education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

SUBJECT GUIDELINES

ENGINEERING TECHNOLOGY

NQF LEVEL 2

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INTRODUCTION

A. What is Engineering Technology?

Engineering Technology introduces students to a variety of engineering tools and equipment used in various fields of engineering and instructs them on how to use the tools and equipment correctly, accurately and safely. Students must identify and select the correct tools for a given task and observe all applicable safety measures when handling and using each tool. As they progress, students will be able to identify and select the correct tools for a particular job quicker and quicker and not waste time searching.

B. Why is Engineering Technology important in the Engineering and Related Design programmes?

In Engineering Technology, students become aware of the importance of various tools used in the Mechanical Engineering field. The subject enables students to produce components and solve mechanical problems practically. It also enables students to do maintenance work using the correct tools and equipment. It is imperative that students at this level be introduced to the proper handling and safe use and maintenance of tools.

Students must be able to capture data using a computer as this will help them to perform tasks like wheel alignment with a computerised system. To convert between units, for example, students must have a good understanding of the digital values of the following prefixes: milli-, centi-, kilo- and mega-.

C. The link between the Engineering Technology Learning Outcomes and the Critical and Developmental Outcomes

Engineering Technology, as a subject:

- Develops students' problem-solving skills.
- Develops the skills students need to care for and maintain tools and equipment.
- Enables students to critically evaluate information.
- Promotes effective communication using mathematical, scientific and technological knowledge, for example students will be able to report a faulty tool and give a clear and accurate description of the problem.
- Encourages group work among students.
- Enables students to identify tools and equipment relevant to a particular situation.
- Enables students to identify a proper location for the safe storage of tools.

D. Factors that contribute to achieving the Engineering Technology Learning Outcomes

- An effective Simulated Engineering Environment or a real engineering workplace where students can display their competencies
- Availability of the right tools and equipment
- Qualified and competent lecturers and assessors who not only aid and facilitate teaching and learning but who are also readily available to provide moral support
- Assessment in language of choice of the student
- Patience, self-discipline and the ability to work in a team
- Critical-thinking and problem-solving skills to readily evaluate data systems and processes

ENGINEERING TECHNOLOGY – LEVEL 2

CONTENTS

1 DURATION AND TUITION TIME

This is a one-year instructional programme comprising 200 teaching and learning hours. The subject may be offered on a part-time basis provided the student meets all the assessment requirements.

Students with special education needs (LSEN) must be catered for in a way that eliminates barriers to learning.

2 SUBJECT LEVEL FOCUS

The student should be able to describe engineering practices and procedures.

Range:

Practices and procedures include safety legislation, housekeeping practices and safe workplace procedures.
Workplace includes but is not limited to classroom, workshop and worksite.

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (50 percent)

3.1.1 Theoretical component

The theoretical component forms 40 percent of the internal assessment mark.

Internal assessment of the theoretical component in Engineering Technology Level 2 takes the form of observation, class questions, group work, informal group competitions with rewards, individual discussions with students, class, topic and semester tests and internal examinations. Lecturers can observe students when marking exercises from the previous day and asking class questions.

Assignments, case studies and tests can be completed at the end of a topic. Tests and internal examinations must form part of the internal assessment.

3.1.2 Practical component

The practical component forms 60 percent of the internal assessment mark.

Practical components include applications and exercises. All practical components must be indicated in a Portfolio of Evidence (PoE).

Internal assessment of the practical component in Engineering Technology Level 2 takes the form of assignments, practical exercises, case studies and practical examinations in a simulated engineering environment.

Students may complete practical exercises daily. Assignments and case studies can be completed at the end of a topic. Practical examinations can form part of internal practical assessment.

- **Some examples of practical assessments include, but are not limited to:**

  A. Presentations (lectures, demonstrations, group discussions and activities, practical work, observation, role-play, independent activity, synthesis and evaluation)

  B. Exhibitions by students

  C. Visits undertaken by students based on a structured assignment task

  D. Research

  E. Task performance in a “Structured Environment”

- **Definition of the term “Structured Environment”**

For the purposes of assessment, “Structured Environment” refers to a simulated workplace or workshop environment. A practicum room should be available at each campus for practical assessment.

- **Evidence in practical assessments**

All evidence pertaining to evaluation of practical work must be reflected in the students' Portfolio of Evidence (PoE). The tools and instruments constructed and used to conduct these assessments must be clear from the evidence contained in the Portfolio of Evidence (PoE).

