentrating on the various finishing methods and how to achieve this finished product. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 25 days.

The learning will enable learners to demonstrate an understanding of:

- KM-11-KT01: Theory of metal pressing and drawing (30%)
- KM-11-KT02: Metal part design (10%)
- KM-11-KT03: Types of metal stamping operations (30%)
- KM-11-KT04: Forming and cutting lubricants (10%)
- KM-11-KT05: Functional stamping lines (20%)

11.2 Guidelines for Topics

11.2.1. KM-11-KT01: Theory of metal pressing and drawing (30%)

Topic elements to be covered include:

- KT0101 Types of cutting processes
- KT0102 Types of material for stamping and drawing

Internal Assessment Criteria and Weight

- IAC0101 Explain the various cutting operations and their various applications including Lancing, Parting, Notching, Shaving
- IAC0102 Trimming, Pinch Trimming and Fine Blanking
- IAC0103 Explain the different processes associated with fine blanking and conventional stamping
- IAC0104 Explain the characteristics of different materials used for stamping and drawing

(Weight 30%)

11.2.2. KM-11-KT02: Metal part design (10%)

Topic elements to be covered include:

- KT0201 Complex tooling
- KT0202 Design considerations

Internal Assessment Criteria and Weight

- IAC0201 Explain how the metal part design has changed over the last decade and how it influenced tool design
- IAC0202 Explain the factors taken into consideration when designing metal parts
- IAC0203 Explain how CAD influence tooling design and its complexity

(Weight 10%)

11.2.3. KM-11-KT03: Types of metal stamping operations (30%)

Topic elements to be covered include:

- KT0301 Shearing
- KT0302 Bending
- KT0303 Drawing

Internal Assessment Criteria and Weight

- IAC0301 Explain the shearing process and calculate cutting force
- IAC0302 Calculate stripping force
- IAC0303 Explain the bending processes
- IAC0304 Identify and discuss forming and drawing processes
- IAC0305 Explain how to test and determine the ductility and stretching properties of sheet metal

(Weight 30%)

11.2.4. KM-11-KT04: Forming and cutting lubricants (10%)

Topic elements to be covered include:

- KT0401 Types of lubricants
- KT0402 Functions of lubricants

Internal Assessment Criteria and Weight

- IAC0401 Analyse the effect of the various types of lubricants, their uses and their application in metal processes
- IAC0402 Explain how to determine the effects of lubricants on metals
- IAC0403 Explain temperature control through the use of lubricants

(Weight 10%)

11.2.5. KM-11-KT05: Functional stamping lines (20%)

Topic elements to be covered include:

- KT0501 Blanking press
- KT0502 Basic press production
- KT0503 Components of a stamping line

Internal Assessment Criteria and Weight

- IAC0501 Identify and explain all the parts and components of a press
- IAC0502 Explain what constitutes a press cycle including bottom dead centre (BDC) and top dead centre (TDC)
- IAC0503 Explain the types of metal stamping operations and their functions
- IAC0504 Identify all components of a stamping line and analyse their functions

(Weight 20%)

11.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

11.4 Exemptions

- None

12. 652201100-KM-12, Introduction to CAD, NQF Level 4, Credits 6

12.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of how the computer aided drafting program functions. This module provides the learner with a basic understanding of how to navigate through the program. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-12-KT01: Types and uses of CAD (25%)
- KM-12-KT02: Icons, commands and mouse functions (25%)
- KM-12-KT03: Modelling applications (25%)
- KM-12-KT04: Introduction to 3D modelling (25%)

12.2 Guidelines for Topics

12.2.1. KM-12-KT01: Types and uses of CAD (25%)

Topic elements to be covered include:

- KT0101 Types of CAD
- KT0102 Uses of CAD

Internal Assessment Criteria and Weight

- IAC0101 Discuss where CAD is being used within different industries and explain its impact
- IAC0102 Explain advantages and disadvantages of CAD
- IAC0103 Explain impact CAD has on the programming side
- IAC0104 Explain how CAD can be used to create drawings

(Weight 25%)

12.2.2. KM-12-KT02: Icons, commands and mouse functions (25%)

Topic elements to be covered include:

- KT0201 Icons
- KT0202 Commands
- KT0203 Mouse functions

Internal Assessment Criteria and Weight

- IAC0201 Explain how the different icons work and how to identify these icons
- IAC0202 Explain how to create and capture toolbars
- IAC0203 Explain how to edit icons and its position
- IAC0204 Explain how to make use of the command bar in text input bar
- IAC0205 List most of the miscellaneous symbols
- IAC0206 Explain various mouse functions used in CAD 3D modelling including Pan, Zoom, Rotate and Snap

- IAC0207 Explain how to use keys on the keyboard together with the mouse to create certain viewing options

(Weight 25%)

12.2.3. KM-12-KT03: Modelling applications (25%)

Topic elements to be covered include:

- KT0301 Sketcher mode
- KT0302 Modelling features
- KT0303 ISO constraint drawing

Internal Assessment Criteria and Weight

- IAC0301 Identify and explain sketch ICONS, sketch basic features and pattern
- IAC0302 Explain modification features including chamfer, trim, mirror, offset
- IAC0303 Identify tools used to determine if drawing is ISO constraint

(Weight 25%)

12.2.4. KM-12-KT04: Introduction to 3D modelling (25%)

Topic elements to be covered include:

- KT0401 Basic sketching
- KT0402 Padding
- KT0403 Groove
- KT0404 Pattern

Internal Assessment Criteria and Weight

- IAC0401 Explain how to create a basic sketch and how to make it ISO-constraint
- IAC0402 Explain how to make use of the icon to create a thickness
- IAC0403 Explain how to use the groove command as an alternative to create a slot type of feature
- IAC0404 Explain different features and uses of commands for creating patterns including rectangular pattern

(Weight 25%)

12.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator

- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

12.4 Exemptions

- None

13. 652201100-KM-13, CAD, NQF Level 5, Credits 14

13.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of how to create an assembly of different parts. How to print a drawing in a scale of 1:1. Knowledge is also gained on how to simulate a tool to see how it operates. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 25 days.

The learning will enable learners to demonstrate an understanding of:

- KM-13-KT01: Principles of drawing and automatic dimension generation for part manufacturing (30%)
- KM-13-KT02: Print a drawing (15%)
- KM-13-KT03: CAD assembly and product design (40%)
- KM-13-KT04: Simulating assembly design (15%)

13.2 Guidelines for Topics

13.2.1. KM-13-KT01: Principles of drawing and automatic dimension generation for part manufacturing (30%)

Topic elements to be covered include:

- KT0101 Theory of switching from 3D modelling mode to drawing mode
- KT0102 ISO drawing sheet set up
- KT0103 Title blocks and templates
- KT0104 3D CAD views
- KT0105 Dimensioning

Internal Assessment Criteria and Weight

- IAC0101 Explain the uses of the icons used in switching from 3D modelling mode to drawing mode
- IAC0102 Explain different ISO sheet sizes and different aspects of set ups in the CAD environment
- IAC0103 Discuss the purpose and the uses of title blocks and templates
- IAC0104 Explain the concept of views and a complex sectional cut
- IAC0105 Discuss drawing rules for dimensioning and the uses of dimensioning commands

(Weight 30%)

13.2.2. KM-13-KT02: Print a drawing (15%)

Topic elements to be covered include:

- KT0201 Set up a view for printing
- KT0202 Preview print
- KT0203 Print an A4 sheet Scale 1:1

Internal Assessment Criteria and Weight

- IAC0201 Set up printer up in drawing mode

- IAC0202 Adjust print preview for area to be printed
- IAC0203 Print an A4 sheet and use a ruler confirm drawing is 1:1

(Weight 15%)

13.2.3. KM-13-KT03: CAD assembly and product design (40%)

Topic elements to be covered include:

- KT0301 Creating a CAD assembly
- KT0302 Principles of generating part in product mode

Internal Assessment Criteria and Weight

- IAC0301 Discuss the processes to pull parts into an assembly
- IAC0302 Identify and explain the commands and icons used in the assembly mode
- IAC0303 Explain how to constrain different parts to one another
- IAC0304 Explain how to create links between features of different parts
- IAC0305 Explain how to create a new part inside the assemble mode
- IAC0306 Discuss the different types of methods one can use to create property tables
- IAC0307 Explain how to create bill of materials

(Weight 40%)

13.2.4. KM-13-KT04: Simulating assembly design (15%)

Topic elements to be covered include:

- KT0401 Simulating an assembly
- KT0402 Simulating mould design
- KT0403 Simulating die design

Internal Assessment Criteria and Weight

- IAC0401 Explain procedure for creating the four piece rotating parts
- IAC0402 Explain how to generate a video of the moving half of a mould
- IAC0403 Explain how to generate the simulation for the moving half of a mould with three steps
- IAC0404 Determine the different angular speeds as well linear speeds
- IAC0405 Determine the different fixing methods

(Weight 15%)

13.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

13.4 Exemptions

- None

14. 652201100-KM-14, CNC Turning Theory, NQF Level 5, Credits 14

14.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the theoretical side of Computer Numeric Control (CNC) turning. Knowledge will be gained in controls of machines, calculations on how to achieve points, programming and the simulation of programs. The learning contact time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-14-KT01: Introduction to CNC turning (5%)
- KM-14-KT02: CNC turning mathematics (15%)
- KM-14-KT03: Turning adjustment and production sheets (5%)
- KM-14-KT04: G-Codes and M-codes (10%)
- KM-14-KT05: Program writing (30%)
- KM-14-KT06: Simulation (35%)

14.2 Guidelines for Topics

14.2.1. KM-14-KT01: Introduction to CNC turning (5%)

Topic elements to be covered include:

- KT0101 Coordinate system
- KT0102 Operating sequences
- KT0103 Program input
- KT0104 Program run

Internal Assessment Criteria and Weight

- IAC0101 Explain the right-hand rule to enable the location of a point in space
- IAC0102 Explain which axis is used in CNC turning as well as positive and negative movement
- IAC0103 Explain the sequences of compiling a program to run without error
- IAC0104 Explain how and where to run programs and using the correct CAM software

(Weight 5%)

14.2.2. KM-14-KT02: CNC turning mathematics (15%)

Topic elements to be covered include:

- KT0201 Basic trigonometry
- KT0202 Analytical mathematics
- KT0203 Calculating intersection points on a profile
- KT0204 Basic interpolation

Internal Assessment Criteria and Weight

- IAC0201 Explain all the different trigonometry features e.g. sin, tan, cos

- IAC0202 Define and apply the Pythagoras rule, sin, tan and cos rules in CNC turning
- IAC0203 Construct and calculate different points on a profile
- IAC0204 Calculate intersection points to write a short program

(Weight 15%)

14.2.3. KM-14-KT03: Turning adjustment and production sheets (5%)

Topic elements to be covered include:

- KT0301 Speeds and Feeds
- KT0302 Tool selection and input data
- KT0303 Machine set-up data
- KT0304 Chronological order of program

Internal Assessment Criteria and Weight

- IAC0301 Define spindle speed and calculate for different materials
- IAC0302 Define feed rate and calculate for different materials and tools
- IAC0303 Explain the different lathe tools and identify different tool data for lathe tools
- IAC0304 Interpret the machine data, explain how to use it on the machines and software package and how to carry out referencing
- IAC0305 Discuss the logical order to follow when writing a program
- IAC0306 Explain the importance of the information to be recorded on production and adjustment sheets

(Weight 5%)

14.2.4. KM-14-KT04: G-Codes and M-codes (10%)

Topic elements to be covered include:

- KT0401 G-codes
- KT0402 M-codes

Internal Assessment Criteria and Weight

- IAC0401 Explain different G-codes and their uses in the turning cycle
- IAC0402 Explain different M-codes to be used on the turning programming software

(Weight 10%)

14.2.5. KM-14-KT05: Program writing (30%)

Topic elements to be covered include:

- KT0501 Program structure
- KT0502 Main program and sub-programming
- KT0503 Different cycles
- KT0504 Compensation

- KT0505 Polar programming

Internal Assessment Criteria and Weight

- IAC0501 Explain the layout of a program for the least amount of turning time
- IAC0502 Discuss safety precautions to be taken into account when doing the different turning activities
- IAC0503 Discuss sub-programs inside the main turning program
- IAC0504 Explain the different 'can-cycles' and cutter-compensation to be used in CNC programming
- IAC0505 Discuss the concept of polar programming and its uses

(Weight 30%)

14.2.6. KM-14-KT06: Simulation (35%)

Topic elements to be covered include:

- KT0601 3D-Tool set-up
- KT0602 Workpiece set-up
- KT0603 Tool selection
- KT0604 Running programs

Internal Assessment Criteria and Weight

- IAC0601 Adjust and add new tools to the software and turning program
- IAC0602 Determine all the different lathe tools to be used in the software program
- IAC0603 Explain how to dimensionally set-up a workpiece for simulation
- IAC0604 Be able to select any tool from the list to be used in the turning program
- IAC0605 Explain on how to run a turning program successfully without any crashes

(Weight 35%)

14.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

14.4 Exemptions

- None

15. 652201100-KM-15, CNC Milling Theory, NQF Level 5, Credits 14

15.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of the theoretical side of Computer Numeric Control (CNC) Milling. Knowledge will be gained in controls of machines, calculations on how to achieve points, programming and the simulation of milling programs. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learning will enable learners to demonstrate an understanding of:

- KM-15-KT01: Introduction to CNC Milling (5%)
- KM-15-KT02: CNC Milling mathematics (15%)
- KM-15-KT03: Milling adjustment and production sheets (5%)
- KM-15-KT04: G-Codes and M-codes (10%)
- KM-15-KT05: Program writing (30%)
- KM-15-KT06: Simulation (35%)

15.2 Guidelines for Topics

15.2.1. KM-15-KT01: Introduction to CNC Milling (5%)

Topic elements to be covered include:

- KT0101 Coordinate system
- KT0102 Operating sequences
- KT0103 Program input
- KT0104 Program run

Internal Assessment Criteria and Weight

- IAC0101 Explain the right-hand rule to enable you to locate point in space
- IAC0102 Explain which axis is used in CNC 3-Axis milling as well as positive and negative movement
- IAC0103 Explain the sequences of compiling a program to run without error
- IAC0104 Explain the different cycles in a program
- IAC0105 Explain how and where to run programs and using the correct CAM software

(Weight 5%)

15.2.2. KM-15-KT02: CNC Milling mathematics (15%)

Topic elements to be covered include:

- KT0201 Basic trigonometry
- KT0202 Analytical mathematics
- KT0203 Calculating intersection points on a profile
- KT0204 Basic interpolation

Internal Assessment Criteria and Weight

- IAC0201 Explain all the different trigonometry features e.g. sin, tan, cos
- IAC0202 Define and apply the Pythagoras rule, sin, tan and cos rules in CNC milling
- IAC0203 Construct and calculate different points on a profile
- IAC0204 Calculate intersection points to write a short program

(Weight 15%)

15.2.3. KM-15-KT03: Milling adjustment and production sheets (5%)

Topic elements to be covered include:

- KT0301 Speeds and Feeds
- KT0302 Tool selection and input data
- KT0303 Machine set-up data
- KT0304 Chronological order of program

Internal Assessment Criteria and Weight

- IAC0301 Define spindle speed and calculate for different materials
- IAC0302 Define feed rate and calculate for different materials and tools
- IAC0303 Explain the different milling tools and identify different tool data for milling tools
- IAC0304 Interpret the machine data, explain how to use it on the machines and software package and how to carry out referencing
- IAC0305 Discuss the logical order to follow when writing a program
- IAC0306 Explain the importance of the information to be recorded on production and adjustment sheets

(Weight 5%)

15.2.4. KM-15-KT04: G-Codes and M-codes (10%)

Topic elements to be covered include:

- KT0401 G-codes
- KT0402 M-codes

Internal Assessment Criteria and Weight

- IAC0401 Explain different G-codes and their uses in the milling cycle
- IAC0402 Explain different M-codes to be used on the milling programming software

(Weight 10%)

15.2.5. KM-15-KT05: Program writing (30%)

Topic elements to be covered include:

- KT0501 Program structure
- KT0502 Main program and sub-programming
- KT0503 Different cycles

- KT0504 Compensation
- KT0505 Polar programming

Internal Assessment Criteria and Weight

- IAC0501 Explain the layout of a program for the least amount of milling time
- IAC0502 Discuss safety precautions to be taken into account when doing the different milling activities
- IAC0503 Discuss sub-programs inside the main milling program
- IAC0504 Explain the different 'can-cycles' and cutter-compensation to be used in CNC programming
- IAC0505 Discuss the concept of polar programming and its uses

(Weight 30%)

15.2.6. KM-15-KT06: Simulation (35%)

Topic elements to be covered include:

- KT0601 3D-Tool set-up
- KT0602 Workpiece set-up
- KT0603 Tool selection
- KT0604 Running programs

Internal Assessment Criteria and Weight

- IAC0601 Adjust and reference cutting tools
- IAC0602 Explain how to set up the 'Work shift'
- IAC0603 Explain how to dimensionally set-up tools workpiece for simulation
- IAC0604 Explain on how to run a milling program successfully without any crashes

(Weight 35%)

15.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Training/facilitation resources
- Assessment tools/instruments for formative assessment

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:30

Legal Requirements:

- None

15.4 Exemptions

- None

SECTION 3B: PRACTICAL SKILL MODULE SPECIFICATIONS

List of Practical Skill Module Specifications

- 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12
- 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5
- 652201100-PM-03, Construct and simulate a CAD 3D Model assembly, NQF Level 5, Credits 9
- 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10
- 652201100-PM-05, Operate a drill press, NQF Level 4, Credits 5
- 652201100-PM-06, Perform basic turning between Centres, NQF Level 3, Credits 12
- 652201100-PM-07, Perform advanced turning between Centres, NQF Level 4, Credits 15
- 652201100-PM-08, Conduct basic turning chucking operations, NQF Level 3, Credits 10
- 652201100-PM-09, Conduct advanced turning chucking operations, NQF Level 4, Credits 10
- 652201100-PM-10, Conduct basic milling operations, NQF Level 3, Credits 10
- 652201100-PM-11, Conduct advanced milling operations, NQF Level 4, Credits 10
- 652201100-PM-12, Conduct basic grinding operations, NQF Level 3, Credits 12
- 652201100-PM-13, Conduct advanced grinding operations, NQF Level 4, Credits 15
- 652201100-PM-14, Conduct basic CNC milling operations, NQF Level 4, Credits 8
- 652201100-PM-15, Conduct advanced CNC milling operations, NQF Level 5, Credits 27
- 652201100-PM-16, Conduct basic CNC turning operations, NQF Level 4, Credits 8
- 652201100-PM-17, Conduct advanced CNC turning operations, NQF Level 5, Credits 28
- 652201100-PM-18, Operate an EDM Plunge machine, NQF Level 5, Credits 15
- 652201100-PM-19, Operate an EDM wire erosion machine, NQF Level 5, Credits 15
- 652201100-PM-20, Manufacture a die, NQF Level 5, Credits 12
- 652201100-PM-21, Manufacture a Mould, NQF Level 5, Credits 9
- 652201100-PM-22, Plan for the tool/die/mould component and assembly manufacturing cycle, NQF Level 5, Credits 21
- 652201100-PM-23, Assess product manufacturing process and verify compliance, NQF Level 5, Credits 19

1. 652201100-PM-01, Implement measurement, materials and safety (MMS) requirements, NQF Level 2, Credits 12

1.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the techniques, methods, sequencing and procedures to implement measurement, materials, safety and housekeeping requirements. The practical modules should take place in a simulated or real work environment. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 15 days.

