



**education**

Department:  
Education  
REPUBLIC OF SOUTH AFRICA

# **NATIONAL CERTIFICATES (VOCATIONAL)**

## **ASSESSMENT GUIDELINES**

### **COMPUTER PROGRAMMING**

#### **NQF Level 4**

September 2007



# COMPUTER PROGRAMMING – LEVEL 4

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## SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for Computer Programming in the National Certificates (Vocational). It must be read with the *National Policy Regarding Further Education and Training Programmes: Approval of the Documents, Policy for the National Certificates (Vocational) Qualifications at Levels 2 to 4 on the National Qualifications Framework (NQF)*. This assessment guideline will be used for National Qualifications Framework Levels 2-4.

This document explains the requirements for the internal and external subject assessment. The lecturer must use this document with the *Subject Guidelines: Computer Programming* to prepare for and deliver Computer Programming. Lecturers should use a variety of resources and apply a range of assessment skills in the setting, marking and recording of assessment tasks.

## SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

### 1 ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

Assessment in the National Certificates (Vocational) is underpinned by the objectives of the National Qualifications Framework (NQF). These objectives are to:

- Create an integrated national framework for learning achievements.
- Facilitate access to and progression within education, training and career paths.
- Enhance the quality of education and training.
- Redress unfair discrimination and past imbalances and thereby accelerate employment opportunities.
- Contribute to the holistic development of the student by addressing:
  - social adjustment and responsibility;
  - moral accountability and ethical work orientation;
  - economic participation; and
  - nation-building.

The principles that drive these objectives are:

- **Integration**

To adopt a unified approach to education and training that will strengthen the human resources development capacity of the nation.

- **Relevance**

To be dynamic and responsive to national development needs.

- **Credibility**

To demonstrate national and international value and recognition of qualification and acquired competencies and skills.

- **Coherence**

To work within a consistent framework of principles and certification.

- **Flexibility**

To allow for creativity and resourcefulness when achieving Learning Outcomes, to cater for different learning styles and use a range of assessment methods, instruments and techniques.

- **Participation**

To enable stakeholders to participate in setting standards and co-ordinating the achievement of the qualification.

- **Access**

To address barriers to learning at each level to facilitate students' progress.

- **Progression**

To ensure that the qualification framework permits individuals to move through the levels of the national qualification via different, appropriate combinations of the components of the delivery system.

- **Portability**

To enable students to transfer credits of qualifications from one learning institution and/or employer to another institution or employer.

- **Articulation**

To allow for vertical and horizontal mobility in the education system when accredited pre-requisites have been successfully completed.

- **Recognition of Prior Learning**

To grant credits for a unit of learning following an assessment or if a student possesses the capabilities specified in the outcomes statement.

- **Validity of assessments**

To ensure assessment covers a broad range of knowledge, skills, values and attitudes (SKVAs) needed to demonstrate applied competency. This is achieved through:

- clearly stating the outcome to be assessed;
- selecting the appropriate or suitable evidence;
- matching the evidence with a compatible or appropriate method of assessment; and
- selecting and constructing an instrument(s) of assessment.

- **Reliability**

To assure assessment practices are consistent so that the same result or judgment is arrived at if the assessment is replicated in the same context. This demands consistency in the interpretation of evidence; therefore, careful monitoring of assessment is vital.

- **Fairness and transparency**

To verify that no assessment process or method(s) hinders or unfairly advantages any student. The following could constitute unfairness in assessment:

- Inequality of opportunities, resources or teaching and learning approaches
- Bias based on ethnicity, race, gender, age, disability or social class
- Lack of clarity regarding Learning Outcome being assessed
- Comparison of students' work with other students, based on learning styles and language

- **Practicability and cost-effectiveness**

To integrate assessment practices within an outcomes-based education and training system and strive for cost and time-effective assessment.

## **2 ASSESSMENT FRAMEWORK FOR VOCATIONAL QUALIFICATIONS**

The assessment structure for the National Certificates (Vocational) qualification is as follows:

### **2.1 Internal continuous assessment (ICASS)**

Knowledge, skills values, and attitudes (SKVAs) are assessed throughout the year using assessment instruments such as projects, tests, assignments, investigations, role-play and case studies. The internal continuous assessment (ICASS) practical component is undertaken in a real workplace, a workshop or a "Structured Environment". This component is moderated internally and externally quality assured by Umalusi. All internal continuous assessment (ICASS) evidence is kept in a Portfolio of Evidence (PoE) and must be readily available for monitoring, moderation and verification purposes.

