



NATIONAL CERTIFICATE (VOCATIONAL)

SUBJECT GUIDELINES

COMPUTER PROGRAMMING

NQF Level 4

September 2007

COMPUTER PROGRAMMING – LEVEL 4

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INTRODUCTION

A. What is Computer Programming?

Computer Programming involves the designing and programming of well-tested and user-friendly computer-based solutions to meet specific requirements.

B. Why is Principles of Computer Programming important in the Information Technology programme?

Principles of Computer Programming is important in the Information Technology programme as it enhances the development of the IT environment.

C. The link between the Learning Outcomes for Principles of Computer Programming and the Critical and Developmental Outcomes

The student will be able to identify and solve problems, and collect, analyse, organise and critically evaluate information that is related to computer programming. The student will also demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

D. Factors that contribute to achieving Computer Programming Learning Outcomes

- Analytical and logical ability
- Keen powers of observation
- Transferring of skills from familiar to unfamiliar situations
- Meticulous attention to detail
- Interest in computers and related topics

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 candidate meets all of the assessment requirements.

Course preparation should take consideration of students with special education needs.

2 SUBJECT LEVEL FOCUS

- Apply computer-programming skills.

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (50 percent)

3.1.1 Theoretical Component

The theoretical component will form 30 percent of internal assessment.

Internal assessment of the theoretical component of Computer Programming Level 4 will take the form of observation, class questions, group work, (informal group competitions with rewards), individual discussions with students, class, topics 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 done at the end of a topic. Tests and internal examinations must form part of internal assessment.

3.1.2 Practical Component

The practical component includes applications and exercises. All practical components must be indicated in a Portfolio of Evidence (PoE)

The practical component will form 70 percent of internal assessment.

Internal assessment of the practical component of Computer Programming Level 4 will take the form of assignments, practical exercises, case studies, practical examination in a simulated business environment.

Students may complete practical exercises on a daily basis. Assignments and case studies can be done at the end of a topic. Practical examination can form part of internal 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
- Guest speaker presentations
- Research
- Task performance in a simulated/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. It is advised that a practicum room is available on each campus for practical assessment.

- **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 constructed and used for the purpose of conducting such assessments must be clear from 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 subjected to both internal and external moderation procedures as contained 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 set externally and marked and moderated internally.

Details in respect of external assessment are contained in the *Assessment Guidelines: Computer Programming* (Level 4).

4 WEIGHTED VALUES OF TOPICS

TOPICS	WEIGHTED VALUE
1. Object Oriented Programming	20
2. Database application design	20
3. Principles of developing software for the internet	20
4. Design and build a web-site using HTML	20
5. Create multimedia, web-based applications with scripting	20
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, as well as purposes of reporting.

6 PASS REQUIREMENTS

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

7 SUBJECT AND LEARNING OUTCOMES

On completion of Computer Programming Level 4 the student should have covered the following topics:

- Topic 1: Object Oriented Programming
- Topic 2: Database application design .
- Topic 3: Principles of developing software for the internet
- Topic 4: Design and build a website using simple HTML
- Topic 5: Create multimedia, web-based applications with scripting

7.1 Topic 1: Object Oriented Programming

7.1.1 Subject Outcome 1: Describe basic object oriented terminology

Learning Outcomes

The student should be able to:

- Explain the basic principles of a class.
- Explain the basic principles of an object.
- Explain the basic principles of information hiding and encapsulation.
- Explain the basic principles of inheritance.
- Explain the basic principles of polymorphism.

7.1.2 Subject Outcome 2: Describe the fundamental differences between object oriented and procedural programming

Learning Outcomes

The student should be able to:

- Explain the implementation of classes in object oriented programming, using examples.
- Explain encapsulation of data and functions/ methods (in classes)
- Describe how global sharing is minimised to enable weak coupling
- Describe how modules exhibit functional cohesion
- Explain and identify possible classes for simple examples and problems.

7.1.3 Subject Outcome 3: Implement object oriented techniques in development of a solution

Learning Outcomes

The student should be able to:

- Identify objects and classes.
- Implement objects and classes
- Implement a class/ classes in a solution to a given problem/ scenario

7.2 Topic 2: Database application design

7.2.1 Subject Outcome 1: Review the requirements for database access for a computer programming solution.

Learning Outcomes

The student should be able to:

- Identify and explain the feasibility of the requirements.
- Explain and identify database access objectives and critical performance factors
- Explain how to estimate costs for the development effort required.
- Explain the need for adopting a review procedure to ensure that the outcomes meet the database access requirements.

7.2.2 Subject Outcome 2: Design database access for a computer application

Learning Outcomes

The student should be able to:

- Describe and demonstrate design implementation per user requirements
- Describe and demonstrate the design of the database structure that resembles the output from the data analysis
- Describe and demonstrate how to ensure that the structure of each table in the database adheres to the third normal form
- Identify and demonstrate the methods of accessing data.
- Identify the key relationships between the tables within the database
- Explain and demonstrate how to ensure that the data types for primary and foreign keys are consistent throughout the database.

7.2.3 Subject Outcome 3: Write program code for database access for an application implementing SQL

Learning Outcomes:

The student should be able to:

- Identify and implement a method for external data connection and access using program code
- Demonstrate how the program code will use language constructs to facilitate the implementation of the solution.
- Explain and demonstrate how to join tables in a query to satisfy a requirement
- Describe how to construct program code that preserves the integrity of data being accessed by multiple users and processes.