The learner will be required to:

- PM-01-PS01: Select and use measuring instruments and tools
- PM-01-PS02: Implement quality assurance, quality control and process planning
- PM-01-PS03: Conduct housekeeping and safety activities

1.2 Guidelines for Practical Skills

1.2.1. PM-01-PS01: Select and use measuring instruments and tools

Scope of Practical Skill

Given a drawing, steel ruler or rule, various: callipers, squares, protractors, gauges, verniers, micrometres, indicators, items for practically measuring e.g. a part the learner must be able to:

- PA0101 Use tools and measuring equipment
- PA0102 Read measurements
- PA0103 Clean and care for tools and measuring equipment

Applied Knowledge

- AK0101 Procedures and methods of using various measuring instruments and tools
- AK0102 Measuring techniques
- AK0103 Good housekeeping and cleaning procedures on the tools / measuring instruments
- AK0104 Methods and procedures for storage of instruments and tools

Internal Assessment Criteria

- IAC0101 All tools and instruments are selected in accordance with task requirements
- IAC0102 Measurements on various items are taken using the appropriate tools and instruments
- IAC0103 Tools and instruments are cleaned, cared for and stored after use in accordance with standard operating procedures

1.2.2. PM-01-PS02: Implement quality assurance, quality control and process planning

Scope of Practical Skill

Given Curriculum material, illustrations or samples of inspection plans, manufacturing processes, charts, QMS, standards, policies and procedures the learner must be able to:

- PA0201 Select measuring instrument and conduct an inspection on a part
- PA0202 Compare measurements taken against drawing specifications

- PA0203 Produce a project plan for manufacturing a component

Applied Knowledge

- AK0201 Techniques and additional ideas to conduct inspections
- AK0202 Steps to follow a quality assurance process

Internal Assessment Criteria

- IAC0201 Inspections are completed utilising the correct measuring equipment and criteria in accordance with the drawing specifications
- IAC0202 Measurements taken are compared against drawing specifications as part of the quality assurance process
- IAC0203 The project plan produced to reflect all components for manufacturing a component in the required sequence

1.2.3. PM-01-PS03: Conduct housekeeping and safety activities

Scope of Practical Skill

Given Personal protective clothing, first aid kit, Safety act posters, safety signs, fire extinguishers, basic first aid training, policies and procedures the learner must be able to:

- PA0301 Interpret the material safety data sheet
- PA0302 Clean, care for and store tools and equipment
- PA0303 Perform a lockout out procedure
- PA0304 Read and interpret safety signs
- PA0305 Report incidents or unsafe conditions
- PA0306 Perform housekeeping activities

Applied Knowledge

- AK0301 Lockout/tag out procedure
- AK0302 Housekeeping techniques
- AK0303 Procedures for conformance to Health and Safety act
- AK0304 Processes and procedures for good housekeeping
- AK0305 Safety procedures and housekeeping standards

Internal Assessment Criteria

- IAC0301 Material safety data sheets are interpreted to determine correct storage and waste removal requirements
- IAC0302 Tools and equipment are cleaned, cared for and stored in accordance with standard operating procedures
- IAC0303 Lockout out procedure is performed to secure a faulty machine in accordance with lock out procedures
- IAC0304 Workstation are neat and clean after performing work activities

1.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Drawings, steel ruler or rule, various: callipers, squares, protractors, gauges, vernier's, micrometres, indicators, items for practically measuring, curriculum material, illustrations or samples of inspection plans, manufacturing processes, charts, QMS, standards, policies and procedures, personal protective clothing, first aid kit, Safety act posters, safety signs, fire extinguishers, basic first aid training, policies and procedures

Human Resource Requirements:

- Trainer/Facilitator
- A SME in the trade and/or part qualification with minimum 5 years industry experience relating to the trade or part qualification
- Trainer/learner ratio 1:15

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

1.4 Exemptions

- None

2. 652201100-PM-02, Make a CAD 3D Model, NQF Level 4, Credits 5

2.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the techniques, methods, sequencing and procedures to make CAD 3D Models. The practical modules should take place in a simulated or real work environment. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 8.75 days.

The learner will be required to:

- PM-02-PS01: Prepare computer for a CAD session
- PM-02-PS02: Create an ISO constrained sketch
- PM-02-PS03: Model a 3D Part using various modelling features
- PM-02-PS04: Create a pattern

2.2 Guidelines for Practical Skills

2.2.1. PM-02-PS01: Prepare computer for a CAD session

Scope of Practical Skill

Given Simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0101 Open a Cad session
- PA0102 Open a drawing
- PA0103 Manipulate the drawing using various mouse functions

Applied Knowledge

- AK0101 Processes and procedures for operating a computer
- AK0102 Techniques to apply CAD software
- AK0103 Method of selecting drawing files
- AK0104 Processes and procedures of using various mouse button functions

Internal Assessment Criteria

- IAC0101 Computer is switched on and ready to open CAD software
- IAC0102 Cad software is opened and ready for operation
- IAC0103 Switch on all relevant toolbars and icons
- IAC0104 An existing 3D model is opened and displayed on screen
- IAC0105 Model is rotated, zoomed and panned using various mouse functions

2.2.2. PM-02-PS02: Create an ISO constrained sketch

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0201 Select mode for creating sketches
- PA0202 Create a sketch

- PA0203 Confirm that sketch is ISO constrained

Applied Knowledge

- AK0201 Processes and procedures to use CAD software
- AK0202 Methods of using various icons and features
- AK0203 ISO constraint confirmation methodology

Internal Assessment Criteria

- IAC0201 Computer shows characteristic that sketch mode has been selected in order to create an ISO constrained sketch
- IAC0202 Icons and commands are used to create a computer sketch according to supplied drawing and dimensions
- IAC0203 Computer "check" command verifies that sketch is ISO constrained and has no errors

2.2.3. PM-02-PS03: Model a 3D Part using various modelling features

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0301 Model a 3D part from a 2D drawing
- PA0302 Use various modelling commands
- PA0303 Use various modification features on 3D model

Applied Knowledge

- AK0301 Modelling processes and procedures
- AK0302 Methods of using icon functions
- AK0303 Procedures for the application of modification commands

Internal Assessment Criteria

- IAC0301 A 3D model is created in accordance with drawing specifications
- IAC0302 Modelling commands are used to create the 3D model as per drawing specification
- IAC0303 Modification commands are used to achieve drawing specification

2.2.4. PM-02-PS04: Create a pattern

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0401 Select the pattern command
- PA0402 Select the face on the model on which to apply the pattern
- PA0403 Apply the features for the pattern command

Applied Knowledge

- AK0401 Procedures of selection
- AK0402 Methods and techniques of interpreting drawing and positioning of pattern
- AK0403 Procedures for applying features suitable for pattern command

Internal Assessment Criteria

- IAC0401 Selection process indicates that the pattern is on the correct face and position as per supplied drawing
- IAC0402 Pattern feature is applied on the model using the pattern command

2.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

2.4 Exemptions

- None

3. 652201100-PM-03, Construct and simulate a CAD 3D Model assembly, NQF Level 5, Credits 9

3.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to construct and simulate a CAD 3D Model assembly. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 8.75 days.

The learner will be required to:

- PM-03-PS01: Create an assembly from existing parts
- PM-03-PS02: Create an additional part in the assembly using top down method
- PM-03-PS03: Construct and simulate an assembly
- PM-03-PS04: Create a 2D drawing

3.2 Guidelines for Practical Skills

3.2.1. PM-03-PS01: Create an assembly from existing parts

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0101 Insert selected components for the assembly
- PA0102 Insert selected sub-assemblies for the assembly
- PA0103 Create constraints and joints between parts

Applied Knowledge

- AK0101 Modelling processes and procedures
- AK0102 Methods of using icon functions and toolbars
- AK0103 Methods built in the CAD structure and procedures to do the assemblies

Internal Assessment Criteria

- IAC0101 A 3D model is created in accordance with drawing specifications
- IAC0102 Use toolbars and icons to do put parts in the correct place
- IAC0103 Use mouse and keyboard functions to achieve the assembly
- IAC0104 Manipulate and explode assembly to check correctness
- IAC0105 Check by using clash detection for parts incorrectly placed

3.2.2. PM-03-PS02: Create an additional part in the assembly using top down method

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0201 Inserting a new part in the assembly
- PA0202 Manipulating an existing part to create a new part

Applied Knowledge

- AK0201 Processes and procedures to use CAD software
- AK0202 Methods of using various icons and features
- AK0203 ISO constraint confirmation methodology

Internal Assessment Criteria

- IAC0201 Use toolbars and icons to create the correct sketch to generate the new part
- IAC0202 Generate the new part using the existing parts in the assembly to constrain the new part
- IAC0203 Constrain the newly created part in the assembly

3.2.3. PM-03-PS03: Construct and simulate an assembly

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0301 Inspect the constraints and joints in the assembly
- PA0302 Auto create and create new joints for the simulation
- PA0303 Generate new mechanism

Applied Knowledge

- AK0301 Processes and procedures to use CAD software
- AK0302 Processes and procedures to create a simulation
- AK0303 Methods of using various icons and features
- AK0304 ISO constraint confirmation methodology

Internal Assessment Criteria

- IAC0301 Use toolbars and icons to create and verify the joints and constraints
- IAC0302 Use mouse to manipulate the assembly
- IAC0303 Put data into the mechanisms to allow for simulations

3.2.4. PM-03-PS04: Create a 2D drawing

Scope of Practical Skill

Given a simulated or real environment, Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work the learner must be able to:

- PA0401 Opening and inserting a drawing file and sheets
- PA0402 Page set-up
- PA0403 Inserting views
- PA0404 Dimensioning
- PA0405 Printing and saving drawings

Applied Knowledge

- AK0401 Processes and procedures to use CAD software

- AK0402 Processes and procedures to create a simulation
- AK0403 Methods of using various icons and features
- AK0404 ISO drawing standards

Internal Assessment Criteria

- IAC0401 Use icons and toolbars to create and open sheets
- IAC0402 Use Windows' way to do sheet set-ups
- IAC0403 A drawing is created in accordance with ISO drawing specifications
- IAC0404 Drawing commands are used which includes all dimensioning to create the drawing
- IAC0405 Modification commands are used to achieve drawing specification

3.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Computer, keyboard, mouse, CAD software loaded in computer, drawings and electronic data media for saving work

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

3.4 Exemptions

- None

4. 652201100-PM-04, Plan and conduct benchwork and layout activities, NQF Level 3, Credits 10

4.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to plan and conduct benchwork and layout activities. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-04-PS01: Mark off and scribe workpiece
- PM-04-PS02: Produce parts on workbench and machines

4.2 Guidelines for Practical Skills

4.2.1. PM-04-PS01: Mark off and scribe workpiece

Scope of Practical Skill

Given drawing, cleaning equipment, instructions, steel plate, centre punch, scribe, outside callipers, marking blue, various files, measuring equipment, PPE, vice the learner must be able to:

- PA0101 Read and interpret drawing
- PA0102 Remove sharp edges and burrs
- PA0103 Mark off and scribe workpiece
- PA0104 Measure scribed workpiece

Applied Knowledge

- AK0101 Methods of interpreting drawings
- AK0102 Techniques for using tools
- AK0103 Procedures for removing edges and burrs
- AK0104 Safety procedures and housekeeping standards
- AK0105 Measuring techniques and accuracy

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to reflect that the scribed profile was completed in accordance with drawing specifications
- IAC0102 Material is assessed visibly for no sharp edges and burrs
- IAC0103 Workpiece is marked off and scribed in accordance with the drawing specifications
- IAC0104 Workpiece is marked off and scribed in accordance with the drawing specifications

4.2.2. PM-04-PS02: Produce parts on workbench and machines

Scope of Practical Skill

Given Drawing, mark sheet, performance affidavit, material: steel, measuring equipment / tooling, PPE, lubricants, files, pedestal drilling machine, hand taps, tap wrench, scrapers, coated

abrasives, bench vice, centre drills, drills, various files, reamers and dial pins, chamfer drills the learner must be able to:

- PA0201 Read and interpret drawing
- PA0202 Select and use tooling and equipment for production of the part
- PA0203 Remove sharp edges and burrs
- PA0204 Prepare workpiece on bench by hand
- PA0205 Mark off workpiece
- PA0206 Perform all drilling operations to produce part

Applied Knowledge

- AK0201 Methods of interpreting drawings
- AK0202 Techniques for using tools
- AK0203 Procedures for removing edges and burrs
- AK0204 Safety procedures and housekeeping standards
- AK0205 Measuring techniques and accuracy

Internal Assessment Criteria

- IAC0201 Drawings are interpreted to determine material and process requirements for producing a part
- IAC0202 Tooling and equipment are selected and used in accordance with task requirements and standard operating procedures
- IAC0203 Materials are inspected for the removal of sharp edges and burrs
- IAC0204 Workpiece preparation activities include filing, marking off and centre punching on bench for drilling machining operations
- IAC0205 All drilling operations including drilling, reaming, tapping and chamfering, are completed to produce a part in accordance with drawing specifications and procedures

4.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Drawing, cleaning equipment, instructions, steel plate, centre punch, scribe, outside callipers, marking glue, various files, PPE, mark sheet, performance affidavit, material: steel, measuring equipment / tooling, lubricants, files, pedestal drilling machine, hand taps, tap wrench, scrapers, coated abrasives, bench vice, centre drills, drills, various files, reamers and dial pins, chamfer drills

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker

- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

4.4 Exemptions

- None

5. 652201100-PM-05, Operate a drill press, NQF Level 4, Credits 5

5.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to operate a drill press. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 8.75 days.

The learner will be required to:

- PM-05-PS01: Prepare for drilling operations
- PM-05-PS02: Clamp and align workpiece
- PM-05-PS03: Perform drilling operations to produce feature of a component
- PM-05-PS04: Conduct quality assurance activities on the workpiece

5.2 Guidelines for Practical Skills

5.2.1. PM-05-PS01: Prepare for drilling operations

Scope of Practical Skill

Given supplied engineering drawing, process plan, machines, equipment, tools and materials, different tool steels, component specifications, safety equipment checklists, safety screens, stock material, tape measures, cleaning and lubricating materials, task instructions, relevant personal protective equipment, drawing specifications, a range of hand tools applicable to the trade including hammers, files, punches, taps, drills, ring and flat spanners, tape measures, 300mm steel rules, Allen keys, a bench grinder, a pedestal drill, a range of measuring devices and instruments applicable to the trade including verniers, dial gauges, inside, outside and depth micrometers, telescopic gauges, marking dye, metal pieces and marking-off tools and equipment, template material, centring pins, mark sheet, performance affidavit, screws, studs, washers, clamps, tooling, drill chucks, various drills, reamers, countersinks, spot facers, counter bores, hammers, cutting fluids the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select tools and equipment for task
- PA0103 Verify that all tooling and equipment are suitable for machining

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of tools and equipment

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required for the task
- IAC0102 Tools and equipment are selected in accordance with identified processes that will be utilised

- IAC0103 Cutting fluids are applied in accordance with the specific operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational conditions of tools and equipment

5.2.2. PM-05-PS02: Clamp and align workpiece

Scope of Practical Skill

Given supplied engineering drawing, process plan, machines, equipment, tools and materials, different tool steels, component specifications, safety equipment checklists, safety screens, stock material, tape measures, cleaning and lubricating materials, task instructions, relevant personal protective equipment, drawing specifications, a range of hand tools applicable to the trade including hammers, files, punches, taps, drills, ring and flat spanners, tape measures, 300mm steel rules, Allen keys, a bench grinder, a pedestal drill, a range of measuring devices and instruments applicable to the trade including verniers, dial gauges, inside, outside and depth micrometers, telescopic gauges, marking dye, metal pieces and marking-off tools and equipment, template material, centring pins, mark sheet, performance affidavit, screws, studs, washers, clamps, tooling, drill chucks, various drills, reamers, countersinks, spot facers, counter bores, hammers, cutting fluids the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Align workpiece and position and secure work table

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment
- AK0204 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0201 The type of clamping device selected and mounted is verified against requirements of specific drilling operation
- IAC0202 Workpiece is clamped in accordance with safe machining operational requirements
- IAC0203 Alignment and positioning of workpiece are completed in accordance with drawing requirements
- IAC0204 The work table is secured to meet safety requirements after verification of workpiece positioning

5.2.3. PM-05-PS03: Perform drilling operations to produce feature of a component

Scope of Practical Skill

Given supplied engineering drawing, process plan, machines, equipment, tools and materials, different tool steels, component specifications, safety equipment checklists, safety screens, stock material, tape measures, cleaning and lubricating materials, task instructions, relevant personal protective equipment, drawing specifications, a range of hand tools applicable to the trade including hammers, files, punches, taps, drills, ring and flat spanners, tape measures, 300mm steel rules, Allen keys, a bench grinder, a pedestal drill, a range of measuring devices and instruments applicable to the trade including verniers, dial gauges, inside, outside and depth micrometers, telescopic gauges, marking dye, metal pieces and marking-off tools and equipment, template material, centring pins, mark sheet, performance affidavit, screws, studs, washers, clamps, tooling, drill chucks, various drills, reamers, countersinks, spot facers, counter bores, hammers, cutting fluids the learner must be able to:

- PA0301 Perform drilling activities
- PA0302 Perform chamfering activities
- PA0303 Perform counter boring activities
- PA0304 Perform counter sinking activities

Applied Knowledge

- AK0301 Procedures, processes, methods and sequencing of drilling activities
- AK0302 Procedures, processes, methods and sequencing of chamfering activities
- AK0303 Procedures, processes, methods and sequencing of counter boring activities
- AK0304 Procedures, processes, methods and sequencing of counter sinking activities

Internal Assessment Criteria

- IAC0301 Drilling activities are measured and verified in accordance with the drawing specifications
- IAC0302 Chamfering activities are measured and verified in accordance with the drawing specifications
- IAC0303 Counter boring activities are measured and verified in accordance with the drawing specifications
- IAC0304 Counter sinking activities are measured and verified in accordance with the drawing specifications

5.2.4. PM-05-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given supplied engineering drawing, process plan, machines, equipment, tools and materials, different tool steels, component specifications, safety equipment checklists, safety screens, stock material, tape measures, cleaning and lubricating materials, task instructions, relevant personal protective equipment, drawing specifications, a range of hand tools applicable to the trade including hammers, files, punches, taps, drills, ring and flat spanners, tape measures, 300mm steel rules, Allen keys, a bench grinder, a pedestal drill, a range of measuring devices and instruments

applicable to the trade including verniers, dial gauges, inside, outside and depth micrometers, telescopic gauges, marking dye, metal pieces and marking-off tools and equipment, template material, centring pins, mark sheet, performance affidavit, screws, studs, washers, clamps, tooling, drill chucks, various drills, reamers, countersinks, spot facers, counter bores, hammers, cutting fluids the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

5.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Engineering drawing, process plan, machines, equipment, tools and materials, different tool steels, component specifications, safety equipment checklists, safety screens, stock material, tape measures, cleaning and lubricating materials, task instructions, relevant personal protective equipment, drawing specifications, a range of hand tools applicable to the trade including hammers, files, punches, taps, drills, ring and flat spanners, tape measures, 300mm steel rules, Allen keys, a bench grinder, a pedestal drill, a range of measuring devices and instruments applicable to the trade including verniers, dial gauges, inside, outside and depth micrometers, telescopic gauges, marking dye, metal pieces and marking-off tools and equipment, template material, centring pins, mark sheet, performance affidavit, screws, studs, washers, clamps, tooling, drill chucks, various drills, reamers, countersinks, spot facers, counter bores, hammers, cutting fluids

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies

- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

5.4 Exemptions

- None

6. 652201100-PM-06, Perform basic turning between Centres, NQF Level 3, Credits 12

6.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing basic turning between centres operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 15 days.