### **2.2 External summative assessment (ESASS)**

The external summative assessment is either a single or a set of written papers set to the requirements of the Subject Learning Outcomes. The Department of Education administers the theoretical component according to relevant assessment policies.

A compulsory component of external summative assessment (ESASS) is the **integrated summative assessment task (ISAT)**. This assessment task draws on the students' cumulative learning throughout the year. The task requires **integrated application of competence** and is executed under strict assessment conditions. The task should take place in a simulated or "Structured Environment". The integrated summative assessment task (ISAT) is the most significant test of students' ability to apply acquired knowledge.

The integrated assessment approach allows students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

External summative assessments will be conducted annually between October and December, with provision made for supplementary sittings.

### 3 MODERATION OF ASSESSMENT

#### 3.1 Internal moderation

Assessment must be moderated according to the internal moderation policy of the Further Education and Training (FET) college. Internal college moderation is a continuous process. The moderator's involvement starts with the planning of assessment methods and instruments and follows with continuous collaboration with and support to the assessors. Internal moderation creates common understanding of Assessment Standards and maintains these across vocational programmes.

#### 3.2 External moderation

External moderation is conducted by the Department of Education, Umalusi and, where relevant, an Education and Training Quality Assurance (ETQA) body according to South African Qualifications Authority (SAQA) and Umalusi standards and requirements.

The external moderator:

- monitors and evaluates the standard of all summative assessments;
- maintains standards by exercising appropriate influence and control over assessors;
- ensures proper procedures are followed;
- ensures summative integrated assessments are correctly administered;
- observes a minimum sample of ten (10) to twenty-five (25) percent of summative assessments;
- gives written feedback to the relevant quality assessor; and
- moderates in case of a dispute between an assessor and a student.

Policy on inclusive education requires that assessment procedures be customised for students who experience barriers to learning, and supported to enable these students to achieve their maximum potential.

### 4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

The period of validity of the internal continuous assessment mark is determined by the *National Policy on the Conduct, Administration and Management of the Assessment of the National Certificates (Vocational)*.

The internal continuous assessment (ICASS) must be re-submitted with each examination enrolment for which it constitutes a component.

### 5 ASSESSOR REQUIREMENTS

Assessors must be subject specialists and should ideally be declared competent against the standards set by the ETDP SETA. If the lecturer conducting the assessments has not been declared a competent assessor, an assessor who has been declared competent may be appointed to oversee the assessment process to ensure the quality and integrity of assessments.

### 6 TYPES OF ASSESSMENT

Assessment benefits the student and the lecturer. It informs students about their progress and helps lecturers make informed decisions at different stages of the learning process. Depending on the intended purpose, different types of assessment can be used.

## 6.1 Baseline assessment

At the beginning of a level or learning experience, baseline assessment establishes the knowledge, skills, values and attitudes (SKVAs) that students bring to the classroom. This knowledge assists lecturers to plan learning programmes and learning activities.

## 6.2 Diagnostic assessment

This assessment diagnoses the nature and causes of learning barriers experienced by specific students. It is followed by guidance, appropriate support and intervention strategies. This type of assessment is useful to make referrals for students requiring specialist help.

## 6.3 Formative assessment

This assessment monitors and supports teaching and learning. It determines student strengths and weaknesses and provides feedback on progress. It determines if a student is ready for summative assessment.

## 6.4 Summative assessment

This type of assessment gives an overall picture of student progress at a given time. It determines whether the student is sufficiently competent to progress to the next level.

## 7 PLANNING ASSESSMENT

An assessment plan should cover three main processes:

### 7.1 Collecting evidence

The assessment plan indicates which Subject Outcomes and Assessment Standards will be assessed, what assessment method or activity will be used and when this assessment will be conducted.

### 7.2 Recording

Recording refers to the assessment instruments or tools with which the assessment will be captured or recorded. Therefore, appropriate assessment instruments must be developed or adapted.

