NATIONAL CERTIFICATE (VOCATIONAL)

SUBJECT GUIDELINES

PROFESSIONAL ENGINEERING PRACTICE

NQF Level 4

September 2007

PROFESSIONAL ENGINEERING PRACTICE – LEVEL 4

CONTENTS

INTRODUCTION

A. What is Professional Engineering Practice?

This subject introduces students to the code of ethics in the engineering world of work. It explains the engineering profession, its role, the role of engineering professional bodies, as well as the impact of engineering on both society and the environment. It introduces students to effective communication through graphics, drawings and graphs. It also embeds the basics of computer programming, as well as small scale computer aided design.

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

Each field of work has its own standards and code of ethics, so this subject addresses these critical issues in mechanical engineering. The subject introduces the students to:

- The engineering world of work, code of ethics, roles of professional bodies, as well as the impact of engineering in both the society and the environment.
- Engineering functions, philosophy and communication (both verbal and through graphics and drawings).

C. The link between the Learning Outcomes for Professional Engineering Practice and the Critical and Development Outcomes

The subject improves the problem solving skills through the use of technology. The students develop critical thinking skills by taking constructive decisions on issues that affect society and the environment. The ethical behaviour of students and their sense of responsibility are enhanced as they learn to adhere to the prescribed code of ethics in engineering. Students' communication skills improve through their making presentations and writing reports.

D. Factors that contribute in the Professional Engineering Practice Learning Outcomes.

- A lecture room.
- A centre with computers loaded with the relevant software, and plotters.
- Qualified and competent facilitators, educators and assessors who not only aid and facilitate teaching, training and learning but who are readily available to provide moral support.
- Students need to be patient and disciplined, and to be able to work well in a team.
- Students need to be critical thinkers, efficient problem-solvers, and readily able to evaluate data systems and processes.

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 all of the assessment requirements set out hereunder are adhered to.

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

2 SUBJECT LEVEL FOCUS

Apply professional conduct and principles in Engineering and Related Design

- Reasons are given (with examples) for a code of ethics and conduct in the engineering sector.
- Ethics relating to environmental sensitivity and sustainability are explained with respect to current legislation.
- Consequences of non-adherence to the code of conduct are explained, with examples.

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (50 percent)

Internal assessment at Level 4 is assessment conducted by the provider, the results of which contribute towards the achievement of certification. Internal assessment thus refers to FET college based assessment (Site-Based Assessment), Continuous Assessment (CASS) and Performance Assessment.

3.1.1 Theoretical Component

The theoretical component will form 40 percent of the internal assessment.

Internal assessment of the theoretical component of Professional Engineering Practice Level 4 will take the form of observations, class questions, group work, individual discussions with students, class and semester tests, internal examinations. Daily observation can be made when marking exercises of the previous day and class questions.

Assignments, case studies and tests can be given at the end of a topic, and must form part of the internal assessment

3.1.2 Practical Component

The practical component will form 60 percent of the internal assessment.

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

Internal assessment of the practical component of Professional Engineering Practice Level 4 will take the form of assignments, practical demonstrations, case studies, practical examinations in a simulated engineering work environment.

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

- **Some examples of practical assessments include, but are not limited to:**
  - Presentations (lectures, demonstrations, group discussions and activities, practical work, observation, role play, self activity, judging and evaluation).
  - Use of aids
  - Exhibitions
  - Visits
  - Research
  - Tests and assignments
  - Structured environment

- **Definition of the term "Structured Environment"**

"Structured environment" for the purposes of assessment refers to an actual or simulated workplace, or workshop environment.

Evidence of this practical component must be provided in the form of a logbook with a clear listing of the competencies to be assessed. The following information must be contained in the logbook, which must form part of the PoE:

- Index of competencies as set out in Learning Outcomes and Assessment Standards;
- Evidence of Learning Outcomes achieved by students;
- Evidence of assessment of Learning Outcomes by an accredited assessor
- Record of time spent on each activity
- Signature of student
- Recommendations of Facilitator

For the logbook to be regarded as valid evidence, it must be signed off by an officially assigned supervisor.

- **Evidence in practical assessments**

All evidence pertaining to evaluation of practical work must be reflected in the student's Portfolio of Evidence. The tools and instruments used for the purpose of conducting such assessments must be part of the evidence contained in the 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 and the practical component of the internal continuous assessment.

3.1.4 Moderation of internal assessment mark

Internal assessment is subject to both 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.

External assessment details are set out in the *Assessment Guidelines: Professional Engineering Practice* (Level 4).

4 WEIGHTED VALUES OF THE TOPICS

TOPICS/TOPICS	WEIGHTED VALUE
1. The Engineering Profession	25%
2. The function, philosophy and process of engineering design	25%
3. Communication in engineering	25%
4. Computation	25%
TOTAL	**100**

5 CALCULATION OF FINAL MARK

Continuous Assessment:	Student's mark/100 x 50/1 = a mark out of 50	(a)
Theoretical Examination Mark:	Student's mark/100 x 50/1 = 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, purposes of moderation and verification.

6 PASS REQUIREMENTS

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

7 SUBJECT AND LEARNING OUTCOMES

On completion of Professional Engineering Practice Level 4 the student should have completed the following topics**.**

Topic 1: The engineering profession
Topic 2: The function, philosophy and process of engineering design
Topic 3: Communication in engineering
Topic 4: Computation

7.1 Topic 1: The engineering profession

7.1.1 Subject Outcome: Identify ethical engineering workplace responsibilities to the community.

Learning Outcomes

Students must be able to:

- Make responsible decisions related to pollution and the environment, taking consideration of the impact on:
  - Air contamination through exhaust processes.
  - Water pollution of rivers, dams and underground sources.
  - Crop spraying and its affect on humans, vegetation, water sources, animals and bird life.
- Explain the effects and consequences of dumping waste, with particular reference to:
  - Chemical disposals.
  - Atomic disposals.
  - Location of the dumping site with reference to various factors:

  Range: Direct path of watershed catchment areas, nearby dams, rivers, and streams, land slides.