The learner will be required to:

- PM-06-PS01: Prepare for basic turning between centres operations
- PM-06-PS02: Clamp and align workpiece
- PM-06-PS03: Perform basic turning between centres operations to produce features of a component
- PM-06-PS04: Conduct quality assurance activities on the workpiece

6.2 Guidelines for Practical Skills

6.2.1. PM-06-PS01: Prepare for basic turning between centres operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select lathe, tools and equipment for task
- PA0103 Verify that lathe, and all other tooling and equipment are suitable for machining

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of machine, tools and equipment for basic turning between centres

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the lathe, tools, equipment and processes required for the task

- IAC0102 Lathe, tools and equipment are selected in accordance with identified processes that will be utilised for basic turning between centres operations
- IAC0103 Cutting fluids are applied in accordance with the specific basic turning between centres operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational condition of tools and equipment

6.2.2. PM-06-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, "dog carrier", knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Position and adjust workpiece and tail stock

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment
- AK0204 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0201 The type of chuck for basic turning between centres is selected and mounted in accordance with requirements for the operation
- IAC0202 Fixed and rotating centres and carriers are selected in accordance with the drawing specifications and the machining operation requirements
- IAC0203 Workpiece and tail stock is positioned, clocked and adjusted in accordance with the drawing specifications and requirements of basic turning between centres operations
- IAC0204 Workpiece is clamped in accordance with safe machining operational requirements
- IAC0205 Alignment and positioning of workpiece are completed in accordance with drawing requirements

6.2.3. PM-06-PS03: Perform basic turning between centres operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills the learner must be able to:

- PA0301 Perform chamfering activities
- PA0302 Perform knurling activities
- PA0303 Perform grooving activities
- PA0304 Perform threading activities
- PA0305 Perform diameter and face turning activities

Applied Knowledge

- AK0301 Procedures, processes, methods and sequencing of chamfering activities
- AK0302 Procedures, processes, methods and sequencing of knurling activities
- AK0303 Procedures, processes, methods and sequencing of grooving activities
- AK0304 Procedures, processes, methods and sequencing of threading activities
- AK0305 Procedures, processes, methods and sequencing of diameter and face turning activities

Internal Assessment Criteria

- IAC0301 Chamfering features are measured and verified in accordance with the drawing specifications
- IAC0302 Knurling features are measured and verified in accordance with the drawing specifications
- IAC0303 Grooving features are measured and verified in accordance with the drawing specifications
- IAC0304 Threading features are measured and verified in accordance with the drawing specifications
- IAC0305 Diameter and face turning activities are measured and verified in accordance with the drawing specifications

6.2.4. PM-06-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, "dog carrier", knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

6.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, "dog carrier", knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and

lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools and centre drills

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

6.4 Exemptions

- None

7. 652201100-PM-07, Perform advanced turning between Centres, NQF Level 4, Credits 15

7.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to perform advanced turning between Centres. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 22.5 days.

The learner will be required to:

- PM-07-PS01: Prepare for advanced turning between Centres operations
- PM-07-PS02: Clamp and align workpiece
- PM-07-PS03: Perform advanced turning between Centres operations to produce feature of a component
- PM-07-PS04: Conduct quality assurance activities on the workpiece

7.2 Guidelines for Practical Skills

7.2.1. PM-07-PS01: Prepare for advanced turning between Centres operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, taper gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, sine bar the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select tools and equipment for time-based task
- PA0103 Verify that all tooling and equipment are suitable for advanced turning between centres

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Tool selection techniques
- AK0103 Interpretation of additional tolerances and time requirements
- AK0104 Procedures for applying cutting fluids
- AK0105 Methods of verifying operational condition of tools and equipment

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required to meet the time and tolerance requirements of advanced turning between centres

- IAC0102 Tools and equipment are selected in accordance with the requirements of advanced turning between centres operations
- IAC0103 Cutting fluids are applied in accordance with the specific operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational conditions of tools and equipment

7.2.2. PM-07-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, taper gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, "dog carrier" dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, sine bar the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Position and adjust workpiece and tail stock

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment
- AK0204 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0201 The type of chuck for advanced turning between centres is selected and mounted in accordance with requirements for the operation
- IAC0202 Fixed and rotating centres and carriers are selected in accordance with the drawing specifications and the machining operation requirements
- IAC0203 Workpiece and tail stock is positioned, clocked and adjusted in accordance with the drawing specifications and requirements of advanced turning between centres operations
- IAC0204 Workpiece is clamped in accordance with safe machining operational requirements

- IAC0205 Alignment and positioning of workpiece are completed in accordance with drawing requirements

7.2.3. PM-07-PS03: Perform advanced turning between Centres operations to produce feature of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, taper gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, dog carrier, dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, sine bar the learner must be able to:

- PA0301 Perform external tapering activities for a time and tightly tolerance based workpiece
- PA0302 Perform chamfering activities for a time and tightly tolerance based workpiece
- PA0303 Perform knurling activities for a time and tightly tolerance based workpiece
- PA0304 Perform external grooving activities for a time and tightly tolerance based workpiece
- PA0305 Perform external threading activities for a time and tightly tolerance based workpiece
- PA0306 Perform diameter and face turning activities for a time and tightly tolerance based workpiece

Applied Knowledge

- AK0301 Taper cutting processes
- AK0302 Procedures, processes, methods and sequencing of chamfering activities
- AK0303 Procedures, processes, methods and sequencing of knurling activities
- AK0304 Procedures, processes, methods and sequencing of grooving activities
- AK0305 Procedures, processes, methods and sequencing of threading activities
- AK0306 Procedures, processes, methods and sequencing of diameter and face turning activities

Internal Assessment Criteria

- IAC0301 Taper features are measured and verified in accordance with the drawing specifications

- IAC0302 Chamfering features are measured and verified in accordance with the drawing specifications
- IAC0303 Knurling features are measured and verified in accordance with the drawing specifications
- IAC0304 Grooving features are measured and verified in accordance with the drawing specifications
- IAC0305 Threading features are measured and verified in accordance with the drawing specifications
- IAC0306 Diameter and face turning activities are measured and verified in accordance with the drawing specifications

7.2.4. PM-07-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, taper gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, sine bar the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined, measured and quality checked in accordance with requirements stipulated in the drawing specifications to meet the time and tight tolerance requirements
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

7.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills and sine bar

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

7.4 Exemptions

- None

8. 652201100-PM-08, Conduct basic turning chucking operations, NQF Level 3, Credits 10

8.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing basic turning chucking operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-08-PS01: Prepare for basic turning chucking operations
- PM-08-PS02: Clamp and align workpiece
- PM-08-PS03: Perform basic turning chucking operations to produce features of a component
- PM-08-PS04: Conduct quality assurance activities on the workpiece

8.2 Guidelines for Practical Skills

8.2.1. PM-08-PS01: Prepare for basic turning chucking operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove vernier the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select lathe, tools and equipment for task
- PA0103 Verify that lathe, and all other tooling and equipment are suitable for machining

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of machine, tools and equipment for basic turning chucking operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the lathe, tools, equipment and processes required for basic turning chucking operations

- IAC0102 Lathe, tools and equipment are selected in accordance with identified processes that will be utilised for basic turning chucking operations
- IAC0103 Cutting fluids are applied in accordance with the specific basic turning chucking operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational condition of tools and equipment

8.2.2. PM-08-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove vernier the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Position and clock workpiece

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment
- AK0204 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0201 The type of chuck for basic turning chucking operations is selected and mounted in accordance with requirements for the operation
- IAC0202 Workpiece is clamped in accordance with safe basic turning chucking operational requirements
- IAC0203 Positioning and clocking of workpiece are completed in accordance with drawing requirements

8.2.3. PM-08-PS03: Perform basic turning chucking operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove vernier the learner must be able to:

- PA0301 Perform chamfering activities
- PA0302 Perform drilling activities
- PA0303 Perform boring activities
- PA0304 Perform threading activities
- PA0305 Perform grooving activities
- PA0306 Perform diameter and face turning activities

Applied Knowledge

- AK0301 Procedures, processes, methods and sequencing of chamfering activities
- AK0302 Procedures, processes, methods and sequencing of drilling activities
- AK0303 Procedures, processes, methods and sequencing of grooving activities
- AK0304 Procedures, processes, methods and sequencing of threading activities
- AK0305 Procedures, processes, methods and sequencing of diameter and face turning activities

Internal Assessment Criteria

- IAC0301 Chamfering features are measured and verified in accordance with the drawing specifications
- IAC0302 Drilling features are measured and verified in accordance with the drawing specifications required for basic turning chucking operations
- IAC0303 Boring features are measured and verified in accordance with the drawing specifications required for basic turning chucking operations
- IAC0304 Threading features are measured and verified in accordance with the drawing specifications required for basic turning chucking operations
- IAC0305 Grooving features are measured and verified in accordance with the drawing specifications required for basic turning chucking operations
- IAC0306 Diameter and face turning activities are measured and verified in accordance with the drawing specifications required for basic turning chucking operations

8.2.4. PM-08-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking blue, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, âœœdog carrierâœœ, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove vernier the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

8.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, âœœdog carrierâœœ, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife

tools, boring tools, grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove vernier

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

8.4 Exemptions

- None

9. 652201100-PM-09, Conduct advanced turning chucking operations, NQF Level 4, Credits 10

9.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to perform advanced turning chucking operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 18.75 days.

The learner will be required to:

- PM-09-PS01: Prepare for advanced turning chucking operations
- PM-09-PS02: Clamp and align workpiece
- PM-09-PS03: Perform advanced turning chucking operations to produce feature of a component
- PM-09-PS04: Conduct quality assurance activities on the workpiece

9.2 Guidelines for Practical Skills

9.2.1. PM-09-PS01: Prepare for advanced turning chucking operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, face-grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove Vernier, sine bar the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select tools and equipment for time-based task
- PA0103 Verify that all tooling and equipment are suitable for advanced turning chucking operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Tool selection techniques
- AK0103 Interpretation of additional tolerances and time requirements
- AK0104 Procedures for applying cutting fluids
- AK0105 Methods of verifying operational condition of tools and equipment

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required to meet the time and tolerance requirements of advanced turning chucking operations
- IAC0102 Tools and equipment are selected in accordance with the requirements of advanced turning chucking operations
- IAC0103 Cutting fluids are applied in accordance with the specific operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational conditions of tools and equipment

9.2.2. PM-09-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, face-grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove Vernier, sine bar the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Position and clock workpiece

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment
- AK0204 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0201 The type of chuck for advanced turning chucking operations is selected and mounted in accordance with requirements for the operation
- IAC0202 Positioning and clocking of workpiece are completed in accordance with drawing requirements
- IAC0203 Workpiece is clamped in accordance with safe machining operational requirements

9.2.3. PM-09-PS03: Perform advanced turning chucking operations to produce feature of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, âœœdog carrierâœœ, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, face-grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove Vernier, sine bar the learner must be able to:

- PA0301 Perform diameter and face turning activities for a time and tightly tolerance based workpiece
- PA0302 Perform drilling activities for a time and tightly tolerance based workpiece
- PA0303 Perform boring activities for a time and tightly tolerance based workpiece
- PA0304 Perform internal threading activities for a time and tightly tolerance based workpiece
- PA0305 Perform internal and face grooving activities for a time and tightly tolerance based workpiece
- PA0306 Perform chamfering activities for a time and tightly tolerance based workpiece
- PA0307 Perform internal and external tapering activities for a time and tightly tolerance based workpiece

Applied Knowledge

- AK0301 Procedures, processes, methods and sequencing of drilling activities
- AK0302 Procedures, processes, methods and sequencing of boring activities
- AK0303 Taper cutting processes
- AK0304 Procedures, processes, methods and sequencing of chamfering activities
- AK0305 Procedures, processes, methods and sequencing of grooving activities
- AK0306 Procedures, processes, methods and sequencing of threading activities
- AK0307 Procedures, processes, methods and sequencing of diameter and face turning activities

Internal Assessment Criteria

- IAC0301 Diameter and face turning activities are measured and verified in accordance with the drawing specifications
- IAC0302 Drilling features are measured and verified in accordance with the drawing specifications

- IAC0303 Boring features are measured and verified in accordance with the drawing specifications
- IAC0304 Internal threading features are measured and verified in accordance with the drawing specifications
- IAC0305 Internal and face grooving features are measured and verified in accordance with the drawing specifications
- IAC0306 Chamfering features are measured and verified in accordance with the drawing specifications
- IAC0307 Internal and external taper features are measured and verified in accordance with the drawing specifications

9.2.4. PM-09-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, a dog carrier, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, face-grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove Vernier, sine bar the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined, measured and quality checked in accordance with requirements stipulated in the drawing specifications to meet the time and tight tolerance requirements
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

9.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, applicable go and no-go thread gauges, thread pitch gauge, thread gauge, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, and a feeler gauge, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, âœœdog carrierâœœ, knurling tools, fixed and rotating centres and safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, knife tools, boring tools, grooving tools, face-grooving tools, parting tools, thread tools, centre drills, inside calliper, internal groove Vernier, sine bar

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

9.4 Exemptions

- None

10. 652201100-PM-10, Conduct basic milling operations, NQF Level 3, Credits 10

10.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing basic milling operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-10-PS01: Prepare for basic milling operations
- PM-10-PS02: Clamp and align workpiece
- PM-10-PS03: Perform basic milling operations to produce features of a component
- PM-10-PS04: Conduct quality assurance activities on the workpiece

10.2 Guidelines for Practical Skills

10.2.1. PM-10-PS01: Prepare for basic milling operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, thread gauge, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select milling machine, tools and equipment for task
- PA0103 Verify that milling machine and all other tooling and equipment are suitable for milling operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of machine, tools and equipment for basic milling operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the milling machine, tools, equipment and processes required for basic milling operations
- IAC0102 Milling machine, tools and equipment are selected in accordance with identified processes that will be utilised for basic milling operations

- IAC0103 Cutting fluids are applied in accordance with the specific basic milling operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational condition of tools and equipment

10.2.2. PM-10-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, thread gauge, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Position and clock workpiece

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment
- AK0204 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0201 The type of vice for basic milling operations is selected and mounted in accordance with requirements for the operation
- IAC0202 Workpiece is clamped in accordance with safe basic milling operations requirements
- IAC0203 Positioning and clocking of workpiece are completed in accordance with drawing requirements

10.2.3. PM-10-PS03: Perform basic milling operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, thread gauge, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids,

safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps the learner must be able to:

- PA0301 Perform chamfering activities
- PA0302 Perform drilling activities
- PA0303 Perform boring activities
- PA0304 Perform tapping activities
- PA0305 Perform reaming activities
- PA0306 Perform slot milling activities
- PA0307 Perform rough, face and end milling activities

Applied Knowledge

- AK0301 Procedures, processes, methods and sequencing of chamfering activities
- AK0302 Procedures, processes, methods and sequencing of drilling activities
- AK0303 Procedures, processes, methods and sequencing of boring activities
- AK0304 Procedures, processes, methods and sequencing of tapping activities
- AK0305 Procedures, processes, methods and sequencing of rough, face and end milling activities
- AK0306 Procedures, processes, methods and sequencing of reaming activities

Internal Assessment Criteria

- IAC0301 Chamfering features are measured and verified in accordance with the drawing specifications
- IAC0302 Drilling features are measured and verified in accordance with the drawing specifications required for basic milling operations
- IAC0303 Boring features are measured and verified in accordance with the drawing specifications required for basic milling operations
- IAC0304 Tapping features are measured and verified in accordance with the drawing specifications required for basic milling operations
- IAC0305 Reaming features are measured and verified in accordance with the drawing specifications required for basic milling operations
- IAC0306 Slot milling features are measured and verified in accordance with the drawing specifications required for basic milling operations
- IAC0307 Face and end milling features are measured and verified in accordance with the drawing specifications required for basic milling operations

10.2.4. PM-10-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, thread gauge, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

10.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, thread gauge, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores and taps

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies

- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

10.4 Exemptions

- None

11. 652201100-PM-11, Conduct advanced milling operations, NQF Level 4, Credits 10

11.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing advanced milling operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 18.75 days.