### 7.3 Reporting

All the evidence is put together in a report to deliver a decision for the subject.

## 8 METHODS OF ASSESSMENT

Methods of assessment refer to who carries out the assessment and includes lecturer assessment, self-assessment, peer assessment and group assessment.

<b>LECTURER ASSESSMENT</b>	The lecturer assesses students' performance against given criteria in different contexts, such as individual work, group work, etc.
<b>SELF-ASSESSMENT</b>	Students assess their own performance against given criteria in different contexts, such as individual work, group work, etc.
<b>PEER ASSESSMENT</b>	Students assess another student's or group of students' performance against given criteria in different contexts, such as individual work, group work, etc.
<b>GROUP ASSESSMENT</b>	Students assess the individual performance of other students within a group or the overall performance of a group of students against given criteria.

## 9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

All evidence collected for assessment purposes is kept or recorded in the student's Portfolio of Evidence (PoE).

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate the Subject Outcome has been attained. This will only be possible if the chosen methods and instruments are appropriate for the target group and the Specific Outcome being assessed.

	METHODS FOR COLLECTING EVIDENCE		
	Observation-based (Less structured)	Task-based (Structured)	Test-based (More structured)
<b>Assessment instruments</b>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Class questions</li> <li>• Lecturer, student, parent discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Assignments or tasks</li> <li>• Projects</li> <li>• Investigations or research</li> <li>• Case studies</li> <li>• Practical exercises</li> <li>• Demonstrations</li> <li>• Role-play</li> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Examinations</li> <li>• Class tests</li> <li>• Practical examinations</li> <li>• Oral tests</li> <li>• Open-book tests</li> </ul>
<b>Assessment tools</b>	<ul style="list-style-type: none"> <li>• Observation sheets</li> <li>• Lecturer's notes</li> <li>• Comments</li> </ul>	<ul style="list-style-type: none"> <li>• Checklists</li> <li>• Rating scales</li> <li>• Rubrics</li> </ul>	<ul style="list-style-type: none"> <li>• Marks (e.g. %)</li> <li>• Rating scales (1-7)</li> </ul>
<b>Evidence</b>	<ul style="list-style-type: none"> <li>• Focus on individual students</li> <li>• Subjective evidence based on lecturer observations and impressions</li> </ul>	<p><b>Open middle:</b> Students produce the same evidence but in different ways.</p> <p><b>Open end:</b> Students use same process to achieve different results.</p>	Students answer the same questions in the same way, within the same time.

## 10 TOOLS FOR ASSESSING STUDENT PERFORMANCE

**Rating scales** are marking systems where a symbol (such as 1 to 7) or a mark (such as 5/10 or 50%) is defined in detail. The detail is as important as the coded score. Traditional marking, assessment and evaluation mostly used rating scales without details such as what was right or wrong, weak or strong, etc.

**Task lists** and **checklists** show the student what needs to be done. These consist of short statements describing the expected performance in a particular task. The statements on the checklist can be ticked off when the student has adequately achieved the criterion. Checklists and task lists are useful in peer or group assessment activities.

**Rubrics** are a hierarchy (graded levels) of criteria with benchmarks that describe the minimum level of acceptable performance or achievement for each criterion. Using rubrics is a different way of assessing and cannot be compared to tests. Each criterion described in the rubric must be assessed separately. Mainly two types of rubrics, namely holistic and analytical, are used.

## 11 SELECTING AND/OR DESIGNING RECORDING AND REPORTING SYSTEMS

The selection or design of recording and reporting systems depends on the purpose of recording and reporting student achievement. **Why** particular information is recorded and **how** it is recorded determine which instrument will be used.

Computer-based systems, for example spreadsheets, are cost and time effective. The recording system should be user-friendly and information should be easily accessed and retrieved.

## 12 COMPETENCE DESCRIPTIONS

All assessment should award marks to evaluate specific assessment tasks. However, marks should be awarded against rubrics and not be simply a total of ticks for right answers. Rubrics should explain the competence level descriptors for the skills, knowledge, values and attitudes (SKVAs) that a student must demonstrate to achieve each level of the rating scale.

When lecturers or assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a Subject Outcome. The relevant Assessment Standard must be used to create the rubric to assess the task or question. The descriptions must clearly indicate the minimum level of attainment for each category on the rating scale.