7.2.4 Subject Outcome 4: Test programs for an application that accesses a database

Learning Outcomes:

The student should be able to:

- Describe and demonstrate how testing checks all program logic paths.
- Describe and demonstrate how testing corrects program code to eliminate errors identified.
- Describe and demonstrate how testing verifies that the database access functions in the required environment
- Describe and demonstrate how testing verifies that the database access performs according to the design requirements.
- Describe and demonstrate how testing verifies that the database functions according to the design requirements.

7.2.5 Subject Outcome 5: Document programs for a computer application that accesses a database

Learning Outcomes:

The student should be able to:

- Describe how the documentation enhances the understanding of the program code.
- Describe how the documentation complements the self-documenting attributes of the program code.
- Develop documentation to support the design, program code and solution

7.3 Topic 3: Principles of developing software for the internet

7.3.1 Subject Outcome 1: Explain the network issues related to internet applications

Learning Outcomes

The student should be able to:

- Explain the internet in terms of a session-less network protocol.
- List the implications of session-less application development.
- Explain the impact of band-width on internet usage and data transfer
- List the implications of band-width for application design.

7.3.2 Subject Outcome 2: Explain the implications of copyright, ownership and royalties

Learning outcomes

The student should be able to:

- Explain copyright issues related to internet development.
- Explain ownership issues related to internet development.
- Explain royalty issues related to internet development.

7.3.3 Subject Outcome 3: Explain version control and security issues related to internet applications

Learning outcomes

The student should be able to:

- Explain version control issues related to internet development.
- Explain security issues related to internet development.
- Explain ways of managing security issues related to internet development.

7.3.4 Subject Outcome 4: Demonstrate the basic implementation of different user interface methods used for internet applications

Learning outcomes

The student should be able to:

- Identify and explain different user interface technologies used primarily for internet application development.
- Indicate the implications of each technology
- Demonstrate the basic implementation of each of the user interface technologies above.

7.4 Topic 4: Design and build a web-site using HTML

7.4.1 Subject Outcome 1: Explain basic guidelines for web-page design

Learning Outcomes

The student should be able to:

- Explain the nature and use of a web-site.
- Identify and explain the physical content of web-pages
- Explain the typical transactions which can be carried out via a web-page

7.4.2 Subject Outcome 2: Use core HTML to build a web-page

Learning Outcomes

The student should be able to:

- Discuss the advantages and disadvantages of HTML editors and other web-site design tools.
- Integrate basic HTML functions in the design of a simple web page
- Define the HTML facilities that apply to typical web transactions

7.5 Topic 5: Create multimedia, web-based applications with scripting

7.5.1 Subject Outcome 1: Plan the use of a multimedia, web-based authored application

Learning Outcomes

The student should be able to:

- Identify the user-specified topic, purpose, target audience and objectives of the application according to agreed development plan.
- Explain how the tools selected to create multimedia, web-based applications with scripting are justified in relation to agreed development plan.
- Identify the hardware and software required to create and run the application according to the agreed development plan.
- Outline and monitor the plan for the creation of a multimedia, web-based application according to project planning principles and financial requirements.
- Describe the configuration of the computer and associated systems necessary for the creation of the application according to the agreed development plan.

7.5.2 Subject Outcome 2: Design a multimedia, web-based application

Learning Outcomes

The student should be able to:

- Design story-boards and flow-diagrams of the multimedia, web-based applications to ensure effective communication between the developer and user.
- Explain and motivate a design for a multimedia, web-based application according to user specifications.

7.5.3 Subject Outcome 3: Identify appropriate text, graphic elements and animation

Learning Outcomes

The student should be able to:

- Explain and demonstrate how to align multimedia, web-based application text, graphic elements and animation with agreed topic, purpose and target audience for the application, considering South African copyright and privacy laws.
- Explain and demonstrate how text, graphic elements and animation are saved according to agreed design specification, considering South African copyright and privacy laws.
- Explain and demonstrate how text, graphic elements and animation are saved in a format that allows them to be integrated into the multimedia, web-based application.

7.5.4 Subject Outcome 4: Create multimedia, web-based application scripts.

Learning outcomes

The student should be able to:

- Explain and demonstrate the script using a diagram
- Explain and demonstrate how to configure the operating environment of the computer and associated applications and software so that it may be used as outlined in the plan.
- Explain and demonstrate how one or more scripts are written using standard features of a scripting language.
- Explain and demonstrate how the scripts are tested, errors identified and corrected for most likely conditions.

7.5.5 Subject Outcome 5: Assemble a multimedia, web-based application including scripts

Learning Outcomes

The student should be able to:

- Explain and demonstrate how to assemble a multimedia, web-based application using the saved text, graphics and animation, and written application scripts to conform to the planned specification and user requirements.
- Explain how the content and function of the application are consistent with the design specification and specified computer system environment

8 RESOURCE NEEDS FOR THE TEACHING OF COMPUTER PROGRAMMING - LEVEL 4

8.1 Physical resources

The following teaching aids should be made available, if possible:

- Lecture room
- Computer for facilitator
- Overhead projector
- Networked computer laboratory with internet access

8.2 Human resources

- The facilitator must have as a major subject Computer Programming at NQF Level 5.
- It will be to the advantage of facilitator if they have already been declared competent as assessor and/or moderator.
- Training in OBE

8.3 Other resources

- Computer per learner
- Networked laser printer
- SQL software
- Programming software
- Web page design software
- Multimedia software
- Animation software
- File per learner for PoE
- DVD-RW per learner
- Ream of paper per learner
- 1 GB flash disk per learner
- Programming magazines and journals
- Multimedia magazines