The learner will be required to:

- PM-11-PS01: Prepare for advanced milling operations
- PM-11-PS02: Clamp and align workpiece
- PM-11-PS03: Perform advanced milling operations to produce features of a component
- PM-11-PS04: Conduct quality assurance activities on the workpiece

11.2 Guidelines for Practical Skills

11.2.1. PM-11-PS01: Prepare for advanced milling operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps, T-slot mill, boring head, high speed tool bit the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select milling machine, tools and equipment for time-based task
- PA0103 Verify that milling machine and all other tooling and equipment are suitable for advanced milling operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Machine and tool selection techniques
- AK0103 Interpretation of additional tolerances and time requirements
- AK0104 Procedures for applying cutting fluids
- AK0105 Methods of verifying operational condition of machine, tools and equipment for advanced milling operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the milling machine, tools, equipment and processes required to meet the time and tolerance requirements of advanced milling operations

- IAC0102 Milling machine, tools and equipment are selected in accordance with the requirements of advanced milling operations
- IAC0103 Cutting fluids are applied in accordance with the specific advanced milling operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe operational condition of tools and equipment

11.2.2. PM-11-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps, T-slot mill, boring head, high speed tool bit the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece
- PA0203 Position and clock workpiece

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Methods of alignment

Internal Assessment Criteria

- IAC0201 The type of vice for advanced milling operations is selected and mounted in accordance with requirements for the operation
- IAC0202 Workpiece is clamped in accordance with safe advanced milling operations requirements
- IAC0203 Positioning and clocking of workpiece are completed in accordance with drawing requirements

11.2.3. PM-11-PS03: Perform advanced milling operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge

and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps, T-slot mill, boring head, high speed tool bit the learner must be able to:

- PA0301 Perform chamfering activities for a time and tightly tolerance based workpiece
- PA0302 Perform drilling activities for a time and tightly tolerance based workpiece
- PA0303 Perform boring and counter boring activities for a time and tightly tolerance based workpiece

Applied Knowledge

- AK0301 Procedures, processes, methods and sequencing of chamfering activities
- AK0302 Procedures, processes, methods and sequencing of drilling activities
- AK0303 Procedures, processes, methods and sequencing of boring activities
- AK0304 Procedures, processes, methods and sequencing of tapping activities
- AK0305 Procedures, processes, methods and sequencing of rough, face and end milling activities
- AK0306 Procedures, processes, methods and sequencing of using of dividing head and rotary tables

Internal Assessment Criteria

- IAC0301 Chamfering features are measured and verified in accordance with the drawing specifications
- IAC0302 Drilling features are measured and verified in accordance with the drawing specifications required for advanced milling operations
- IAC0303 Boring features are measured and verified in accordance with the drawing specifications required for advanced milling operations
- IAC0304 T-slot milling features are measured and verified in accordance with the drawing specifications required for advanced milling operations
- IAC0305 Face and end milling features are measured and verified in accordance with the drawing specifications required for advanced milling operations

11.2.4. PM-11-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including

chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps, T-slot mill, boring head, high speed tool bit the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

11.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, lathe, bench grinder, a pedestal drill, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, boring tools, centre drills, slot and end mills, rose cutter, counter bores, taps, T-slot mill, boring head, high speed tool bit

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

11.4 Exemptions

- None

12. 652201100-PM-12, Conduct basic grinding operations, NQF Level 3, Credits 12

12.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to conduct basic grinding operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 15 days.

The learner will be required to:

- PM-12-PS01: Prepare for basic grinding operations
- PM-12-PS02: Clamp and align workpiece
- PM-12-PS03: Perform basic grinding operations to produce feature of a component
- PM-12-PS04: Conduct quality assurance activities on the workpiece

12.2 Guidelines for Practical Skills

12.2.1. PM-12-PS01: Prepare for basic grinding operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select surface grinder, grinding wheels, tools and equipment for surface grinding operations
- PA0103 Verify that surface grinder and all tooling and equipment are suitable for basic surface grinding operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Grinding wheel selection, wheel balancing and dressing techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of surface grinder, grinding wheels, tools and equipment

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required for basic surface grinding
- IAC0102 Surface grinder, grinding wheels, tools and equipment are selected in accordance with surface grinding operations

- IAC0103 Cutting fluids are applied in accordance with the specific operations and processes
- IAC0104 Verification activities include checking grinding conditions and safe operational conditions of surface grinder, grinding wheels tools and equipment

12.2.2. PM-12-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece for basic grinding operations
- PA0203 Position and clock workpiece for basic grinding operations

Applied Knowledge

- AK0201 Selection methods
- AK0202 Selection methods
- AK0203 Clocking methods
- AK0204 Procedures for positioning and clocking workpiece

Internal Assessment Criteria

- IAC0201 The type of clamping device selected and mounted is verified against requirements for basic surface grinding operations
- IAC0202 Workpiece is clamped in accordance with safe basic surface grinding operational requirements
- IAC0203 Alignment and positioning of workpiece are completed in accordance with drawing requirements

12.2.3. PM-12-PS03: Perform basic grinding operations to produce feature of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and

lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0301 Select grinding wheel
- PA0302 Dress grinding wheel
- PA0303 Balance grinding wheel
- PA0304 Mount grinding wheel on surface grinder
- PA0305 Clamp and clock workpiece
- PA0306 Grind workpiece

Applied Knowledge

- AK0301 Selection methods
- AK0302 Dressing techniques
- AK0303 Balancing procedures
- AK0304 Wheel mounting procedures
- AK0305 Clamping and clocking procedures

Internal Assessment Criteria

- IAC0301 Grinding wheel is selected according to the material used for the task
- IAC0302 Grinding wheel is dressed in accordance with standard operating procedures
- IAC0303 Grinding wheel is balanced in accordance with standard operating procedures
- IAC0304 Grinding wheel is mounted in accordance with standard operating procedures and to meet safety requirements
- IAC0305 Workpiece is clamped and clocked in accordance with task requirements
- IAC0306 Workpiece is ground in accordance with drawing specifications

12.2.4. PM-12-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

12.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

12.4 Exemptions

- None

13. 652201100-PM-13, Conduct advanced grinding operations, NQF Level 4, Credits 15

13.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to conduct advanced grinding operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 25 days.

The learner will be required to:

- PM-13-PS01: Prepare for advanced grinding operations
- PM-13-PS02: Clamp and align workpiece
- PM-13-PS03: Perform advanced grinding operations to produce feature of a component
- PM-13-PS04: Conduct quality assurance activities on the workpiece

13.2 Guidelines for Practical Skills

13.2.1. PM-13-PS01: Prepare for advanced grinding operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select surface grinder, grinding wheels, tools and equipment for grinding hardened materials
- PA0103 Verify that surface grinder and all tooling and equipment are suitable for grinding hardened materials

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 Grinding wheel selection for soft and hardened materials
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of surface grinder, grinding wheels, tools and equipment

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required for grinding hardened materials
- IAC0102 Surface grinder, grinding wheels, tools and equipment are selected required for grinding hardened materials

- IAC0103 Cutting fluids are applied in accordance with the specific operations and processes
- IAC0104 Verification activities include checking grinding conditions and safe operational conditions for grinding hardened materials

13.2.2. PM-13-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece for advanced grinding operations
- PA0203 Position and clock workpiece for advanced grinding operations

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Clocking methods
- AK0204 Procedures for positioning and clocking workpiece

Internal Assessment Criteria

- IAC0201 The type of clamping device selected and mounted is verified against requirements for advanced grinding operations
- IAC0202 Workpiece is clamped in accordance with safe advanced surface grinding operational requirements
- IAC0203 Alignment and positioning of workpiece are completed in accordance with drawing requirements

13.2.3. PM-13-PS03: Perform advanced grinding operations to produce feature of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools,

hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0301 Dress grinding wheel for a time and tightly tolerance based workpiece
- PA0302 Balance grinding wheel for a time and tightly tolerance based workpiece
- PA0303 Mount grinding wheel on surface grinder for a time and tightly tolerance based workpiece
- PA0304 Grind workpiece for a time and tightly tolerance based workpiece
- PA0305 Dress a radius on a grinding wheel for a time and tightly tolerance based workpiece
- PA0306 Grind radius on workpiece for a time and tightly tolerance based workpiece

Applied Knowledge

- AK0301 Selection methods
- AK0302 Dressing techniques
- AK0303 Balancing procedures
- AK0304 Wheel mounting procedures
- AK0305 Clamping and clocking procedures

Internal Assessment Criteria

- IAC0301 Grinding wheel is selected according to the requirements for hardened material
- IAC0302 Grinding wheel is dressed in accordance with standard operating procedures
- IAC0303 Grinding wheel is balanced in accordance with standard operating procedures
- IAC0304 Grinding wheel is mounted in accordance with standard operating procedures and to meet safety requirements
- IAC0305 The radius dressing is completed to meet grinding wheel dressing requirements
- IAC0306 Workpiece is clamped and clocked in accordance with grinding procedures
- IAC0307 Radius is ground in accordance with drawing specifications

13.2.4. PM-13-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

13.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, surface grinder, bench grinder, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, grinding wheels, swivel grinding vice, grinding vice, gauge blocks, height gauge, wheel dresser, radius dresser, sine bar, V-block, magnetic blocks

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

13.4 Exemptions

- None

14. 652201100-PM-14, Conduct basic CNC milling operations, NQF Level 4, Credits 8

14.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing basic CNC milling operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-14-PS01: Prepare for basic CNC milling operations
- PM-14-PS02: Produce basic CNC milling programme
- PM-14-PS03: Clamp and clock workpiece
- PM-14-PS04: Perform basic CNC milling operations to produce features of a component
- PM-14-PS05: Conduct quality assurance activities on the workpiece

14.2 Guidelines for Practical Skills

14.2.1. PM-14-PS01: Prepare for basic CNC milling operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select CNC milling machine, tools and equipment for task
- PA0103 Verify that CNC milling machine and all other tooling and equipment are suitable for basic CNC milling operations
- PA0104 Determine the sequence of basic CNC milling operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 CNC milling machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of CNC milling machine, tools and equipment for basic CNC milling operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the CNC milling machine, tools, equipment and processes required for basic CNC milling operations

- IAC0102 CNC milling machine, tools and equipment are selected in accordance with identified processes that will be utilised for basic CNC milling operations
- IAC0103 Cutting fluids are applied in accordance with the specific basic CNC milling operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe CNC operational condition of tools and equipment

14.2.2. PM-14-PS02: Produce basic CNC milling programme

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0201 Produce basic CNC milling programme
- PA0202 Set up sheets
- PA0203 Conduct a computer simulation

Applied Knowledge

- AK0201 Methods of programming
- AK0202 Simulation sequencing

Internal Assessment Criteria

- IAC0201 A basic CNC milling programme is produced to on a PC
- IAC0202 Set-up sheets are completed to include the tool holder positions and types of tools used
- IAC0203 A basic CNC milling programme is produced to deliver a successful simulation of a profile as per drawing requirements

14.2.3. PM-14-PS03: Clamp and clock workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and

end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0301 Mount and clock CNC milling machine vice
- PA0302 Clamp and clock workpiece
- PA0303 Mount collets and tools in tool holders

Applied Knowledge

- AK0301 Selection methods
- AK0302 Clamping techniques
- AK0303 Methods of alignment
- AK0304 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0301 CNC milling machine vice is mounted and clocked in accordance with standard operating procedures
- IAC0302 Workpiece is clamped and clocked in accordance with standard operating procedures
- IAC0303 CNC milling machine tools and collets are mounted to reflect required tool offsets and tool types according to drawing specifications

14.2.4. PM-14-PS04: Perform basic CNC milling operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0401 Set up CNC milling machine
- PA0402 Perform a dry run of the CNC milling programme
- PA0403 Run the programme on the CNC milling machine to produce the workpiece

Applied Knowledge

- AK0401 Set up procedures
- AK0402 Dry run procedures
- AK0403 Sequencing of running programme

Internal Assessment Criteria

- IAC0401 The set up of the CNC milling machine reflects referencing X, Y and Z axis with reference to the clocked workpiece
- IAC0402 A dry run of the CNC milling programme is performed in order to check for any errors
- IAC0403 The machined workpiece meets the drawing specifications

14.2.5. PM-14-PS05: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0501 Measure workpiece
- PA0502 Complete inspection checklist
- PA0503 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0501 Measuring methods
- AK0502 Procedures for completing checklists
- AK0503 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0501 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0502 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0503 Non-compliances are identified and recorded on the inspection sheet

14.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various

drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

14.4 Exemptions

- None

15. 652201100-PM-15, Conduct advanced CNC milling operations, NQF Level 5, Credits 27

15.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing advanced CNC milling operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 31.25 days.

The learner will be required to:

- PM-15-PS01: Prepare for advanced CNC milling operations
- PM-15-PS02: Produce advanced CNC milling programme
- PM-15-PS03: Clamp and clock workpiece
- PM-15-PS04: Perform advanced CNC milling operations to produce features of a component
- PM-15-PS05: Conduct quality assurance activities on the workpiece

15.2 Guidelines for Practical Skills

15.2.1. PM-15-PS01: Prepare for advanced CNC milling operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select CNC milling machine, tools and equipment for task
- PA0103 Verify that CNC milling machine and all other tooling and equipment are suitable for advanced CNC milling operations
- PA0104 Determine the sequence of basic CNC milling operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 CNC milling machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of CNC milling machine, tools and equipment for advanced CNC milling operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the CNC milling machine, tools, equipment and processes required for advanced CNC milling operations

- IAC0102 CNC milling machine, tools and equipment are selected in accordance with identified processes that will be utilised for advanced CNC milling operations
- IAC0103 Cutting fluids are applied in accordance with the specific advanced CNC milling operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe CNC operational condition of tools and equipment

15.2.2. PM-15-PS02: Produce advanced CNC milling programme

Scope of Practical Skill

Given simulated or working environment, task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0201 Produce advanced CNC milling programme
- PA0202 Set up sheets
- PA0203 Conduct a computer simulation

Applied Knowledge

- AK0201 Programming methodologies
- AK0202 Calculation techniques
- AK0203 Simulation procedures

Internal Assessment Criteria

- IAC0201 A advanced CNC milling programme is produced on a PC including a tapping cycle
- IAC0202 Complex mathematical calculations are completed to produce an advanced CNC milling programme
- IAC0203 Set-up sheets are completed to include the tool holder positions and types of tools used
- IAC0204 The advanced CNC milling programme is produced to deliver a successful simulation of a profile in accordance with complex drawing requirements

15.2.3. PM-15-PS03: Clamp and clock workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial

gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0301 Mount and clock CNC milling machine vice
- PA0302 Clamp and clock workpiece
- PA0303 Mount collets and tools in tool holders

Applied Knowledge

- AK0301 Selection methods
- AK0302 Clamping techniques
- AK0303 Methods of alignment
- AK0304 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0301 CNC milling machine vice is mounted and clocked in accordance with standard operating procedures
- IAC0302 Workpiece is clamped and clocked in accordance with standard operating procedures
- IAC0303 CNC milling machine tools and collets are mounted to reflect required tool offsets and tool types according to drawing specifications

15.2.4. PM-15-PS04: Perform advanced CNC milling operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0401 Set up CNC milling machine
- PA0402 Perform a dry run of the advanced CNC milling programme
- PA0403 Run the programme on the CNC milling machine to produce the workpiece including the tapping cycle

Applied Knowledge

- AK0401 Set up procedures
- AK0402 Dry run procedures
- AK0403 Sequencing of running programme

Internal Assessment Criteria

- IAC0401 The set up of the CNC milling machine reflects referencing X, Y and Z axis with reference to the clocked workpiece
- IAC0402 A dry run of the CNC milling programme is performed in order to check for any errors
- IAC0403 The machined workpiece meets the drawing specifications

15.2.5. PM-15-PS05: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps the learner must be able to:

- PA0501 Measure workpiece
- PA0502 Complete inspection checklist
- PA0503 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0501 Measuring methods
- AK0502 Procedures for completing checklists
- AK0503 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0501 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0502 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0503 Non-compliances are identified and recorded on the inspection sheet

15.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module

- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, telescopic gauges, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, slot and end mills, rose cutter, roughing cutters, CNC programming software and hardware, tool holders and collets, edge finder, taps

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

15.4 Exemptions

- None

16. 652201100-PM-16, Conduct basic CNC turning operations, NQF Level 4, Credits 8

16.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing basic CNC turning operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-16-PS01: Prepare for basic CNC turning operations
- PM-16-PS02: Produce basic CNC turning programme
- PM-16-PS03: Clamp and clock workpiece
- PM-16-PS04: Perform basic CNC turning operations to produce features of a component
- PM-16-PS05: Conduct quality assurance activities on the workpiece

16.2 Guidelines for Practical Skills

16.2.1. PM-16-PS01: Prepare for basic CNC turning operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select CNC turning machine, tools and equipment for task
- PA0103 Verify that CNC turning machine and all other tooling and equipment are suitable for basic CNC turning operations
- PA0104 Determine the sequence of basic CNC turning operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 CNC turning machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of CNC turning machine, tools and equipment for basic CNC turning operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the CNC turning machine, tools, equipment and processes required for basic CNC turning operations

- IAC0102 CNC turning machine, tools and equipment are selected in accordance with identified processes that will be utilised for basic CNC turning operations
- IAC0103 Cutting fluids are applied in accordance with the specific basic CNC turning operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe CNC operational condition of tools and equipment

16.2.2. PM-16-PS02: Produce basic CNC turning programme

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0201 Produce basic CNC turning programme
- PA0202 Set up sheets
- PA0203 Conduct a computer simulation

Applied Knowledge

- AK0201 Programming methodologies
- AK0202 Sequencing of dry run

Internal Assessment Criteria

- IAC0201 A basic CNC turning programme is produced to on a PC
- IAC0202 Set-up sheets are completed to include the tool holder positions and types of tools used
- IAC0203 A basic CNC turning programme is produced to deliver a successful simulation of a profile as per drawing requirements

16.2.3. PM-16-PS03: Clamp and clock workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and

lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0301 Mount CNC lathe chuck
- PA0302 Clamp and clock workpiece
- PA0303 Mount tools into tool holders

Applied Knowledge

- AK0301 Selection methods
- AK0302 Clamping techniques
- AK0303 Methods of alignment
- AK0304 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0301 CNC lathe chuck is mounted in accordance with standard operating procedures
- IAC0302 Workpiece is clamped and clocked in accordance with standard operating procedures
- IAC0303 CNC turning machine tools are mounted to reflect required tool offsets and tool types according to drawing specifications

16.2.4. PM-16-PS04: Perform basic CNC turning operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0401 Set up CNC turning machine
- PA0402 Perform a dry run of the CNC turning programme
- PA0403 Run the programme on the CNC turning machine to produce the workpiece

Applied Knowledge

- AK0401 Set up procedures
- AK0402 Dry run procedures
- AK0403 Sequencing of dry run

Internal Assessment Criteria

- IAC0401 The set up of the CNC turning machine reflects referencing X and Z axis with reference to the clocked workpiece
- IAC0402 A dry run of the CNC turning programme is performed in order to check for any errors
- IAC0403 The machined workpiece meets the drawing specifications

16.2.5. PM-16-PS05: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0501 Measure workpiece
- PA0502 Complete inspection checklist
- PA0503 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0501 Measuring methods
- AK0502 Procedures for completing checklists
- AK0503 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0501 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0502 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0503 Non-compliances are identified and recorded on the inspection sheet

16.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel

rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre and rotating centre

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

16.4 Exemptions

- None

17. 652201100-PM-17, Conduct advanced CNC turning operations, NQF Level 5, Credits 28

17.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies of performing advanced CNC turning operations. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 31.25 days.