## 13 STRATEGIES FOR COLLECTING EVIDENCE

A number of different assessment instruments may be used to collect and record evidence. Examples of instruments that can be (adapted and) used in the classroom include:

### 13.1 Record sheets

The lecturer observes students working in a group. These observations are recorded in a summary table at the end of each project. The lecturer can design a record sheet to observe students' interactive and problem-solving skills, attitudes towards group work and involvement in a group activity.

### 13.2 Checklists

Checklists should have clear categories to ensure that the objectives are effectively met. The categories should describe how the activities are evaluated and against what criteria they are evaluated. Space for comments is essential.

## SECTION C: ASSESSMENT IN COMPUTER PROGRAMMING

### 1 SCHEDULE OF ASSESSMENT

At NQF levels 2, 3 and 4, lecturers will conduct assessments as well as develop a schedule of formal assessments that will be undertaken in the year. All three levels also have an external examination that accounts for 50 percent of the total mark. The marks allocated to assessment tasks completed during the year, kept or recorded in a Portfolio of Evidence (PoE), account for the other 50 percent.

The Portfolio of Evidence (PoE) and the external assessment include practical and written components. The practical assessment in Computer Programming must, where necessary, be subjected to external moderation by Umalusi or an appropriate Education and Training Quality Assurance (ETQA) body, appointed by the Umalusi Council in terms of Section 28(2) of the *General and Further Education and Training Quality Assurance Act, 2001 (Act No. 58 of 2001)*.

### 2 RECORDING AND REPORTING

Computer Programming, as is the case for all the other Vocational subjects, is assessed according to five levels of competence. The level descriptions are explained in the following table.

#### **Scale of Achievement for the Vocational component**

RATING CODE	RATING	MARKS %
5	Outstanding	80-100
4	Highly Competent	70-79
3	Competent	50-69
2	Not yet competent	40-49
1	Not achieved	0-39

The programme of assessment should be recorded in the Lecturer's Portfolio of Assessment for each subject. The following at least should be included in the Lecturer's Assessment Portfolio:

- A contents page
- The formal schedule of assessment
- The requirements for each assessment task
- The tools used for each assessment task
- Recording instrument(s) for each assessment task
- A mark sheet and report for each assessment task

The college must standardise these documents.

The student's Portfolio of Evidence (PoE) must include at least:

- A contents page
- The assessment tasks according to the assessment schedule
- The assessment tools or instruments for the task
- A record of the marks (and comments) achieved for each task

Where a task cannot be contained as evidence in the Portfolio of Evidence (PoE), its exact location must be recorded and it must be readily available for moderation purposes.

# **ASSESSMENT OF COMPUTER PROGRAMMING LEVEL 4**

### 3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN COMPUTER PROGRAMMING - LEVEL 4

#### Topic 1: Object Oriented Programming

SUBJECT OUTCOME	
<b>1.1 Describe basic object oriented terminology</b>	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> <li>The description explains the basic principles of a class.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the basic principles of a class.</li> </ul>
<ul style="list-style-type: none"> <li>The description explains the basic principles of an object. Range: Definition and implementation of objects</li> </ul>	<ul style="list-style-type: none"> <li>Explain the basic principles of an object.</li> </ul>
<ul style="list-style-type: none"> <li>The description explains the basic principles of information hiding and encapsulation.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the basic principles of information hiding and encapsulation.</li> </ul>
<ul style="list-style-type: none"> <li>The description explains the basic principles of inheritance</li> </ul>	<ul style="list-style-type: none"> <li>Explain the basic principles of inheritance.</li> </ul>
<ul style="list-style-type: none"> <li>The description explains the basic principles of polymorphism</li> </ul>	<ul style="list-style-type: none"> <li>Explain the basic principles of polymorphism.</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