3.1.3 Processing of internal assessment mark for the year

A year mark out of 100 is calculated by adding the marks of the theoretical component (40 percent) and the practical component (60 percent) of the internal continuous assessment (ICASS).

3.1.4 Moderation of internal assessment mark

Internal assessment is subjected to internal and external moderation procedures as set out in the *National Examinations Policy for FET College Programmes*.

3.2 External assessment (50 percent)

A National Examination is conducted annually in October or November by means of a paper(s) set and moderated externally. A practical component will also be assessed.

External assessment details and procedures are set out in the *Assessment Guidelines: Engineering Technology* (Level 2).

4 WEIGHTED VALUES OF TOPICS

TOPICS	WEIGHTED VALUES
1. Engineering Hand Tools	20
2. Engineering Power Tools	20
3. Engineering Measuring Equipment	15
4. Engineering Precision Measuring Equipment	10
5. SI Units of Measurement	10
6. Engineering Marking-off Equipment	10
7. Basic Engineering Drawing	15
TOTAL	**100**

5 CALCULATION OF FINAL MARK

Internal assessment mark: Student's mark/100 x 50 = a mark out of 50 (a)

Examination mark: Student's mark/100 x 50 = a mark out of 50 (b)

Final mark: (a) + (b) = a mark out of 100

All marks are systematically processed and accurately recorded to be available as hard copy evidence for, amongst others, reporting, moderation and verification purposes.

6 PASS REQUIREMENTS

The student must obtain at least fifty (50) percent in ICASS and fifty (50) percent in the examination.

7 SUBJECT AND LEARNING OUTCOMES

On the completion of Engineering Technology Level 2, the student should have covered the following topics:

Topic 1: Engineering Hand Tools
Topic 2: Engineering Power Tools
Topic 3: Engineering Measuring Equipment
Topic 4: Engineering Precision Measuring Equipment
Topic 5: SI Units of Measurement
Topic 6: Engineering Marking-off Equipment
Topic 7: Basic Engineering Drawing

7.1 Topic 1: Engineering Hand Tools

Subject Outcome 1: Select engineering hand tools.

Learning Outcomes:

The student should be able to:

- List different hand tools used in manufacturing, engineering and technology.
- Identify parts of the selected engineering hand tools.
- Discuss the use(s) or functions of each selected engineering hand tool.
- Decide on the best hand tool for a specific task.

Subject Outcome 2: Use engineering hand tools.

Learning Outcomes:

The student should be able to:

- Discuss the importance of using engineering hand tools safely.
- Record the consequences of using engineering hand tools incorrectly.
- Explain how a malfunctioning hand tool can be identified during use.
- Demonstrate the safe use of engineering hand tools to meet the task requirements.

Subject Outcome 3: Care for engineering hand tools.

Learning Outcomes:

The student should be able to:

- List factors to consider when caring for and maintaining hand tools.
- Identify and report faulty hand tools and take corrective action.
- Explain the consequences of improper care and storage of engineering hand tools.

7.2 Topic 2: Engineering Power Tools

Subject Outcome 1: Select engineering power tools (electrical, hydraulic and pneumatic).

Learning Outcomes:

The student should be able to:

- List different power tools used in manufacturing, engineering and technology fields.
- Identify parts of the selected engineering power tools.
- Discuss the use(s) or functions of each select engineering power tool.
- Decide on the best power tool for a specific task.

Subject Outcome 2: Use engineering power tools.

Learning Outcomes:

The student should be able to:

- List the safety measures to be taken when using different power tools.
- Discuss the importance of following the manufacturer's recommendations when working with various power tools.
- Use power tools safely, correctly and accurately.

Subject Outcome 3: Maintain and care for engineering power tools.

Learning Outcomes:

The student should be able to:

- List all elements to consider when maintaining and caring for power tools.
- Demonstrate the ability to check power supplies to power tools.
- Inspect various power tools for defects.
- Lubricate power tools according to the manufacturer's recommendations.

7.3 Topic 3: Engineering Measuring Equipment

Subject Outcome 1: Select engineering measuring equipment.

Learning Outcomes:

The student should be able to:
- List a variety of engineering measuring equipments.
- Identify the different parts of measuring equipment.
- Discuss the functions of each measuring tool.
- Decide on the best measuring tool for a specific task.

Subject Outcome 2: Use engineering measuring equipment.

Learning Outcomes:

The student should be able to:
- Record safety precautions to be taken when using engineering measuring equipment.
- Employ engineering measuring equipment safely and accurately.