The learner will be required to:

- PM-17-PS01: Prepare for advanced CNC turning operations
- PM-17-PS02: Produce advanced CNC turning programme
- PM-17-PS03: Clamp and clock workpiece
- PM-17-PS04: Perform advanced CNC turning operations to produce features of a component
- PM-17-PS05: Conduct quality assurance activities on the workpiece

17.2 Guidelines for Practical Skills

17.2.1. PM-17-PS01: Prepare for advanced CNC turning operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select CNC turning machine, tools and equipment for task
- PA0103 Verify that CNC turning machine and all other tooling and equipment are suitable for advanced CNC turning operations
- PA0104 Determine the sequence of advanced CNC turning operations

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 CNC turning machine and tool selection techniques
- AK0103 Procedures for applying cutting fluids
- AK0104 Methods of verifying operational condition of CNC turning machine, tools and equipment for advanced CNC turning operations

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the CNC turning machine, tools, equipment and processes required for advanced CNC turning operations
- IAC0102 CNC turning machine, tools and equipment are selected in accordance with identified processes that will be utilised for advanced CNC turning operations
- IAC0103 Cutting fluids are applied in accordance with the specific advanced CNC turning operations and processes
- IAC0104 Verification activities include checking cutting conditions and safe CNC operational condition of tools and equipment

17.2.2. PM-17-PS02: Produce advanced CNC turning programme

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0201 Produce advanced CNC turning programme
- PA0202 Set up sheets
- PA0203 Conduct a computer simulation

Applied Knowledge

- AK0201 Programming methodologies
- AK0202 Calculation techniques
- AK0203 Simulation procedures

Internal Assessment Criteria

- IAC0201 An advanced CNC turning programme is produced on a PC including threading, taper cutting and convex and concave radii
- IAC0202 Complex mathematical calculations are completed to produce an advanced CNC turning programme
- IAC0203 Set-up sheets are completed to include the tool holder positions and types of tools used
- IAC0204 The advanced CNC turning programme is produced to deliver a successful simulation of a profile in accordance with complex drawing requirements

17.2.3. PM-17-PS03: Clamp and clock workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0301 Mount CNC lathe chuck
- PA0302 Clamp and clock workpiece
- PA0303 Mount tools in tool holders

Applied Knowledge

- AK0301 Selection methods
- AK0302 Clamping techniques
- AK0303 Methods of alignment
- AK0304 Procedures for securing workpiece

Internal Assessment Criteria

- IAC0301 CNC lathe chuck is mounted in accordance with standard operating procedures
- IAC0302 Workpiece is clamped and clocked in accordance with standard operating procedures
- IAC0303 CNC turning machine tools are mounted to reflect required tool offsets and tool types according to drawing specifications

17.2.4. PM-17-PS04: Perform advanced CNC turning operations to produce features of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0401 Set up CNC turning machine

- PA0402 Perform a dry run of the advanced CNC turning programme
- PA0403 Run the programme on the CNC turning machine to produce the workpiece including threading, taper cutting and convex and concave radii

Applied Knowledge

- AK0401 Set up procedures
- AK0402 Dry run procedures
- AK0403 Sequencing of running programme

Internal Assessment Criteria

- IAC0401 The set up of the CNC turning machine reflects referencing X and Z axis with reference to the clocked workpiece
- IAC0402 A dry run of the CNC turning programme is performed in order to check for any errors
- IAC0403 The machined workpiece meets the drawing specifications

17.2.5. PM-17-PS05: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre the learner must be able to:

- PA0501 Measure workpiece
- PA0502 Complete inspection checklist
- PA0503 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0501 Measuring methods
- AK0502 Procedures for completing checklists
- AK0503 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0501 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0502 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0503 Non-compliances are identified and recorded on the inspection sheet

17.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, drill chucks, various drills, reamers, countersinks, spot facers, hammers, cutting fluids, safety equipment, safety checklists, safety screens, cleaning and lubricating materials, cutting tools, cutting inserts including chamfering tools, centre drills, CNC programming software and hardware, tool holders, edge finder, tool holders, facing tools, chamfer tools, thread cutting tools, grooving tools, radius gauges, thread cutting gauge, thread gauge, go and no-go thread gauges, fixed centre, rotating centre

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

17.4 Exemptions

- None

18. 652201100-PM-18, Operate an EDM Plunge machine, NQF Level 5, Credits 15

18.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to operate an EDM Plunge machine. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-18-PS01: Prepare for EDM plunge operations
- PM-18-PS02: Clamp and align workpiece
- PM-18-PS03: Perform EDM plunge operations to produce feature of a component
- PM-18-PS04: Conduct quality assurance activities on the workpiece

18.2 Guidelines for Practical Skills

18.2.1. PM-18-PS01: Prepare for EDM plunge operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, tool makers vice, gauge blocks, height gauge, sine bar, electrode holder, electrodes, surface finishing gauge, machine spark gap setting manual, V-block, magnetic table the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select EDM plunge machine settings, tools and equipment for EDM plunge operations
- PA0103 Verify that EDM plunge machine and all tooling and equipment are suitable for EDM plunge operations
- PA0104 Calculate sparking gap

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 EDM plunge machine setting procedures
- AK0103 Methods of verifying operational condition of EDM plunge machine, tools and equipment
- AK0104 Process of calculating spark gap

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required for EDM plunge
- IAC0102 EDM plunge machine settings are selected in accordance with EDM plunge operations

- IAC0103 Verification activities are completed for safe machine operational conditions
- IAC0104 Sparking gap is calculated in accordance with machine parameters to meet drawing specifications

18.2.2. PM-18-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, tool makers vice, gauge blocks, height gauge, sine bar, electrode holder, electrodes, surface finishing gauge, machine spark gap setting manual, V-block, magnetic table the learner must be able to:

- PA0201 Select and mount clamping devices for workpiece
- PA0202 Clamp workpiece for EDM plunge operations
- PA0203 Position and clock workpiece for EDM plunge operations

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Clocking methods
- AK0204 Procedures for positioning and clocking workpiece

Internal Assessment Criteria

- IAC0201 The type of clamping device selected and mounted is verified against requirements for EDM plunge operations
- IAC0202 Workpiece is clamped in accordance with EDM plunge operational requirements
- IAC0203 Alignment and positioning of workpiece are completed in accordance with drawing requirements

18.2.3. PM-18-PS03: Perform EDM plunge operations to produce feature of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, tool makers vice, gauge blocks, height gauge, sine bar, electrode holder, electrodes, surface finishing gauge, machine spark gap setting manual, V-block, magnetic table the learner must be able to:

- PA0301 Mount and clock the electrode in position

- PA0302 Reference electrode to workpiece
- PA0303 Set EDM plunge machine parameters
- PA0304 Set dielectric level and flushing conditions
- PA0305 Spark workpiece

Applied Knowledge

- AK0301 Mounting and clocking procedures
- AK0302 Positioning techniques
- AK0303 Procedures for setting parameters
- AK0304 Procedures and processes to set dielectric levels
- AK0305 Sparking procedures

Internal Assessment Criteria

- IAC0301 Electrode is mounted and clocked in accordance with the EDM plunge machining procedures
- IAC0302 The electrode positioning is completed in relation to the workpiece
- IAC0303 EDM plunge machine parameters are set to achieve the required surface finish and sizes in accordance with the drawing specifications
- IAC0304 Dielectric level is set to submerge the workpiece and flushing conditions are set in accordance with standard operating procedures
- IAC0305 Workpiece is sparked to meet all quality and safety requirements in accordance with task requirements

18.2.4. PM-18-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, tool makers vice, gauge blocks, height gauge, sine bar, electrode holder, electrodes, surface finishing gauge, machine spark gap setting manual, V-block, magnetic table the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists
- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

18.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, tool makers vice, gauge blocks, height gauge, sine bar, electrode holder, electrodes, surface finishing gauge, machine spark gap setting manual, V-block, magnetic table

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

18.4 Exemptions

- None

19. 652201100-PM-19, Operate an EDM wire erosion machine, NQF Level 5, Credits 15

19.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to operate an EDM wire erosion machine. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 12.5 days.

The learner will be required to:

- PM-19-PS01: Prepare for EDM wire erosion machine operations
- PM-19-PS02: Clamp and align workpiece
- PM-19-PS03: Perform EDM wire erosion machine operations to produce feature of a component
- PM-19-PS04: Conduct quality assurance activities on the workpiece

19.2 Guidelines for Practical Skills

19.2.1. PM-19-PS01: Prepare for EDM wire erosion machine operations

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, clamping jigs, gauge blocks, height gauge, sine bar, machine spark gap setting manual, EDM wire, side cutter the learner must be able to:

- PA0101 Interpret a drawing
- PA0102 Identify and select EDM wire erosion machine settings, tools and equipment for EDM wire erosion machine operations
- PA0103 Verify that EDM wire erosion machine and all tooling and equipment are suitable for EDM wire erosion machine operations
- PA0104 Calculate sparking gap

Applied Knowledge

- AK0101 Methodology for reading and interpreting drawings
- AK0102 EDM wire erosion machine setting procedures
- AK0103 Methods of verifying operational condition of EDM wire erosion machine, tools and equipment
- AK0104 Process of calculating spark gap

Internal Assessment Criteria

- IAC0101 Drawings are interpreted to determine the tools, equipment and processes required for EDM wire erosion machine
- IAC0102 EDM wire erosion machine settings are selected in accordance with EDM wire erosion machine operations

- IAC0103 EDM wire erosion machine settings are selected in accordance with EDM wire erosion machine operations
- IAC0104 Sparking gap is calculated in accordance with machine parameters to meet drawing specifications

19.2.2. PM-19-PS02: Clamp and align workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, clamping jigs, gauge blocks, height gauge, sine bar, machine spark gap setting manual, EDM wire, side cutter the learner must be able to:

- PA0201 Select and mount clamping jigs for workpiece
- PA0202 Clamp workpiece for EDM wire erosion machine operations
- PA0203 Position and clock workpiece for EDM wire erosion machine operations

Applied Knowledge

- AK0201 Selection methods
- AK0202 Clamping techniques
- AK0203 Clocking methods
- AK0204 Procedures for positioning and clocking workpiece

Internal Assessment Criteria

- IAC0201 The type of clamping jigs selected and mounted is verified in accordance with EDM wire erosion machine operations
- IAC0202 Workpiece is clamped in accordance with EDM wire erosion machine operational requirements
- IAC0203 Alignment and positioning of workpiece are completed in accordance with EDM wire erosion machine operations

19.2.3. PM-19-PS03: Perform EDM wire erosion machine operations to produce feature of a component

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, clamping jigs, gauge blocks, height gauge, sine bar, machine spark gap setting manual, EDM wire, side cutter the learner must be able to:

- PA0301 Mount and clock the jig and workpiece
- PA0302 Position workpiece in relation to EDM wire erosion machine reference
- PA0303 Set EDM wire erosion machine parameters
- PA0304 Set dielectric and flushing conditions
- PA0305 Wire cut workpiece

Applied Knowledge

- AK0301 Jig mounting and clocking procedures
- AK0302 Positioning techniques
- AK0303 Procedures for setting EDM wire erosion machine parameters
- AK0304 Procedures and processes to set dielectric levels and flushing conditions
- AK0305 Wire cutting procedures

Internal Assessment Criteria

- IAC0301 The jig and workpiece are mounted and clocked in accordance with the EDM wire erosion machining procedures
- IAC0302 A wire alignment and the workpiece positioning are completed in relation to EDM wire erosion machine reference
- IAC0303 EDM wire erosion machine parameters are set to achieve the required sizes and profile features in accordance with the drawing specifications
- IAC0304 Dielectric value and flushing conditions are set in accordance with standard operating procedures
- IAC0305 Workpiece is wire cut to meet all quality and safety criteria in accordance with task requirements

19.2.4. PM-19-PS04: Conduct quality assurance activities on the workpiece

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, clamping jigs, gauge blocks, height gauge, sine bar, machine spark gap setting manual, EDM wire, side cutter the learner must be able to:

- PA0401 Measure workpiece
- PA0402 Complete inspection checklist
- PA0403 Verify sizes, identify non-compliances and record findings

Applied Knowledge

- AK0401 Measuring methods
- AK0402 Procedures for completing checklists

- AK0403 Procedures for verification and recording activities

Internal Assessment Criteria

- IAC0401 Workpiece is examined and measured in accordance with requirements stipulated in the drawing specifications
- IAC0402 Inspection sheet is completed reflecting actual sizes of the workpiece
- IAC0403 Non-compliances are identified and recorded on the inspection sheet

19.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, radius gauges, verniers, steel rulers, dial gauges, inside, outside and depth micrometers, clock gauge and stand, tape measures, marking dye, a range of hand tools, hammers, safety equipment, safety checklists, safety screens, cleaning materials, clamping jigs, gauge blocks, height gauge, sine bar, machine spark gap setting manual, EDM wire, side cutter

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

19.4 Exemptions

- None

20. 652201100-PM-20, Manufacture a die, NQF Level 5, Credits 12

20.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to manufacture a die. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 8.75 days.

The learner will be required to:

- PM-20-PS01: Plan and prepare the die manufacturing process
- PM-20-PS02: Machine components
- PM-20-PS03: Assemble die components
- PM-20-PS04: Conduct tool trial and de-bugging activities

20.2 Guidelines for Practical Skills

20.2.1. PM-20-PS01: Plan and prepare the die manufacturing process

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0101 Read and interpret drawings
- PA0102 Determine wire EDM requirements
- PA0103 Check the availability of all components on the Bill of Material
- PA0104 Determine off-set requirements
- PA0105 Determine punch sizes and tolerances requirements
- PA0106 Procure tools, equipment, parts and steel material
- PA0107 Identify and mark components that require heat treatment.

Applied Knowledge

- AK0101 Planning processes and procedures
- AK0102 Methods of working with Bill of Material
- AK0103 Procedures for completing data sheets
- AK0104 Processes and procedures for procuring tools, equipment and materials
- AK0105 Techniques of identifying part heat treatment requirements

Internal Assessment Criteria

- IAC0101 The drawing is read and interpreted including drawing notes, tolerances "cutting clearance", Wire-EDM offsets assessment criteria, tool drawing sheets, sectioned views, how the tool functions and critical dimensions in order to determine the requirements of the die to be manufactured
- IAC0102 EDM wire requirements are determined including wire erosion profile, surface finish requirements, and starting hole sizes and positions

- IAC0103 Availability of all components on the bill of material are checked in accordance with tool drawing and tool manufacturing requirements
- IAC0104 The off-set requirements are determined in accordance with machine manufacturers technology database
- IAC0105 The punch sizes and tolerances requirements are determined according to drawing specifications
- IAC0106 The availability of all tools, equipment, machines and parts is verified and confirmed in accordance with the requirements of the task
- IAC0107 Components that require heat treatment are identified and marked in order to prepare for heat treatment processes

20.2.2. PM-20-PS02: Machine components

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0201 Plan the machining tasks
- PA0202 Identify parts that require multiple processes and sequence operations
- PA0203 Conventional machining
- PA0204 Specialised machining
- PA0205 Check parts before sending for heat treatment
- PA0206 Plan conventional and advanced machining
- PA0207 Machine after heat treatment
- PA0208 Wire-EDM

Applied Knowledge

- AK0201 Planning procedures
- AK0202 Sequencing of tasks and activities
- AK0203 Methods and techniques of various machining operations
- AK0204 Checking procedures
- AK0205 CNC machining and tool selection techniques
- AK0206 Methods of verifying CNC machining such as cutting paths, simulation and collision prevention
- AK0207 Required CNC programming knowledge and off-set calculations
- AK0208 Clamping, machine and job setup methodology
- AK0209 Knowledge of speeds and feeds applicable to various materials and cutting tools

Internal Assessment Criteria

- IAC0201 Machining tasks are planned and parts that are machined are sequenced in accordance with heat treatment requirements
- IAC0202 Parts that require multiple operations are identified including milling grinding, hardening, grinding, Sink-EDM and wire EDM, and the sequence of operations are determined and planned to include sufficient oversize provisions for secondary machining requirements
- IAC0203 Perform all conventional machining activities such as, milling, turning, drilling and grinding as per drawing specifications
- IAC0204 Perform all specialised machining activities such as, CNC milling, CNC turning, Wire-EDM and Plunge-EDM as per drawing specifications
- IAC0205 Parts that need heat treatment are checked for threads, starting holes for wire-EDM and any other pre-machining requirements before sending for heat treatment
- IAC0206 Machining operations, tool requirements and preparation programs for CNC machines are planned in order to machine components
- IAC0207 EDM wired in accordance with requirements including parts that need wire-EDM are marked, starting hole positions indicated, outside or inside contour needs identified and that the material has sufficient oversize for clamping
- IAC0208 Plates are machined in accordance with specifications

20.2.3. PM-20-PS03: Assemble die components

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0301 Fit cutting elements
- PA0302 Assemble bottom die/shoe
- PA0303 Position Die plate
- PA0304 Position Stripper /guide plate and punch holder
- PA0305 Assemble upper die
- PA0306 Finish lower die bolster (scrap holes)
- PA0307 Prepare and manufacture the setup / Tool stop
- PA0308 Conduct dry testing
- PA0309 Conduct visual inspection

Applied Knowledge

- AK0301 Assembling procedures
- AK0302 Assembling sequences
- AK0303 Testing procedures and sequences

Internal Assessment Criteria

- IAC0301 The upper and die shoe line up by confirming that there is no edging as the punches travel from the guide plate into the die plate
- IAC0302 Punches run freely in the guide plate without play

20.2.4. PM-20-PS04: Conduct tool trial and de-bugging activities

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0401 De-bug Die
- PA0402 Coining punches for "eye" area and "profile bend"
- PA0403 Perform a re-trial
- PA0404 Produce component and complete documentation requirements
- PA0405 Remove tool, clean press area and tool

Applied Knowledge

- AK0401 Debugging methods
- AK0402 Re-trial procedures
- AK0403 Procedures for completing documentation
- AK0404 Tool cleaning procedures and methods

Internal Assessment Criteria

- IAC0401 Tool is set in the applicable press with a minimum 45T press
- IAC0402 Each progression is manually pitched and irregularities are observed in accordance with parameters
- IAC0403 Strip is inspected for any irregularities with emphasis on the pilot holes and signs of mis-feeds
- IAC0404 Produced components are checked against drawing specifications with special emphasis on the coining punches and adjusted as required
- IAC0405 Re-testing and de-bugging activities are undertaken to ensure that produced components comply to drawing specifications
- IAC0406 Documentary requirements are met in accordance with inspection procedures

20.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module

- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

20.4 Exemptions

- None

21. 652201100-PM-21, Manufacture a Mould, NQF Level 5, Credits 9

21.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to practice the standards, processes, procedures, techniques and methodologies to manufacture a mould. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 8.75 days.