SUBJECT OUTCOME	
<b>1.2 Describe the fundamental differences between object oriented and procedural programming</b>	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> <li>The description explains the implementation of classes in object orientated programming, using examples</li> </ul>	<ul style="list-style-type: none"> <li>Explain the implementation of classes in object oriented programming, using examples</li> </ul>
<ul style="list-style-type: none"> <li>The description explains encapsulation of data and functions/methods in OO versus procedural programming</li> </ul>	<ul style="list-style-type: none"> <li>Explain encapsulation of data and functions/methods (in classes)</li> </ul>
<ul style="list-style-type: none"> <li>Global data sharing is minimised to enable weak coupling, and modules exhibit functional cohesion.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how global data sharing is minimised to enable weak coupling.</li> <li>Describe how modules exhibit functional cohesion.</li> </ul>
<ul style="list-style-type: none"> <li>The description identifies possible classes for simple examples and problems</li> <li>Range: similar complexity, to application mastered in Basic programming principles and standards</li> </ul>	<ul style="list-style-type: none"> <li>Explain and identify possible classes for simple examples and problems</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>1.3 Implement object oriented techniques in development of a solution</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>• Objects and classes are identified and classes are defined to provide a solution to a given problem/scenario</li> <li>• <i>Range: object identification, class design, objects instantiation, object array/s, methods, encapsulation, inheritance, polymorphism</i></li> </ul>	<ul style="list-style-type: none"> <li>• Identify objects and classes</li> <li>• Implement a class/classes in a solution to a given problem/scenario</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Class tests</li> <li>• Projects/Practical work</li> <li>• Assignments</li> <li>• Group work</li> </ul>	

## Topic 2: Database application design

<b>SUBJECT OUTCOMES</b>	
<b>2.1 Review the requirements for database access for a computer programming solution.</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>• The review identifies and explains the feasibility of the requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and explain the feasibility of the requirements.</li> </ul>
<ul style="list-style-type: none"> <li>• The review identifies the database access objectives and critical performance factors.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain and identify database access objectives and critical performance factors</li> </ul>
<ul style="list-style-type: none"> <li>• The review explains how to estimate costs for the development effort required</li> </ul>	<ul style="list-style-type: none"> <li>• Explain how to estimate costs for the development effort required.</li> </ul>
<ul style="list-style-type: none"> <li>• The review explains the need for adopting a review procedure to ensure that the outcomes meet the database access requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the need for adopting a review procedure to ensure that the outcomes meet the database access requirements.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Class tests</li> <li>• Projects/Practical work</li> <li>• Assignments</li> <li>• Group work</li> </ul>	

<b>SUBJECT OUTCOMES</b>	
<b>2.2 Design database access for a computer application</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>The design describes and demonstrates design implementation per user requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate design implementation per user requirements</li> </ul>
<ul style="list-style-type: none"> <li>The design of the database structure that resembles the output from the data analysis is described and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate the design of the database structure that resembles the output from the data analysis</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which the design ensures that the structure of each table in the database adheres to the third normal form (normalised tables) is described and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate how to ensure that the structure of each table in the database adheres to the third normal form.</li> </ul>
<ul style="list-style-type: none"> <li>The design identifies and demonstrates the methods of accessing data.</li> </ul>	<ul style="list-style-type: none"> <li>Identify and demonstrate the methods of accessing data.</li> </ul>
<ul style="list-style-type: none"> <li>The key relationships between the tables within the database are identified.</li> </ul>	<ul style="list-style-type: none"> <li>Identify the key relationships between the tables within the database</li> </ul>
<ul style="list-style-type: none"> <li>Strategies in the design to ensure that the data types for primary and foreign keys are consistent throughout the database are explained and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Explain and demonstrate how to ensure that the data types for primary and foreign keys are consistent throughout the database.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOMES</b>	
<b>2.3 Write program code for database access for an application implementing SQL</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>A method for external data connection and access is identified, and implemented using program code</li> <li><i>Range: a connection string, data base object, data objects e.g. table objects, session objects</i></li> </ul>	<ul style="list-style-type: none"> <li>Identify and implement a method for external data connection and access using program code</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which the program code uses language constructs to facilitate the implementation of the solution is demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate how the program code will use language constructs to facilitate the implementation of the solution.</li> </ul>
<ul style="list-style-type: none"> <li>Tables are joined in a query to satisfy a requirement</li> </ul>	<ul style="list-style-type: none"> <li>Explain and demonstrate how to join tables in a query to satisfy a requirement</li> </ul>
<ul style="list-style-type: none"> <li>Program code is constructed that preserves the integrity of the data being accessed by multiple users and processes.</li> <li><i>Range: inserts, updates</i></li> </ul>	<ul style="list-style-type: none"> <li>Describe how to construct program code that preserves the integrity of data being accessed by multiple users and processes.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOMES</b>	
<b>2.4 Test programs for an application that accesses a database</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>The manner in which testing checks all program logic paths is described and demonstrated</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate how testing checks all program logic paths.</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which testing corrects program code to eliminate errors identified is described and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate how testing corrects program code to eliminate errors identified.</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which testing verifies that the database access functions in the required environment is described and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate how testing verifies that the database access functions in the required environment</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which testing verifies that the database access performs according to the design requirements is described and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate how testing verifies that the database access performs according to the design requirements.</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which testing verifies that the database functions according to the design requirements is described and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Describe and demonstrate how testing verifies that the database functions according to the design requirements.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOMES</b>	
<b>2.5 Document programs for a computer application that accesses a database</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>The manner in which the documentation enhances the understanding of the program code is described.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how the documentation enhances the understanding of the program code.</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which the documentation complements self-documenting attributes of the program code is described.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how the documentation complements the self-documenting attributes of the program code.</li> </ul>
<ul style="list-style-type: none"> <li>Documentation is developed to support the design, program code and solution</li> </ul>	<ul style="list-style-type: none"> <li>Develop documentation to support the design, program code and solution</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

