education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

SUBJECT GUIDELINES

ENGINEERING FUNDAMENTALS

NQF LEVEL 2

September 2007

INTRODUCTION

A. What is Engineering Fundamentals?

Engineering Fundamentals introduces the student to the three important fields of engineering in the manufacturing, engineering and technology environments. Students interested in Fabrication and Extraction, Manufacturing and Assembly or Engineering and Related Design will be exposed to the basic industrial environment, engineering principles and operations and engineering systems, activities and processes.

B. Why is Engineering Fundamentals important in the Engineering and Related Design programme?

Engineering Fundamentals introduces students to:

- the basic industrial environment, principles, operations, activities, processes and the world of work of the different engineering fields in the manufacturing, engineering and technology fields;
- the legislative requirements of Occupational Health and Safety Act and the Mine Health and Safety Act which regulate the engineering working environment; and
- the required behavioural traits, professional ethos and codes of conduct which are necessary for effecting and facilitating safe working practices, good housekeeping practices and correct use of safety equipment to ensure a safe and productive workplace.

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

Engineering Fundamentals will develop students' problem-solving skills by requiring them to continually collect, analyse and evaluate data.

The subject will instil and enhance team spirit by affirming the importance of teamwork.

Through communication using visual, mathematical, scientific and technological means, students will learn effective reporting methods in this subject.

Engineering Fundamentals will also create a sense of respect and responsibility towards the environment as well as the health and safety of fellow human beings.

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

- An effective Simulated Engineering Environment or a real engineering workplace where students can display their competencies
- Qualified and competent lecturers and assessors who not only aid and facilitate teaching, training and learning but who are readily available to provide moral support
- Patience, self-discipline and teamwork skills
- Critical thinking and problem-solving skills to readily evaluate data systems and processes

ENGINEERING FUNDAMENTALS – 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:

- Identify and explain the various disciplines and practices in the manufacturing, engineering and technology fields.

  Range: The various disciplines include, but are not limited to, chemical, mechanical and geological exploration (mining and metallurgy).
- Demonstrate various practices include safety legislation, housekeeping and workplace safety.
- Identify engineering disciplines according to their core functions and roles.

  Range:

  Roles refer to better designs, better solutions to problems and better functioning of the community.
  Functions refer to, but are not limited to, boiler making, automotive industry, fitting and machining, mining operations and chemical industry.

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 Fundamentals 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 Fundamentals 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 Fundamentals* (Level 2).

4 WEIGHTED VALUES OF TOPICS

TOPICS	WEIGHTED VALUES
1. South African Manufacturing, Engineering and Technology	40
2. Safety Practices in the Engineering Workplace	30
3. Basic Fire-fighting.	10
4. Basic First Aid	7
5. Health and the Environment	13
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 Fundamentals Level 2, the student should have covered the following:

Topic 1: South African Manufacturing, Engineering and Technology
Topic 2: Safety Practices in the Engineering Workplace
Topic 3: Basic Fire-fighting
Topic 4: Basic First Aid
Topic 5: Health and the Environment

7.1 Topic 1: South African Manufacturing, Engineering and Technology

Subject Outcome 1: Identify and describe the work environments in the manufacturing, engineering and technology fields.

Learning Outcomes:

The student must be able to:

- Identify the occupational areas in the manufacturing, engineering and technology fields.
- Identify work ethics in manufacturing, engineering and technology fields.
- Explain quality of work life.
- Discuss a code of conduct in an engineering workplace.

Subject Outcome 2: Discuss legislation affecting the world of work in the manufacturing, engineering and technology fields.

Range: The Bill of Rights, Employment Equity Act and Labour Relations Act

Learning Outcomes:

The student must be able to:

- Identify different acts that govern the world of work in South Africa.
- Explain the purpose of the legislation that affect the world of work in South Africa.
- Discuss the impact of this legislation on the world of work in South Africa.

7.2 Topic 2: Safety Practices in the Engineering Workplace

Subject Outcome 1: Comply with housekeeping practices.

Learning Outcomes:

The student must be able to:

- Clean and maintain machines and tools.
- Clean working environments.
- Monitor and control orderliness and cleanliness in the workplace.
- Allocate suitable storage places for goods that need to be stacked.
- Maintain storage and stacking equipment.
- Apply housekeeping to demarcated areas.
- Identify and explain the purpose of demarcated areas, emergency stops, exits and first aid stations

Subject Outcome 2: Use and explain the purpose of safety and protective equipment.

Learning Outcomes:

The student must be able to:

- Discuss the purpose of safety equipment and safety procedures.
- Discuss the purpose of personal protective equipment.
- Use personal protective equipment.
- Use safety equipment correctly.

Subject Outcome 3: Keep the work area safe and productive.

Learning Outcomes:

The student must be able to:

- Check tools and equipment for safety.
- Use machines and tools safely.
- Check workplace and site for safety.
- Identify and respond to unsafe or potentially unsafe conditions that may occur while on working.
- Identify emergency conditions.
- Identify, use and store chemicals, solvents, gases and explosives.

7.3 Topic 3 : Basic Fire-fighting

Subject Outcome 1: Describe different types of fire and demonstrate how to combat each type in the workplace.

Learning Outcomes:

The student must be able to:

- Identify the types of fire and their contexts.
- Select and apply appropriate fire-fighting procedures.
- Identify, select and use appropriate fire-fighting equipment.

7.4 Topic 4: Basic First Aid

Subject Outcome 1: Understand and administer first aid.

Learning Outcomes:

The student must be able to:

- Identify and discuss basic first aid concepts.
- Determine the nature of the injury or medical emergency and identify the basic first aid necessary.
- Apply basic first aid procedure.

7.5 Topic 5: Health and the Environment

Subject Outcome 1: Explain the purpose of the Occupational Health and Safety Act and the Mine Health and Safety Act.

Learning Outcomes:

The student must be able to:

- Define the legal terminology used in the acts.
- Explain the purpose of making a working environment safe and healthy as regulated by legislation.
- Describe the role of the employer and employee in terms of their rights, roles, liabilities and responsibilities regarding safety.

Subject Outcome 2: Perform the role of a safety, health and environmental protection representative.

Learning Outcomes:

The student must be able to:

- Explain and discuss the role and responsibilities of a safety, heath and environmental protection representative.
- Investigate and inspect safety, heath and environmental protection issues in the workplace.
- Consult employees about safety, health and environmental protection issues in the workplace.
- Represent employees in safety, health and environmental protection structures and processes.
- Coach employees on safety, health and environmental protection issues.

Subject Outcome 3: Describe the influence pollution has on the environment.

Learning Outcomes:

The student must be able to:

- Define pollution.
- Identify and describe different types of pollution.
- Identify ways of lowering or eradicating pollution.

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

8.1 Physical resources

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

- Storeroom
- Tool room
- Lecture room(s)
- Training area or work area
- Ablution facilities

8.2 Human resources

The lecturer for Engineering Fundamentals 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.

8.3 Other resources

Consumables, individual tool and equipment requirements and learning materials and resources, for example:

- Literature and learning material which address tasks
- Learning materials on projection equipment
- Educational tours to relevant learning venues
- Educational and motivational talks from industry
- Visual and audio-visual material
- Workshop manuals and documentation for theoretical knowledge
- Models and demonstrations

Funds from the learning provider or funding bodies for the procurement of consumables, tools and equipment must be readily available to ensure the effective operation of a Simulated Environment where students are individually equipped with the necessary tools.