The learner will be required to:

- PM-21-PS01: Plan and prepare the mould manufacturing process
- PM-21-PS02: Machine parts
- PM-21-PS03: Assemble mould components
- PM-21-PS04: Conduct tool trial and de-bugging activities

21.2 Guidelines for Practical Skills

21.2.1. PM-21-PS01: Plan and prepare the mould manufacturing process

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0101 Read and interpret drawings
- PA0102 Determine wire or plunge EDM requirements
- PA0103 Check the availability of all components on the Bill of Material
- PA0104 Calculate cavity sizes
- PA0105 Determine cavity plate and tolerances requirements
- PA0106 Procure tools, equipment, parts and steel material
- PA0107 Identify and mark components that require heat treatment

Applied Knowledge

- AK0101 Planning processes and procedures
- AK0102 Methods of working with Bill of Material
- AK0103 Procedures for completing data sheets
- AK0104 Processes and procedures for procuring tools, equipment, machines and materials
- AK0105 Techniques of identifying part heat treatment requirements
- AK0106 Plastics and the various shrinkage factor that applies to the relevant plastic used

Internal Assessment Criteria

- IAC0101 The drawing is read and interpreted including drawing notes, tolerances "shrinkage calculation sheets", assessment criteria, tool drawing sheets, sectioned views, how the tool functions and critical dimensions in order to determine the requirements of the mould to be manufactured

- IAC0102 EDM requirements are determined including wire erosion profile, surface finish requirements, electrode requirements and starting hole sizes and positions
- IAC0103 Availability of all components on the bill of material are checked in accordance with tool drawing and tool manufacturing requirements
- IAC0104 Cavity sizes are calculated as per the shrinkage factor
- IAC0105 The cavity plate and tolerances requirements are determined reflecting with dimensions in accordance with drawing specifications
- IAC0106 All document requirements are met to procure tools, equipment and parts in accordance with tool drawing
- IAC0107 The availability of all tools, equipment, machines and parts is verified and confirmed in accordance with the requirements of the task
- IAC0108 Components that require heat treatment are identified and marked in order to prepare for heat treatment processes

21.2.2. PM-21-PS02: Machine parts

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0201 Plan the machining tasks
- PA0202 Identify parts that require multiple processes and sequence operations
- PA0203 Conventional machining
- PA0204 Specialised machining
- PA0205 Check parts before sending for heat treatment
- PA0206 Plan conventional and advanced machining
- PA0207 Machine after heat treatment
- PA0208 Wire EDM
- PA0209 Plunge EDM, machine cavity inserts and cavity core inserts
- PA0210 Drill water channels and thread for coupling

Applied Knowledge

- AK0201 Planning procedures
- AK0202 Sequencing of tasks and activities
- AK0203 Methods and techniques of various machining operations
- AK0204 Checking procedures
- AK0205 CNC machining and tool selection techniques
- AK0206 Methods of verifying CNC machining such as cutting paths, simulation and collision prevention

- AK0207 Required CNC programming knowledge and off-set calculations
- AK0208 Clamping, machine and job setup methodology
- AK0209 Knowledge of speeds and feeds applicable to various materials and cutting tools

Internal Assessment Criteria

- IAC0201 Machining tasks are planned and parts that are machined are sequenced in accordance with heat treatment requirements
- IAC0202 Parts that require multiple operations are identified including milling, grinding, hardening, grinding, Sink-EDM and wire EDM, and the sequence of operations are determined and planned to include sufficient oversize provisions for secondary machining requirements
- IAC0203 Perform all conventional machining activities such as, milling, turning, drilling and grinding as per drawing specifications
- IAC0204 Perform all specialised machining activities such as, CNC milling, CNC turning, Wire-EDM and Plunge-EDM as per drawing specifications
- IAC0205 Parts that need heat treatment are checked for threads, starting holes for wire-EDM and any other pre-machining requirements before sending for heat treatment in accordance with machining requirements
- IAC0206 Machining operations, tool requirements and programs for CNC machines are planned in order to machine components
- IAC0207 EDM plunge activities are completed as per task requirements
- IAC0208 EDM wired in accordance with requirements including parts that need wire-EDM are marked, starting hole positions indicated, outside or inside contour needs identified and that the material has sufficient oversize for clamping
- IAC0209 Copper electrodes are machined in considering shrinkage factor and sparking gap
- IAC0210 The machine parameters, electrode and the workpiece are set up in accordance with machining operational requirements
- IAC0211 The cavity inserts and cavity core inserts are plunged in accordance with machine settings and to meet drawing specifications
- IAC0212 Water channels are drilled and thread for coupling are machined in accordance with drawing specifications

21.2.3. PM-21-PS03: Assemble mould components

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0301 Fit mould components and accessories
- PA0302 Assemble fixed half

- PA0303 Assemble moving half
- PA0304 Adjust ejectors and core pins

Applied Knowledge

- AK0301 Fitting procedures
- AK0302 Assembly steps and sequences
- AK0303 Adjustment processes
- AK0304 Securing procedures

Internal Assessment Criteria

- IAC0301 Mould components are fitted to reflect that all core inserts are a slide fit in the cavity inserts, all ejectors and sleeve ejectors move freely and clearance does not exceed 0.02 mm
- IAC0302 Fixed half is adjusted ensuring that the sprue bush is level with the split line on the fixed half
- IAC0303 Sprue bush is secured against rotation, cavity core inserts are fitted into cavity insert and height is adjusted before mounting the back plate
- IAC0304 Moving half is assembled ensuring the ejector pins and sleeve ejector move freely, push backs are adjusted to correct length in accordance with drawing specifications

21.2.4. PM-21-PS04: Conduct tool trial and de-bugging activities

Scope of Practical Skill

Given task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment the learner must be able to:

- PA0401 Sample the mould
- PA0402 De-bug mould

Applied Knowledge

- AK0401 Sampling procedures
- AK0402 Debugging procedures and techniques
- AK0403 Quality checks

Internal Assessment Criteria

- IAC0401 Half shots are produced in order to make comparison between cavities to determine if gates are equally balanced and check for defects and bad split line
- IAC0402 The two cavities are compared to one another to determine if the parts are identical in size to ensure balanced mould
- IAC0403 The mould is tested and de-bugged to ensure a balanced mould

21.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

21.4 Exemptions

- None

22. 652201100-PM-22, Plan for the tool/die/mould component and assembly manufacturing cycle, NQF Level 5, Credits 21

22.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to plan and develop all concepts and processes required to produce a tool/ die/ mould to manufacture a product to specification. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 23.75 days.

The learner will be required to:

- PM-22-PS01: Plan component and assembly and produce a schedule for machining processes
- PM-22-PS02: Report on engineering drawing and specification
- PM-22-PS03: Evaluate occupational health and safety requirements
- PM-22-PS04: Interpret the simulation and tool/mould development process results to verify and adjust tool/mould design

22.2 Guidelines for Practical Skills

22.2.1. PM-22-PS01: Plan component and assembly and produce a schedule for machining processes

Scope of Practical Skill

Given the working environment, supplied engineering drawing, product specification and available machines the learner must be able to:

- PA0101 Determine machining tools, bill of materials, equipment and required measuring equipment
- PA0102 Determine the machining and required measuring process
- PA0103 Determine the machining sequence
- PA0104 Draw a job plan, procedures and work schedule based on machining processes
- PA0105 Estimate production cost with reference to materials, resources, processes, volumes and time

Applied Knowledge

- AK0101 Application and principles of job planning, bench-work and layout
- AK0102 Theories of measurement and metrology
- AK0103 Fundamentals of uses, preparations and operations of machines and tools
- AK0104 Theory of production time estimation
- AK0105 Applied basic statistics for machining
- AK0106 Application of safety and housekeeping
- AK0107 Theories of production costs, raw material costs and labour costs

Internal Assessment Criteria

- IAC0101 Materials and machines identified meet the requirements of the specifications against the engineering drawings

- IAC0102 Measuring equipment selected meet the tolerance specifications of the drawings
- IAC0103 Planning production, processes and procedures documents developed meet product specification
- IAC0104 Cost to manufacture are accurate and provide for all aspects of tool/die and mould manufacturing

22.2.2. PM-22-PS02: Report on engineering drawing and specification

Scope of Practical Skill

Given the working environment, supplied engineering drawing, product specification and available machines the learner must be able to:

- PA0201 Read and interpret drawings with reference to projected views, materials, machining processes, tolerances, finishing, references and volumes (quantities)
- PA0202 Report on engineering drawing and specification

Applied Knowledge

- AK0201 Application of science, measurement and materials
- AK0202 Principles of design review processes
- AK0203 Theories and principles of engineering drawing

Internal Assessment Criteria

- IAC0201 Demonstration and explanation of knowledge of drawing practices and specification
- IAC0202 Free hand sketches of models and parts are demonstrated to meet specifications

22.2.3. PM-22-PS03: Evaluate occupational health and safety requirements

Scope of Practical Skill

Given the working environment, supplied engineering drawing, product specification and available machines the learner must be able to:

- PA0301 Conduct and health and safety checks
- PA0302 Compile safety, health, environmental, risk and quality (SHERQ) requirements and report

Applied Knowledge

- AK0301 Fundamentals of uses, preparations and operations of machines and tools
- AK0302 Legislation and application of Health and Safety

Internal Assessment Criteria

- IAC0301 The SHERQ requirements are accurately identified and evaluated to determine the Corrective occupational health and safety measures are developed and applied in accordance with task requirements

22.2.4. PM-22-PS04: Interpret the simulation and tool/mould development process results to verify and adjust tool/mould design

Scope of Practical Skill

Given the working environment, supplied engineering drawing, product specification and available machines the learner must be able to:

- PA0401 Simulate the required CNC machining process including tool and machine setting by using equipment, computer simulation programmes to verify the machining process
- PA0402 Interpret the simulation and CNC set-up and machining process results
- PA0403 Report on simulation results with possible adjustment and recommendations

Applied Knowledge

- AK0401 Theories of CNC programming to control machine tools
- AK0402 Basics of pneumatics, hydraulics
- AK0403 Report writing techniques
- AK0404 Properties of mechanical systems

Internal Assessment Criteria

- IAC0401 Required part/product is generated through simulation using computer software in accordance to specification
- IAC0402 Results are interpreted to determine variances and any adjustments required
- IAC0403 Reports are produced reflecting adjustment requirements and recommendations for CNC machining process

22.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

22.4 Exemptions

- None

23. 652201100-PM-23, Assess product manufacturing process and verify compliance, NQF Level 5, Credits 19

23.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to apply process planning and quality control practices. The learning contract time, which is the time that reflects the required duration of enrolment for this module, is at least 23.75 days.

The learner will be required to:

- PM-23-PS01: Assess process planning
- PM-23-PS02: Verify product manufacturing process and plans
- PM-23-PS03: Certify compliance to specification

23.2 Guidelines for Practical Skills

23.2.1. PM-23-PS01: Assess process planning

Scope of Practical Skill

Given process plan, product specification, machines, equipment, tools and materials the learner must be able to:

- PA0101 Check that the machining operations, equipment and tools meet specification
- PA0102 Confirm or record changes to the process planning
- PA0103 Recommend alternatives to elements of the process planning

Applied Knowledge

- AK0101 Demonstrate basic knowledge of Measurement, Materials and Safety
- AK0102 Principles and techniques of machining process, job planning, bench-work and layout

Internal Assessment Criteria

- IAC0101 Report on machining operations, equipment and tools comply to specifications
- IAC0102 Explanation and report on changes and recommendation demonstrate knowledge of implementing alternative machining process

23.2.2. PM-23-PS02: Verify product manufacturing process and plans

Scope of Practical Skill

Given process plan, product specification, machines, equipment, tools and materials the learner must be able to:

- PA0201 Assess procedures followed in manufacturing processes
- PA0202 Revise and adjust the processes

Applied Knowledge

- AK0201 Theory of Measurement, Materials and Safety
- AK0202 Principles and techniques of machining process, job planning, bench-work and layout

Internal Assessment Criteria

- IAC0201 The faults in process planning are identified and corrected by applying knowledge of alternative machining processes

23.2.3. PM-23-PS03: Certify compliance to specification

Scope of Practical Skill

Given process plan, product specification, machines, equipment, tools and materials the learner must be able to:

- PA0301 Adjust procedures to ensure that product meet quality specifications
- PA0302 Adjust machines, tools and materials to meet specifications

Applied Knowledge

- AK0301 Theory of Measurement, Materials and Safety
- AK0302 Principles and techniques of machining process, job planning, bench-work and layout

Internal Assessment Criteria

- IAC0301 Evaluation report to ensure that the product meets required specification

23.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Access to working OR simulated tooling environment
- Access to learning materials and manuals used to provide training to learners for the practice of the skills covered within the module
- Task instructions, relevant personal protective equipment, engineering drawing, product specification, material, a range of measuring devices and instruments, CNC (milling and turning) and EDM (wire and spark) toolroom machines and equipment

Human Resource Requirements:

- Facilitator should have a qualification or proven experience as a Toolmaker
- ETD qualification
- Assessor competencies
- Facilitator/learner ratio 1 to 20

Legal Requirements:

- Compliance to OHS Act and relevant labour legislation

23.4 Exemptions

- None

SECTION 3C: WORK EXPERIENCE MODULE SPECIFICATIONS

List of Work Experience Module Specifications

- 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5
- 652201100-WM-02, Drill press operations, NQF Level 4, Credits 10
- 652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10
- 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10
- 652201100-WM-05, Milling operations, NQF Level 4, Credits 15
- 652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10
- 652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35
- 652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35
- 652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35
- 652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35
- 652201100-WM-11, Quality assurance processes for verification of product conformance to specifications, NQF Level 5, Credits 13
- 652201100-WM-12, Tool production processes to meet customer needs and specifications, NQF Level 5, Credits 20

1. 652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5

1.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to workplace orientation and working alongside a qualified Toolmaker to undertake job planning, preparation and various elementary toolmaking processes and procedures. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 15 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-01-WE01: Workplace and safety orientation
- WM-01-WE02: Observe and document manufacturing processes
- WM-01-WE03: Observe and document maintenance processes
- WM-01-WE04: Observe and document design processes
- WM-01-WE05: Observe and document toolroom processes
- WM-01-WE06: Conduct pedestal grinder operations
- WM-01-WE07: Perform benchwork activities
- WM-01-WE08: Operate different saws with different blades
- WM-01-WE09: Read and interpret a drawing for a specific tool
- WM-01-WE10: Perform layout activities

1.2 Guidelines for Work Experiences

1.2.1. WM-01-WE01: Workplace and safety orientation

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Research the company size, product range, logistics, vision / mission and document the findings
- WA0102 Write a report on the company's safety requirements and complete a safety survey
- WA0103 Write a report on the company's quality management system (QMS) requirements and perform a QMS survey
- WA0104 Investigate and participate in a quality conformance procedure, document the process and produce a flow chart
- WA0105 Report on the workplace product development process using the PDLC model
- WA0106 Procure and use personal protective equipment (PPE), and adhere to safety standards and regulations and report unsafe conditions

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific job assignment completed by the learner

- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on the workplace orientation activities as referenced in the job card signed by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.2. WM-01-WE02: Observe and document manufacturing processes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Observe and record each facet of the manufacturing process
- WA0202 Produce a framework for the manufacturing process
- WA0203 Develop a flow chart of the overall manufacturing process

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on the manufacturing process activities as referenced in the job card signed by the learner

1.2.3. WM-01-WE03: Observe and document maintenance processes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0301 Observe, record and document the maintenance process
- WA0302 Design a flow chart for the maintenance process

Supporting Evidence

- SE0301 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0302 Verification conducted by authorising manager, supervisor, trainer or instructor, on the maintenance process activities as referenced in the job card signed by the learner
- SE0303 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.4. WM-01-WE04: Observe and document design processes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0401 Observe and record each facet of the design process
- WA0402 Produce a framework for the design process
- WA0403 Develop a flow chart of the overall design process

Supporting Evidence

- SE0401 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0402 Verification conducted by authorising manager, supervisor, trainer or instructor, on the design process activities as referenced in the job card signed by the learner
- SE0403 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.5. WM-01-WE05: Observe and document toolroom processes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0501 Observe and record each facet of the toolroom process
- WA0502 Produce a framework for the toolroom process
- WA0503 Develop a flow chart of the overall toolroom process

Supporting Evidence

- SE0501 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0502 Verification conducted by authorising manager, supervisor, trainer or instructor, on the toolroom process activities as referenced in the job card signed by the learner
- SE0503 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.6. WM-01-WE06: Conduct pedestal grinder operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0601 Dress a grinding wheel
- WA0602 Sharpen drill bits
- WA0603 Grind various tools
- WA0604 Change grinding wheels
- WA0605 Conduct ring tests

Supporting Evidence

- SE0601 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0602 Verification conducted by authorising manager, supervisor, trainer or instructor, on the pedestal grinder operations as referenced in the job card signed by the learner
- SE0603 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.7. WM-01-WE07: Perform benchwork activities

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0701 Measure part properties
- WA0702 Select and verify various materials by type
- WA0703 Cut material into the right size
- WA0704 Locate and inspect workstations
- WA0705 Perform tooling care and maintenance activities
- WA0706 Measure parts
- WA0707 Complete quality control inspection reports and data
- WA0708 Deburr materials by hand
- WA0709 Conduct filing activities
- WA0710 Polish parts
- WA0711 Broach parts by hand
- WA0712 Use different metal files
- WA0713 Check surface finishes
- WA0714 Use a hacksaw and different blades

Supporting Evidence

- SE0701 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0702 Verification conducted by authorising manager, supervisor, trainer or instructor, on the benchwork activities as referenced in the job card signed by the learner
- SE0703 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.8. WM-01-WE08: Operate different saws with different blades

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0801 Operate a horizontal and vertical bandsaw with different blades
- WA0802 Select proper speeds and feeds for sawing operations
- WA0803 Measure materials
- WA0804 Cut materials
- WA0805 Saw a given angle
- WA0806 Use of hoist and slings
- WA0807 Implement responsibilities for lock out and tag out
- WA0808 Perform stock calculations
- WA0809 Select saws for various jobs

Supporting Evidence

- SE0801 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0802 Verification conducted by authorising manager, supervisor, trainer or instructor, on the saw operations as referenced in the job card signed by the learner
- SE0803 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.9. WM-01-WE09: Read and interpret a drawing for a specific tool

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0901 Draw freehand drawings
- WA0902 Label different types of view and use various types of lines
- WA0903 Locate surfaces and features on various drawing views and use various dimensions
- WA0904 Compute total tolerances
- WA0905 Interpret internal threads
- WA0906 Interpret tables, specifications, references and notes

Supporting Evidence

- SE0901 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE0902 Verification conducted by authorising manager, supervisor, trainer or instructor, on the reading and interpreting a drawing for a specific tool as referenced in the job card signed by the learner
- SE0903 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.2.10. WM-01-WE10: Perform layout activities