**Topic 3: Principles of developing software for the internet**

<b>SUBJECT OUTCOME</b>	
<b>3.1 Explain the network issues related to internet applications</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>• Session-less network protocol for the internet is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the internet in terms of a session-less network protocol.</li> </ul>
<ul style="list-style-type: none"> <li>• The explanation lists the implications of session-less application development.</li> </ul>	<ul style="list-style-type: none"> <li>• List the implications of session-less application development.</li> </ul>
<ul style="list-style-type: none"> <li>• The impact of limited band-with on internet usage and data transfer is explained.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the impact of band-width on internet usage and data transfer</li> </ul>
<ul style="list-style-type: none"> <li>• The implications of band-width for application design are listed.</li> </ul>	<ul style="list-style-type: none"> <li>• List the implications of band-width for application design.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Class tests</li> <li>• Projects/Practical work</li> <li>• Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>3.2 Explain the implications of copyright, ownership and royalties</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>• Copyright issues related to Internet development is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain copyright issues related to internet development.</li> </ul>
<ul style="list-style-type: none"> <li>• Ownership issues related to Internet development is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain ownership issues related to internet development.</li> </ul>
<ul style="list-style-type: none"> <li>• Royalty issues related to Internet development is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain royalty issues related to internet development.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Class tests</li> <li>• Projects/Practical work</li> <li>• Assignments</li> <li>• Group work</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>3.3 Explain version control and security issues related to internet applications</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>• Version control issues related to internet development is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain version control issues related to internet development.</li> </ul>
<ul style="list-style-type: none"> <li>• Security issues related to internet development is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain security issues related to internet development.</li> </ul>
<ul style="list-style-type: none"> <li>• Ways of managing security issues related to internet development is explained</li> </ul>	<ul style="list-style-type: none"> <li>• Explain ways of managing security issues related to internet development.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• Class tests</li> <li>• Projects/Practical work</li> <li>• Assignments</li> <li>• Group work</li> </ul>	



SUBJECT OUTCOME	
<b>3.4 Demonstrate the basic implementation of different user interface methods used for internet applications</b>	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> <li>The demonstration identifies and explains different user interface methods used for Internet application development. <i>Range: web forms, server pages, applets.</i></li> </ul>	<ul style="list-style-type: none"> <li>Identify and explain different user interface technologies used primarily for internet application development.</li> </ul>
<ul style="list-style-type: none"> <li>The demonstration indicates the implications of each technology.</li> </ul>	<ul style="list-style-type: none"> <li>Indicate the implications of each technology</li> </ul>
<ul style="list-style-type: none"> <li>The basic implementation of each of the user interface technologies is demonstrated</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate the basic implementation of each of the user interface technologies above.</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