Subject Outcome 3: Care for and maintain engineering measuring equipment.

Learning Outcomes:

The student should be able to:
- List all elements to consider when caring for and maintaining engineering measuring equipment.
- Explain the consequences of improper care for and storage of engineering measuring equipment.
- Demonstrate the ability to maintain engineering measuring equipment.
- Store engineering measuring equipment safely.

7.4 Topic 4: Engineering Precision Measuring Equipment

Subject Outcome 1: Select engineering precision measuring equipment.

Learning Outcomes:

The student should be able to:
- Select engineering precision measuring equipment.
- Identify parts of the precision measuring equipment.
- Discuss the functions of precision measuring equipment.
- Decide on the best precision measuring equipment for a specific task.

Subject Outcome 2: Use engineering precision measuring equipment.

Learning Outcomes:

The student should be able to:
- List safety measures to be observed when using precision measuring equipment.
- Demonstrate the use of engineering precision measuring equipment.

Subject Outcome 3: Care for and maintain precision measuring equipments.

Learning Outcomes:

The student should be able to:
- List care and maintenance factors for precision measuring equipment.
- Maintain engineering precision measuring equipment.
- Store precision measuring equipment.

7.5 Topic 5: SI Units of Measurement

Subject Outcome 1: Demonstrate knowledge of basic SI units of measurement.

Learning Outcomes:

The student should be able to:
- Identify basic units of measurement used in science engineering.
- Define the physical quantities that are measured by the SI units.

Subject Outcome 2: Convert between SI units.

Learning Outcomes:

The student should be able to:
- Perform conversions according to relevant digital values.
- Derive new units from the relationships between the SI units (i.e. the quantities they measure).

7.6 Topic 6: Engineering Marking-off Equipment

Subject Outcome 1: Select engineering marking-off equipment.

Learning Outcomes:

The student should be able to:
- List marking-off equipment.
- Compare different marking-off equipments.
- Identify appropriate marking-off equipment for specific tasks.

Subject Outcome 2: Use engineering marking-off equipment.

Learning Outcomes:

The student should be able to:
- Discuss safety precautions to be observed when using marking-off equipment.
- Apply engineering marking-off equipment safely.
- Test the working condition of marking-off equipment.

Subject Outcome 3: Care for engineering marking-off equipment.

Learning Outcomes:

The student should be able to:
- List all elements to consider when caring for and maintaining engineering marking-off equipment.
- Explain the consequences of improper care for and storage of engineering marking-off equipment.
- Demonstrate ability to maintain engineering marking-off equipment.
- Store engineering marking-off equipment safely.

7.7 Topic 7: Basic Engineering Drawings

Subject Outcome 1: Interpret and understand basic engineering drawings and sketches.

Learning Outcomes:

The student should be able to:
- Demonstrate an understanding of the terminology used in drawings.
- Explain the function and purpose of a drawing in terms of engineering principles and practices.
- Apply knowledge and skills to interpret drawings to translate their meanings into simple understanding.

Subject Outcome 2: Apply basic engineering drawing practices.

Learning Outcomes:

The student should be able to:
- Plan the drawing or reproduction appropriately to maximise page space.
- Draw border lines neatly and accurately.
- Insert construction lines to get an outline of the main drawing components.
- Produce the drawing as per the scale or tolerances.

Subject Outcome 3: Produce drawings in two-dimensional views

Learning Outcomes:

The student should be able to:
- Apply knowledge of first-angle and third-angle orthographic projection to produce the required drawing.

- Use understanding of isometric projections and principles to produce front, top and side views in two dimensions.

8 RESOURCE NEEDS FOR THE TEACHING OF ENGINEERING TECHNOLOGY – LEVEL 2

8.1 Physical resources

Building infrastructure, fixtures, networks, plant and machinery, for example:

- Storeroom (A storeroom that houses heavy consumables must be equipped with mechanical lifting devices suitable for the storage purpose.)
- Tool room
- Lecture room(s)
- Training area or work area
- Ablution facilities

8.2 Human resources

The lecturer for Engineering Technology Level 2 must be:

- a subject matter expert,
- certificated as an assessor with the ETDP SETA,
- registered with an ETQA or SETA,
- a life-long student,
- in possession of an NQF Level 5 teaching qualification,
- conversant with outcomes-based methodologies, and
- skilled in facilitating learning programme development.

Lecturers must attend seminars and upgrading workshops to keep up-to-date with the latest developments in technology.