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA1001 Prepare a surface or layout
- WA1002 Layout stock
- WA1003 Use a surface gauge
- WA1004 Read measuring equipment
- WA1005 Use gauge blocks
- WA1006 Layout work with a combination square

Supporting Evidence

- SE1001 Job card detailing the name of the learner and the specific job assignment completed by the learner
- SE1002 Verification conducted by authorising manager, supervisor, trainer or instructor, on the layout activities as referenced in the job card signed by the learner
- SE1003 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module

1.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

1.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

1.5 Additional Assignments to be Assessed Externally

None

2. 652201100-WM-02, Drill press operations, NQF Level 4, Credits 10

2.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform drill press operations and activities. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 18.75 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-02-WE01: Perform drill press operations and activities
- WM-02-WE02: Conduct housekeeping and implement safety standards during drill press operations

2.2 Guidelines for Work Experiences

2.2.1. WM-02-WE01: Perform drill press operations and activities

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Secure a workpiece
- WA0102 Machine ream a hole
- WA0103 Hand ream a hole
- WA0104 Select speeds and feeds
- WA0105 Perform tapping procedure
- WA0106 Countersink and spot face a hole
- WA0107 Make use of drifts
- WA0108 Install drill chucks and taper shank tools
- WA0109 Clamp piece to the table horizontally and vertically
- WA0110 Determine the appropriate process of work
- WA0111 Align and centre the drill to the hole position

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific drill press operations and housekeeping and safety activities completed by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on the drill press operations and housekeeping and safety activities undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

2.2.2. WM-02-WE02: Conduct housekeeping and implement safety standards during drill press operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during drill press operations
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during specific drill press operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during drill press operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

2.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

2.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

2.5 Additional Assignments to be Assessed Externally

None

3. 652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10

3.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out between centres turning operations for straight turning and activities related to turning. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 18.75 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-03-WE01: Perform turning operations between centres
- WM-03-WE02: Conduct housekeeping and implement safety standards during turning operations between centres

3.2 Guidelines for Work Experiences

3.2.1. WM-03-WE01: Perform turning operations between centres

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Set up a lathe
- WA0102 Face a part to length
- WA0103 Centre drill
- WA0104 Use chucks
- WA0105 Use a parting tool
- WA0106 Perform lathe filing
- WA0107 Produce rough and finish cuts
- WA0108 Determine speeds and feeds
- WA0109 Locate main power and position guards, clamping and support points
- WA0110 Turn diameters and shoulders
- WA0111 Machine chamfers
- WA0112 Use a carrier (dog)

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific turning operations between centres completed by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on turning between centres operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

3.2.2. WM-03-WE02: Conduct housekeeping and implement safety standards during turning operations between centres

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during turning operations between centres
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during turning operations between centres
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during turning operations between centres
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

3.3 Contextualised Workplace Knowledge

- 1 Company quality management systems and procedures
- 2 Work instructions, checklists, specifications and standards
- 3 Manufacturer manuals and specifications
- 4 Company health and safety policies and procedures
- 5 Company tools and equipment handling, care, maintenance and storage procedures
- 6 Company policies and procedures

3.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

3.5 Additional Assignments to be Assessed Externally

None

4. 652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10

4.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out chucking operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 18.75 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-04-WE01: Perform chucking operations
- WM-04-WE02: Conduct housekeeping and implement safety standards during chucking operations

4.2 Guidelines for Work Experiences

4.2.1. WM-04-WE01: Perform chucking operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Set up a lathe
- WA0102 Face a part to length
- WA0103 Centre drill and drill a part
- WA0104 Identify chucks
- WA0105 Make use of a parting tool
- WA0106 Perform lathe filling
- WA0107 Produce rough and finish cuts
- WA0108 Determine speeds and feeds
- WA0109 Locate main power and position guards, clamping and support points
- WA0110 Turn diameters and shoulders
- WA0111 Machine chamfers

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific chucking operations by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on chucking operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

4.2.2. WM-04-WE02: Conduct housekeeping and implement safety standards during chucking operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during chucking operations
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during chucking operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during chucking operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

4.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

4.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

4.5 Additional Assignments to be Assessed Externally

None

5. 652201100-WM-05, Milling operations, NQF Level 4, Credits 15

5.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out milling operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 25 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-05-WE01: Perform milling operations
- WM-05-WE02: Conduct housekeeping and implement safety standards during milling operations

5.2 Guidelines for Work Experiences

5.2.1. WM-05-WE01: Perform milling operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Prepare a checklist and check overall conditions of the machines
- WA0102 Remove and store previous tooling and job articles
- WA0103 Inspects machinery and equipment for safety
- WA0104 Set mill feeds and speeds
- WA0105 Mount various cutters and workpieces
- WA0106 Use a vice
- WA0107 Perform conventional milling and climb milling
- WA0108 Sweep in a vertical milling machine head
- WA0109 Cut a square key, slots, radii and ID and OD profiles with a boring head
- WA0110 Use an edge finder and a wiggler
- WA0111 Mill a woodruff key slot
- WA0112 Use counter bores and countersinks
- WA0113 Implement various drill points geometries

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific milling operations by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on milling operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

5.2.2. WM-05-WE02: Conduct housekeeping and implement safety standards during milling operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during milling operations
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during milling operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during milling operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

5.3 Contextualised Workplace Knowledge

- 1 Company quality management systems and procedures
- 2 Work instructions, checklists, specifications and standards
- 3 Manufacturer manuals and specifications
- 4 Company health and safety policies and procedures
- 5 Company tools and equipment handling, care, maintenance and storage procedures
- 6 Company policies and procedures

5.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

5.5 Additional Assignments to be Assessed Externally

None

6. 652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10

6.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out grinding operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 18.75 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-06-WE01: Perform grinding operations
- WM-06-WE02: Conduct housekeeping and implement safety standards during grinding operations

6.2 Guidelines for Work Experiences

6.2.1. WM-06-WE01: Perform grinding operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Dress a grinding wheel
- WA0102 Change grinding wheels
- WA0103 Check for cracks by conducting ring test
- WA0104 Dress and true a grinding wheel
- WA0105 Balance a grinding wheel
- WA0106 Surface grind a work piece
- WA0107 Grind a slot in a work piece

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific grinding operations by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on grinding operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

6.2.2. WM-06-WE02: Conduct housekeeping and implement safety standards during grinding operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during grinding operations
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during grinding operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during grinding operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

6.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

6.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

6.5 Additional Assignments to be Assessed Externally

None

7. 652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35

7.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out CNC milling operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 37.5 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-07-WE01: Perform CNC milling operations
- WM-07-WE02: Conduct housekeeping and implement safety standards during CNC milling operations

7.2 Guidelines for Work Experiences

7.2.1. WM-07-WE01: Perform CNC milling operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Calculate speeds and feeds
- WA0102 Install mill work holding devices
- WA0103 Calculate and prepare CNC Thread milling operations
- WA0104 Machine thread cycles
- WA0105 Monitor and control CNC milling operations
- WA0106 Modify tooling
- WA0107 Troubleshoot tooling performance, non-performance
- WA0108 Respond to a tool break situation
- WA0109 Troubleshoot out of specification surface finishes
- WA0110 Investigate situations where the cycle time is too long
- WA0111 Investigate reasons for out of tolerance GD and T
- WA0112 Isolate reasons for why a CNC program not downloading
- WA0113 Analyse why SPC is not meeting stated standards or limits
- WA0114 Start and stop CNC milling machine
- WA0115 Square a block to specification using a milling process
- WA0116 Tap one hole
- WA0117 Countersink or counter bore holes
- WA0118 Edit existing machining programs
- WA0119 Create G, M and conversational programs
- WA0120 Setup mills
- WA0121 Machine electrodes
- WA0122 Fill in the production and adjustment sheets

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific CNC milling operations by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on CNC milling operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

7.2.2. WM-07-WE02: Conduct housekeeping and implement safety standards during CNC milling operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during CNC milling operations
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during CNC milling operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during CNC milling operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

7.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

7.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

7.5 Additional Assignments to be Assessed Externally

None

8. 652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35

8.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out CNC turning operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 37.5 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-08-WE01: Perform CNC turning operations
- WM-08-WE02: Conduct housekeeping and implement safety standards during CNC turning operations

8.2 Guidelines for Work Experiences

8.2.1. WM-08-WE01: Perform CNC turning operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Install turning workholders
- WA0102 Assemble and install tools and tool holders
- WA0103 Bore soft jaws
- WA0104 Perform a start-up and stop procedure
- WA0105 Modify tooling
- WA0106 Re-surface chuck faces
- WA0107 Troubleshoot tooling performance, non-performance
- WA0108 Respond to a tool break situation
- WA0109 Troubleshoot out of specification surface finishes
- WA0110 Investigate situations where the cycle time is too long
- WA0111 Investigate reasons for out of tolerance GD and T
- WA0112 Analyse why SPC is not meeting stated standards or limits
- WA0113 Square a block to specification using a milling process
- WA0114 Cut face to length
- WA0115 Edit existing machining programs
- WA0116 Setup CNC machine
- WA0117 Machine electrodes
- WA0118 Fill in the production and adjustment sheets

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific CNC turning operations by the learner

- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on CNC turning operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

8.2.2. WM-08-WE02: Conduct housekeeping and implement safety standards during CNC turning operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during CNC turning operations
- WA0203 Conduct housekeeping activities

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during CNC turning operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during CNC turning operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

8.3 Contextualised Workplace Knowledge

- 1 Company quality management systems and procedures
- 2 Work instructions, checklists, specifications and standards
- 3 Manufacturer manuals and specifications
- 4 Company health and safety policies and procedures
- 5 Company tools and equipment handling, care, maintenance and storage procedures
- 6 Company policies and procedures

8.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

8.5 Additional Assignments to be Assessed Externally

None

9. 652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35

9.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out EDM plunge operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 37.5 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-09-WE01: Perform EDM plunge operations
- WM-09-WE02: Conduct housekeeping and implement safety standards during EDM plunge operations

9.2 Guidelines for Work Experiences

9.2.1. WM-09-WE01: Perform EDM plunge operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Create an electrode
- WA0102 Machine hardened materials
- WA0103 Perform an inspection on the electrode
- WA0104 Create a process plan for burning profiles
- WA0105 Burn profiles as specified
- WA0106 Check work quality and compliance
- WA0107 Apply shrinkage factors
- WA0108 Apply flushing

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific EDM plunge operations by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on EDM plunge operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

9.2.2. WM-09-WE02: Conduct housekeeping and implement safety standards during EDM plunge operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during EDM plunge operations
- WA0203 Conduct housekeeping activities

- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during EDM plunge operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during EDM plunge operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

9.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

9.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

9.5 Additional Assignments to be Assessed Externally

None

10. 652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35

10.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to working alongside a qualified Toolmaker to perform and carry out EDM wire operations. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least five times over a period of 37.5 days. The Learner will be required to successfully complete each Work Experience at least once.

The learner will be required to:

- WM-10-WE01: Perform EDM wire operations
- WM-10-WE02: Conduct housekeeping and implement safety standards during EDM wire operations

10.2 Guidelines for Work Experiences

10.2.1. WM-10-WE01: Perform EDM wire operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Setup EDM wire machine
- WA0102 Machine hardened materials
- WA0103 Perform an inspection on a wire-cut electrode
- WA0104 Calculate wire EDM offsets
- WA0105 Create a process plan for Wire EDM cutting
- WA0106 Wire cut features as specified
- WA0107 Check work quality and compliance

Supporting Evidence

- SE0101 Job card detailing the name of the learner and the specific EDM wire operations by the learner
- SE0102 Verification conducted by authorising manager, supervisor, trainer or instructor, on EDM wire operations undertaken by the learner
- SE0103 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

10.2.2. WM-10-WE02: Conduct housekeeping and implement safety standards during EDM wire operations

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Procure and use PPE
- WA0202 Implement safety standards and regulations during EDM wire operations
- WA0203 Conduct housekeeping activities
- WA0204 Report any unsafe conditions

Supporting Evidence

- SE0201 Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during EDM wire operations
- SE0202 Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during EDM wire operations
- SE0203 Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience

10.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

10.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

10.5 Additional Assignments to be Assessed Externally

None

11. 652201100-WM-11, Quality assurance processes for verification of product conformance to specifications, NQF Level 5, Credits 13

11.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to and experience in all activities related to quality assurance processes for verification of product conformance to specifications in a real life toolmaking environment. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least once within the workplace placement period.

The learner will be required to:

- WM-11-WE01: Process certification of machined components
- WM-11-WE02: Evaluate the impact of certified and non-certified components
- WM-11-WE03: Conduct material resource planning for a product due for production

11.2 Guidelines for Work Experiences

11.2.1. WM-11-WE01: Process certification of machined components

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Investigate Quality Management with respect to: policy, procedures (AQL) and record keeping
- WA0102 Complete quality control and inspection reports
- WA0103 Inspect parts and establish conformance to specifications
- WA0104 Conduct and analyse statistical process planning (SPC)

Supporting Evidence

- SE0101 Produced SPC Chart
- SE0102 Report on QMS measurement results
- SE0103 Report on calibration procedures

11.2.2. WM-11-WE02: Evaluate the impact of certified and non-certified components

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Use existing data to calculate the percentage of non- certified components
- WA0202 Write a report on the impact of non-certified components
- WA0203 Investigate and analyse processes and comment/ suggest improvements and corrective actions

Supporting Evidence

- SE0201 Report compiled by the learner reflecting job card and impact of non - conforming components, signed by the artisan

- SE0202 A report compiled by the learner recommending improvements/ corrective actions on processes including comments on how previous improvements affected the process, and signed by the artisan improving on the learner assessment

11.2.3. WM-11-WE03: Conduct material resource planning for a product due for production

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0301 Use existing data and define material, resource and process (MRP) for a specific product
- WA0302 Evaluate material availability schedule and resources for product development processes
- WA0303 Write a report on the effectiveness of the process plan

Supporting Evidence

- SE0301 Report compiled by the learner reflecting a job card and work done on the MRP
- SE0302 Report compiled by the learner reflecting on product process plan

11.3 Contextualised Workplace Knowledge

1 Company quality management systems and procedures

2 Work instructions, checklists, specifications and standards

3 Manufacturer manuals and specifications

4 Company health and safety policies and procedures

5 Company tools and equipment handling, care, maintenance and storage procedures

6 Company policies and procedures

11.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

11.5 Additional Assignments to be Assessed Externally

None

12. 652201100-WM-12, Tool production processes to meet customer needs and specifications, NQF Level 5, Credits 20

12.1 Purpose of the Work Experience Modules

The focus of the work experience is on providing the learner an opportunity to:

Gain exposure to and experience in all activities related to the certified tool production processes to meet customer needs and specifications in a real life toolmaking environment. The Learner will be required to observe, assist, work under supervision and independently complete the following work activities at least once within the workplace placement period.

The learner will be required to:

- WM-12-WE01: Interpret customer and product specifications
- WM-12-WE02: Record and audit available facilities, materials and process information for product development and production processes
- WM-12-WE03: Assemble, dry test and quality assure tool/die/mould production
- WM-12-WE04: Conduct tool repair, servicing and scheduling
- WM-12-WE05: Record and apply safety principles and documentation

12.2 Guidelines for Work Experiences

12.2.1. WM-12-WE01: Interpret customer and product specifications

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Read and interpret drawings and product specifications
- WA0102 Participate in team meetings determining the manufacturing, production processes and product feasibility
- WA0103 Compile a report on work of the product development team

Supporting Evidence

- SE0101 Minutes of the product development team
- SE0102 Report on the work of the product development team

12.2.2. WM-12-WE02: Record and audit available facilities, materials and process information for product development and production processes

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0201 Audit available facilities, materials and equipment
- WA0202 Produce a report on the design review processes

Supporting Evidence

- SE0201 Check list of available facilities, materials and equipment
- SE0202 Development process report.

12.2.3. WM-12-WE03: Assemble, dry test and quality assure tool/die/mould production

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0301 Assemble the tool according to design specification
- WA0302 Check the tool for correct operation according to specification
- WA0303 Record information according to quality assurance procedures

Supporting Evidence

- SE0301 Assembled tool according to specification
- SE0302 Check list or report on tool operation

12.2.4. WM-12-WE04: Conduct tool repair, servicing and scheduling

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0401 Develop a maintenance schedule for a tool and associated equipment/machines
- WA0402 Service and repair a tool and related equipment/ machine
- WA0403 Conduct a routine tool and equipment/ machine inspection according to procedures
- WA0404 Update machine maintenance documentation

Supporting Evidence

- SE0401 Checklist of routine inspection
- SE0402 Maintenance schedule
- SE0403 Loss of production report.