7.1.2 Subject Outcome 2: Identify ethical engineering workplace responsibilities to employees and clients.

Learning Outcomes

Students must be able to:

- Interpret employee's state of mind.

  Range: Observation of work output level, quality of work, communication with colleagues, character change and absenteeism.
- Demonstrate concern for employees through personal contact and addressing various matters.

  Range: Job satisfaction, hobbies and sport interests, family life, vision for the future.
- Perform after sales service with clientele

  Range: Periodical telephone contact, discussions about products, social drivers, etc i.e.:
  - *Luncheons.*
  - *Technology and/or product conferences.*
  - *Sports events.*
  - *Sponsored and other events and activities*.

7.1.3 Subject Outcome 3: Identify ethical engineering responsibilities to the environment**.**

Learning Outcomes

Students must be able to:

- Illustrate responsible thinking with respect to environmental impact, with reference to different factors.

  Range: Defacing the landscape and vegetation, transportation congestion, destruction and/or construction of roads, noise disturbance from factories, mining and air traffic.
- Suitable positioning of industrial areas.

  Range: Wind direction and seasonal changes, eco-sensitive areas, health effects on communities.

7.1.4 Subject Outcome 4: Explain the role of engineering professional bodies

Learning Outcomes

Students must be able to:

- Define the characteristics of engineering professional bodies in.
- Explain the characteristics of engineering professional bodies in.
- Define the responsibilities of professional bodies.
- Explain the responsibilities and roles of professional bodies.

7.2 Topic 2: The function, philosophy and the process of engineering design

7.2.1 Subject Outcome 1: Discuss the main steps in the engineering design process.

Learning Outcomes

Students must be able to:

- Identify the main steps in the design process.
- Discuss the main steps in the design process.
- Discuss the effects of not complying with acceptable design process.

7.2.2 Subject Outcome 2: Discuss the nature and roles of different types of models used in the engineering design process.

Learning Outcomes

Students must be able to:

- Identify the different models used in the engineering design process.
- Investigate the nature of each model used in the engineering design process.
- Discuss the role of each model used in the engineering design process.

7.3 Topic 3: Communication in engineering

7.3.1 Subject Outcome 1: Interpret sketches drawings and graphs of engineering structures and mechanisms.

Learning Outcomes

Students must be able to:

- Identify the different features from a given sketch, drawing or graph.
- Make a presentation to demonstrate understanding of the given sketch, drawing or graph.
- Use engineering drawings and diagrams to construct small-scale models to demonstrate understanding of the given drawing.

7.3.2 Subject Outcome 2: Design system representation**.**

Range: Block diagrams, flow charts and/or logical networks.

Learning Outcomes

Students must be able to:

- Identify different system representations in manufacturing, engineering and technology.
- Discuss and design the block diagram as a system representation in manufacturing, engineering and technology.
- Discuss and design the flow chart as a system representation in manufacturing, engineering and technology.
- Discuss and design the logical networks as a system representation in manufacturing, engineering and technology.

7.3.3 Subject Outcome 3: Compile a technical report.

Learning Outcomes

Students must be able to:

- Identify different approaches to compiling a technical report.
- Consider the necessity for reporting in various stages of a project.
- Structure the content of a technical report.
- Compile a comprehensive technical report.
- Present a technical report

7.4 Topic 4: Computation

7.4.1 Subject Outcome 1: Identify and explain different computer hardware devicesand their functions in the engineering field.

Learning Outcomes

Students must be able:

- Discuss the principles of data processing.
- Identify the memory and storage devices and their functions in the engineering field.
- Discuss the different input and output devices and their differences.
- Explain the operation of Arithmetic Logical unit of a computer.

7.4.2 Subject Outcome 2: Compare different computer languages.

Learning Outcomes

Students must be able to:

- Discuss the concepts used in high and low level computer languages.
- Perform a simple in-line code in a high level language.
- Perform simple structured programming.
- Discuss the concepts of complex software systems.

7.4.3 Subject Outcome 3: Apply software tools to produce the desired outcomes.

Learning Outcomes

Students must be able:

- Use software tools to produce spreadsheets.
- Use specialised software tools to produce graphics and drawings.

  Range: Specialised software tools refer to but are not limited to CAD.

8 RESOURCE NEEDS FOR THE TEACHING OF PROFESSIONAL ENGINEERING PRACTICE - LEVEL 4

8.1 Human Resources

Minimum educator qualifications and training and ongoing up-skilling requirements:

- Subject matter expertise
- A life-long student
- In possession of an NQF level 5 teaching qualification
- Conversant with Outcomes Based Education (OBE) methodologies
- Instructor qualified in the field of study
- Skilled in learning programme development
- A trade test will be an added advantage

It is of paramount importance that educators working in this environment attend seminars and upgrading workshops in order to be updated and re-skilled in the latest technological developments.

Physical Resources

Building infrastructure, fixtures, networks, plant and machinery:

- Store room-consumables
- Lecture room(s) equipped with:
  - Drawing tables (adjustable height and mounted with drawing equipment recommended).
  - Drawing room chairs (adjustable height recommended).
- A computer room with data projector, printers and plotters (latest technology recommended).
- Ablution facilities