12.2.5. WM-12-WE05: Record and apply safety principles and documentation

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0501 Conduct health and safety inspection for the maintenance department in terms of procedures
- WA0502 Inspect that a tool and equipment/machine complies to prescribed safety standards
- WA0503 Apply login tag out safety procedures according to OSH Act
- WA0504 Compile a report on tool performance

Supporting Evidence

- SE0501 Health and Safety Checklists
- SE0502 Supervisor's learner Assessment Report
- SE0503 Tool and equipment/ machine design review report

12.3 Contextualised Workplace Knowledge

- 1 Company quality management systems and procedures
- 2 Work instructions, checklists, specifications and standards
- 3 Manufacturer manuals and specifications
- 4 Company health and safety policies and procedures
- 5 Company tools and equipment handling, care, maintenance and storage procedures
- 6 Company policies and procedures

12.4 Criteria for Workplace Approval

Physical Requirements:

- Access to an operational, fully equipped workshop

Human Resource Requirements:

- Maximum artisan to apprentice ratio of 1:3
- A qualified artisan with at least two years relevant industry experience

Legal Requirements:

- None

12.5 Additional Assignments to be Assessed Externally

None

SECTION 4: STATEMENT OF WORK EXPERIENCE

Curriculum Number:	652201100
Curriculum Title:	Toolmaker

Learner Details	
Name:	
ID Number:	

Employer Details	
Company Name:	
Address:	
Supervisor Name:	
Work Telephone:	
E-Mail:	

652201100-WM-01, Workplace orientation, job planning and preparation and elementary toolmaking processes and procedures, NQF Level 3, Credits 5

WM-01-WE01	Workplace and safety orientation		
	Scope Work Experience	Date	Signature
WA0101	Research the company size, product range, logistics, vision / mission and document the findings		
WA0102	Write a report on the company's safety requirements and complete a safety survey		
WA0103	Write a report on the company's quality management system (QMS) requirements and perform a QMS survey		
WA0104	Investigate and participate in a quality conformance procedure, document the process and produce a flow chart		
WA0105	Report on the workplace product development process using the PDLC model		
WA0106	Procure and use personal protective equipment (PPE), and adhere to safety standards and regulations and report unsafe conditions		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on the workplace orientation activities as referenced in the job card signed by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		

WM-01-WE02	Observe and document manufacturing processes		
	Scope Work Experience	Date	Signature
WA0201	Observe and record each facet of the manufacturing process		
WA0202	Produce a framework for the manufacturing process		
WA0203	Develop a flow chart of the overall manufacturing process		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on the manufacturing process activities as referenced in the job card signed by the learner		
WM-01-WE03	Observe and document maintenance processes		
	Scope Work Experience	Date	Signature
WA0301	Observe, record and document the maintenance process		
WA0302	Design a flow chart for the maintenance process		
	Supporting Evidence	Date	Signature
SE0301	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0302	Verification conducted by authorising manager, supervisor, trainer or instructor, on the maintenance process activities as referenced in the job card signed by the learner		

SE0303	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		
WM-01-WE04	Observe and document design processes		
	Scope Work Experience	Date	Signature
WA0401	Observe and record each facet of the design process		
WA0402	Produce a framework for the design process		
WA0403	Develop a flow chart of the overall design process		
	Supporting Evidence	Date	Signature
SE0401	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0402	Verification conducted by authorising manager, supervisor, trainer or instructor, on the design process activities as referenced in the job card signed by the learner		
SE0403	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		
WM-01-WE05	Observe and document toolroom processes		
	Scope Work Experience	Date	Signature
WA0501	Observe and record each facet of the toolroom process		
WA0502	Produce a framework for the toolroom process		
WA0503	Develop a flow chart of the overall toolroom process		

	Supporting Evidence	Date	Signature
SE0501	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0502	Verification conducted by authorising manager, supervisor, trainer or instructor, on the toolroom process activities as referenced in the job card signed by the learner		
SE0503	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		
WM-01-WE06	Conduct pedestal grinder operations		
	Scope Work Experience	Date	Signature
WA0601	Dress a grinding wheel		
WA0602	Sharpen drill bits		
WA0603	Grind various tools		
WA0604	Change grinding wheels		
WA0605	Conduct ring tests		
	Supporting Evidence	Date	Signature
SE0601	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0602	Verification conducted by authorising manager, supervisor, trainer or instructor, on the pedestal grinder operations as referenced in the job card signed by the learner		
SE0603	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this		

	specific module		
WM-01-WE07	Perform benchwork activities		
	Scope Work Experience	Date	Signature
WA0701	Measure part properties		
WA0702	Select and verify various materials by type		
WA0703	Cut material into the right size		
WA0704	Locate and inspect workstations		
WA0705	Perform tooling care and maintenance activities		
WA0706	Measure parts		
WA0707	Complete quality control inspection reports and data		
WA0708	Deburr materials by hand		
WA0709	Conduct filing activities		
WA0710	Polish parts		
WA0711	Broach parts by hand		
WA0712	Use different metal files		
WA0713	Check surface finishes		
WA0714	Use a hacksaw and different blades		
	Supporting Evidence	Date	Signature
SE0701	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0702	Verification conducted by authorising manager, supervisor, trainer or instructor, on the benchwork activities as referenced in the job card signed by the learner		
SE0703	Portfolio of evidence prepared by the learner		

	and signed by the supervisor detailing the work completed by the learner in relation to this specific module		
WM-01-WE08	Operate different saws with different blades		
	Scope Work Experience	Date	Signature
WA0801	Operate a horizontal and vertical bandsaw with different blades		
WA0802	Select proper speeds and feeds for sawing operations		
WA0803	Measure materials		
WA0804	Cut materials		
WA0805	Saw a given angle		
WA0806	Use of hoist and slings		
WA0807	Implement responsibilities for lock out and tag out		
WA0808	Perform stock calculations		
WA0809	Select saws for various jobs		
	Supporting Evidence	Date	Signature
SE0801	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0802	Verification conducted by authorising manager, supervisor, trainer or instructor, on the saw operations as referenced in the job card signed by the learner		
SE0803	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		

WM-01-WE09	Read and interpret a drawing for a specific tool		
	Scope Work Experience	Date	Signature
WA0901	Draw freehand drawings		
WA0902	Label different types of view and use various types of lines		
WA0903	Locate surfaces and features on various drawing views and use various dimensions		
WA0904	Compute total tolerances		
WA0905	Interpret internal threads		
WA0906	Interpret tables, specifications, references and notes		
	Supporting Evidence	Date	Signature
SE0901	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE0902	Verification conducted by authorising manager, supervisor, trainer or instructor, on the reading and interpreting a drawing for a specific tool as referenced in the job card signed by the learner		
SE0903	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		
WM-01-WE10	Perform layout activities		
	Scope Work Experience	Date	Signature
WA1001	Prepare a surface or layout		
WA1002	Layout stock		
WA1003	Use a surface gauge		
WA1004	Read measuring equipment		

WA1005	Use gauge blocks		
WA1006	Layout work with a combination square		
	Supporting Evidence	Date	Signature
SE1001	Job card detailing the name of the learner and the specific job assignment completed by the learner		
SE1002	Verification conducted by authorising manager, supervisor, trainer or instructor, on the layout activities as referenced in the job card signed by the learner		
SE1003	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific module		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		

6	Company policies and procedures		
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	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-02, Drill press operations, NQF Level 4, Credits 10

WM-02-WE01	Perform drill press operations and activities		
	Scope Work Experience	Date	Signature
WA0101	Secure a workpiece		
WA0102	Machine ream a hole		
WA0103	Hand ream a hole		
WA0104	Select speeds and feeds		
WA0105	Perform tapping procedure		
WA0106	Countersink and spot face a hole		
WA0107	Make use of drifts		
WA0108	Install drill chucks and taper shank tools		
WA0109	Clamp piece to the table horizontally and vertically		
WA0110	Determine the appropriate process of work		
WA0111	Align and centre the drill to the hole position		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific drill press operations and housekeeping and safety activities completed by the learner		

SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on the drill press operations and housekeeping and safety activities undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-02-WE02	Conduct housekeeping and implement safety standards during drill press operations		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during drill press operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during specific drill press operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during drill press operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace	Date	Signature
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	Knowledge		
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-03, Procedures for turning between Centres, NQF Level 4, Credits 10

WM-03-WE01	Perform turning operations between centres		
	Scope Work Experience	Date	Signature
WA0101	Set up a lathe		
WA0102	Face a part to length		
WA0103	Centre drill		
WA0104	Use chucks		

WA0105	Use a parting tool		
WA0106	Perform lathe filing		
WA0107	Produce rough and finish cuts		
WA0108	Determine speeds and feeds		
WA0109	Locate main power and position guards, clamping and support points		
WA0110	Turn diameters and shoulders		
WA0111	Machine chamfers		
WA0112	Use a carrier (dog)		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific turning operations between centres completed by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on turning between centres operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-03-WE02	Conduct housekeeping and implement safety standards during turning operations between centres		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during turning operations between centres		
WA0203	Conduct housekeeping activities		

WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during turning operations between centres		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during turning operations between centres		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		

6	Company policies and procedures		
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	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-04, Procedures for chucking operations, NQF Level 4, Credits 10

WM-04-WE01	Perform chucking operations		
	Scope Work Experience	Date	Signature
WA0101	Set up a lathe		
WA0102	Face a part to length		
WA0103	Centre drill and drill a part		
WA0104	Identify chucks		
WA0105	Make use of a parting tool		
WA0106	Perform lathe filing		
WA0107	Produce rough and finish cuts		
WA0108	Determine speeds and feeds		
WA0109	Locate main power and position guards, clamping and support points		
WA0110	Turn diameters and shoulders		
WA0111	Machine chamfers		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific chucking operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on chucking		

	operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-04-WE02	Conduct housekeeping and implement safety standards during chucking operations		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during chucking operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during chucking operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during chucking operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality		

	management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-05, Milling operations, NQF Level 4, Credits 15

WM-05-WE01	Perform milling operations		
	Scope Work Experience	Date	Signature
WA0101	Prepare a checklist and check overall conditions of the machines		
WA0102	Remove and store previous tooling and job articles		
WA0103	Inspects machinery and equipment for safety		
WA0104	Set mill feeds and speeds		

WA0105	Mount various cutters and workpieces		
WA0106	Use a vice		
WA0107	Perform conventional milling and climb milling		
WA0108	Sweep in a vertical milling machine head		
WA0109	Cut a square key, slots, radii and ID and OD profiles with a boring head		
WA0110	Use an edge finder and a wiggler		
WA0111	Mill a woodruff key slot		
WA0112	Use counter bores and countersinks		
WA0113	Implement various drill points geometries		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific milling operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on milling operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-05-WE02	Conduct housekeeping and implement safety standards during milling operations		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during milling operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		

	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during milling operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during milling operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-06, Procedures for surface grinding operations, NQF Level 4, Credits 10

WM-06-WE01	Perform grinding operations		
	Scope Work Experience	Date	Signature
WA0101	Dress a grinding wheel		
WA0102	Change grinding wheels		
WA0103	Check for cracks by conducting ring test		
WA0104	Dress and true a grinding wheel		
WA0105	Balance a grinding wheel		
WA0106	Surface grind a work piece		
WA0107	Grind a slot in a work piece		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific grinding operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on grinding operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-06-WE02	Conduct housekeeping and implement safety standards during grinding operations		
	Scope Work Experience	Date	Signature

WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during grinding operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during grinding operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during grinding operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		

5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-07, CNC milling operations, NQF Level 5, Credits 35

WM-07-WE01	Perform CNC milling operations		
	Scope Work Experience	Date	Signature
WA0101	Calculate speeds and feeds		
WA0102	Install mill work holding devices		
WA0103	Calculate and prepare CNC Thread milling operations		
WA0104	Machine thread cycles		
WA0105	Monitor and control CNC milling operations		
WA0106	Modify tooling		
WA0107	Troubleshoot tooling performance, non-performance		
WA0108	Respond to a tool break situation		
WA0109	Troubleshoot out of specification surface finishes		
WA0110	Investigate situations where the cycle time is too long		

WA0111	Investigate reasons for out of tolerance GD and T		
WA0112	Isolate reasons for why a CNC program not downloading		
WA0113	Analyse why SPC is not meeting stated standards or limits		
WA0114	Start and stop CNC milling machine		
WA0115	Square a block to specification using a milling process		
WA0116	Tap one hole		
WA0117	Countersink or counter bore holes		
WA0118	Edit existing machining programs		
WA0119	Create G, M and conversational programs		
WA0120	Setup mills		
WA0121	Machine electrodes		
WA0122	Fill in the production and adjustment sheets		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific CNC milling operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on CNC milling operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-07-WE02	Conduct housekeeping and implement safety standards during CNC milling operations		

	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during CNC milling operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during CNC milling operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during CNC milling operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		

4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-08, Procedures for CNC turning operations, NQF Level 5, Credits 35

WM-08-WE01	Perform CNC turning operations		
	Scope Work Experience	Date	Signature
WA0101	Install turning workholders		
WA0102	Assemble and install tools and tool holders		
WA0103	Bore soft jaws		
WA0104	Perform a start-up and stop procedure		
WA0105	Modify tooling		
WA0106	Re-surface chuck faces		
WA0107	Troubleshoot tooling performance, non-performance		
WA0108	Respond to a tool break situation		
WA0109	Troubleshoot out of specification surface finishes		
WA0110	Investigate situations where the cycle time is		

	too long		
WA0111	Investigate reasons for out of tolerance GD and T		
WA0112	Analyse why SPC is not meeting stated standards or limits		
WA0113	Square a block to specification using a milling process		
WA0114	Cut face to length		
WA0115	Edit existing machining programs		
WA0116	Setup CNC machine		
WA0117	Machine electrodes		
WA0118	Fill in the production and adjustment sheets		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific CNC turning operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on CNC turning operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-08-WE02	Conduct housekeeping and implement safety standards during CNC turning operations		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during CNC turning operations		

WA0203	Conduct housekeeping activities		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during CNC turning operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during CNC turning operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		

6	Company policies and procedures		
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	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-09, EDM Plunge operations, NQF Level 5, Credits 35

WM-09-WE01	Perform EDM plunge operations		
	Scope Work Experience	Date	Signature
WA0101	Create an electrode		
WA0102	Machine hardened materials		
WA0103	Perform an inspection on the electrode		
WA0104	Create a process plan for burning profiles		
WA0105	Burn profiles as specified		
WA0106	Check work quality and compliance		
WA0107	Apply shrinkage factors		
WA0108	Apply flushing		
	Supporting Evidence	Date	Signature
SE0101	Job card detailing the name of the learner and the specific EDM plunge operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on EDM plunge operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this		

	specific work experience		
WM-09-WE02	Conduct housekeeping and implement safety standards during EDM plunge operations		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during EDM plunge operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during EDM plunge operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during EDM plunge operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications		

	and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-10, EDM wire operations, NQF Level 5, Credits 35

WM-10-WE01	Perform EDM wire operations		
	Scope Work Experience	Date	Signature
WA0101	Setup EDM wire machine		
WA0102	Machine hardened materials		
WA0103	Perform an inspection on a wire-cut electrode		
WA0104	Calculate wire EDM offsets		
WA0105	Create a process plan for Wire EDM cutting		
WA0106	Wire cut features as specified		
WA0107	Check work quality and compliance		
	Supporting Evidence	Date	Signature

SE0101	Job card detailing the name of the learner and the specific EDM wire operations by the learner		
SE0102	Verification conducted by authorising manager, supervisor, trainer or instructor, on EDM wire operations undertaken by the learner		
SE0103	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		
WM-10-WE02	Conduct housekeeping and implement safety standards during EDM wire operations		
	Scope Work Experience	Date	Signature
WA0201	Procure and use PPE		
WA0202	Implement safety standards and regulations during EDM wire operations		
WA0203	Conduct housekeeping activities		
WA0204	Report any unsafe conditions		
	Supporting Evidence	Date	Signature
SE0201	Job card detailing the name of the learner and the housekeeping and safety activities completed by the learner during EDM wire operations		
SE0202	Verification conducted by authorising manager, supervisor, trainer or instructor, on housekeeping and safety activities undertaken by the learner during EDM wire operations		
SE0203	Portfolio of evidence prepared by the learner and signed by the supervisor detailing the work completed by the learner in relation to this specific work experience		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
2	Work instructions, checklists, specifications and standards		
3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature

652201100-WM-11, Quality assurance processes for verification of product conformance to specifications, NQF Level 5, Credits 13

WM-11-WE01	Process certification of machined components		
	Scope Work Experience	Date	Signature
WA0101	Investigate Quality Management with respect to: policy, procedures (AQL) and record keeping		

WA0102	Complete quality control and inspection reports		
WA0103	Inspect parts and establish conformance to specifications		
WA0104	Conduct and analyse statistical process planning (SPC)		
	Supporting Evidence	Date	Signature
SE0101	Produced SPC Chart		
SE0102	Report on QMS measurement results		
SE0103	Report on calibration procedures		
WM-11-WE02	Evaluate the impact of certified and non-certified components		
	Scope Work Experience	Date	Signature
WA0201	Use existing data to calculate the percentage of non- certified components		
WA0202	Write a report on the impact of non-certified components		
WA0203	Investigate and analyse processes and comment/ suggest improvements and corrective actions		
	Supporting Evidence	Date	Signature
SE0201	Report compiled by the learner reflecting job card and impact of non - conforming components, signed by the artisan		
SE0202	A report compiled by the learner recommending improvements/ corrective actions on processes including comments on how previous improvements affected the process, and signed by the artisan improving on the learner assessment		
WM-11-WE03	Conduct material resource planning for a		

	product due for production		
	Scope Work Experience	Date	Signature
WA0301	Use existing data and define material, resource and process (MRP) for a specific product		
WA0302	Evaluate material availability schedule and resources for product development processes		
WA0303	Write a report on the effectiveness of the process plan		
	Supporting Evidence	Date	Signature
SE0301	Report compiled by the learner reflecting a job card and work done on the MRP		
SE0302	Report compiled by the learner reflecting on product process plan		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
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3	Manufacturer manuals and specifications		
4	Company health and safety policies and procedures		
5	Company tools and equipment handling, care, maintenance and storage procedures		

6	Company policies and procedures		
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	Additional Assignments to be Assessed Externally	Date	Signature
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652201100-WM-12, Tool production processes to meet customer needs and specifications, NQF Level 5, Credits 20

WM-12-WE01	Interpret customer and product specifications		
	Scope Work Experience	Date	Signature
WA0101	Read and interpret drawings and product specifications		
WA0102	Participate in team meetings determining the manufacturing, production processes and product feasibility		
WA0103	Compile a report on work of the product development team		
	Supporting Evidence	Date	Signature
SE0101	Minutes of the product development team		
SE0102	Report on the work of the product development team		
WM-12-WE02	Record and audit available facilities, materials and process information for product development and production processes		
	Scope Work Experience	Date	Signature
WA0201	Audit available facilities, materials and equipment		
WA0202	Produce a report on the design review processes		

	Supporting Evidence	Date	Signature
SE0201	Check list of available facilities, materials and equipment		
SE0202	Development process report.		
WM-12-WE03	Assemble, dry test and quality assure tool/die/mould production		
	Scope Work Experience	Date	Signature
WA0301	Assemble the tool according to design specification		
WA0302	Check the tool for correct operation according to specification		
WA0303	Record information according to quality assurance procedures		
	Supporting Evidence	Date	Signature
SE0301	Assembled tool according to specification		
SE0302	Check list or report on tool operation		
WM-12-WE04	Conduct tool repair, servicing and scheduling		
	Scope Work Experience	Date	Signature
WA0401	Develop a maintenance schedule for a tool and associated equipment/machines		
WA0402	Service and repair a tool and related equipment/ machine		
WA0403	Conduct a routine tool and equipment/ machine inspection according to procedures		
WA0404	Update machine maintenance documentation		
	Supporting Evidence	Date	Signature
SE0401	Checklist of routine inspection		
SE0402	Maintenance schedule		

SE0403	Loss of production report.		
WM-12-WE05	Record and apply safety principles and documentation		
	Scope Work Experience	Date	Signature
WA0501	Conduct health and safety inspection for the maintenance department in terms of procedures		
WA0502	Inspect that a tool and equipment/machine complies to prescribed safety standards		
WA0503	Apply login tag out safety procedures according to OSH Act		
WA0504	Compile a report on tool performance		
	Supporting Evidence	Date	Signature
SE0501	Health and Safety Checklists		
SE0502	Supervisor's learner Assessment Report		
SE0503	Tool and equipment/ machine design review report		

	Contextualised Workplace Knowledge	Date	Signature
1	Company quality management systems and procedures		
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4	Company health and safety policies and procedures		

5	Company tools and equipment handling, care, maintenance and storage procedures		
6	Company policies and procedures		

	Additional Assignments to be Assessed Externally	Date	Signature
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