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

SUBJECT OUTCOME	
<b>4.1 Explain basic guidelines for web-page design</b>	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> <li>The nature and use of a web-site is explained.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the nature and use of a web-site.</li> </ul>
<ul style="list-style-type: none"> <li>The physical content of web-pages is identified and explained</li> </ul>	<ul style="list-style-type: none"> <li>Identify and explain the physical content of web-pages</li> </ul>
<ul style="list-style-type: none"> <li>Typical transactions which can be carried out via a web-page are explained.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the typical transactions which can be carried out via a web-page</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

SUBJECT OUTCOME	
<b>4.2 Use core HTML to build a web-page</b>	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> <li>The advantages and disadvantages of HTML editors and other web-site design tools are discussed.</li> </ul>	<ul style="list-style-type: none"> <li>Discuss the advantages and disadvantages of HTML editors and other web-site design tools.</li> </ul>
<ul style="list-style-type: none"> <li>Basic HTML functions are integrated in the design of a simple web page</li> </ul>	<ul style="list-style-type: none"> <li>Integrate basic HTML functions in the design of a simple web page</li> </ul>
<ul style="list-style-type: none"> <li>The HTML facilities that apply to typical web transactions are defined</li> </ul>	<ul style="list-style-type: none"> <li>Define the HTML facilities that apply to typical web transactions</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

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

<b>SUBJECT OUTCOME</b>	
<b>5.1 Plan the use of a multimedia, web-based authored application</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>The user-specified topic, purpose, target audience and objectives of the application are identified according to agreed development plan</li> </ul>	<ul style="list-style-type: none"> <li>Identify the user-specified topic, purpose, target audience and objectives of the application according to agreed development plan.</li> </ul>
<ul style="list-style-type: none"> <li>The way in which the tools selected to create multimedia, web-based applications with scripting are justified in relation to agreed development plan is explained.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how the tools selected to create multimedia, web-based applications with scripting are justified in relation to agreed development plan.</li> </ul>
<ul style="list-style-type: none"> <li>The hardware and software required to create and run the application according to the agreed development plan are identified.</li> </ul>	<ul style="list-style-type: none"> <li>Identify the hardware and software required to create and run the application according to the agreed development plan.</li> </ul>
<ul style="list-style-type: none"> <li>The plan for the creation of a multimedia, web-based application is outlined and monitored according to project planning principles and financial requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Outline and monitor the plan for the creation of a multimedia, web-based application according to project planning principles and financial requirements.</li> </ul>
<ul style="list-style-type: none"> <li>The configuration of the computer and associated systems necessary for the creation of the application according to the agreed development plan are described.</li> </ul>	<ul style="list-style-type: none"> <li>Describe the configuration of the computer and associated systems necessary for the creation of the application according to the agreed development plan.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>5.2 Design a multimedia, web-based application</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>Story-boards and flow-diagrams of the multimedia, web-based applications are designed to ensure effective communication between developer and user.</li> </ul>	<ul style="list-style-type: none"> <li>Design story-boards and flow-diagrams of the multimedia, web-based applications to ensure effective communication between the developer and user.</li> </ul>
<ul style="list-style-type: none"> <li>A multimedia, web-based application design is explained and motivated according to user specifications.</li> </ul>	<ul style="list-style-type: none"> <li>Explain and motivate a design for a multimedia, web-based application according to user specifications.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>5.3 Identify appropriate text, graphic elements and animation</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>The manner in which multimedia, web-based application text, graphics elements and animation are aligned with agreed topic, purpose and target audience for the application and South African copyright and privacy laws, is explained and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which text, graphics elements and animation saved according to agreed design specification considering South African copyright and privacy laws is explained and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Explain and demonstrate how text, graphic elements and animation are saved according to agreed design specification, considering South African copyright and privacy laws.</li> </ul>
<ul style="list-style-type: none"> <li>The manner in which text, graphic elements and animation are saved in a format that allows them to be integrated into the multimedia, web-based application is explained and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

<b>SUBJECT OUTCOME</b>	
<b>5.4 Create multimedia, web-based application scripts.</b>	
<b>ASSESSMENT STANDARD</b>	<b>LEARNING OUTCOME</b>
<ul style="list-style-type: none"> <li>The script is explained and demonstrated using a diagram</li> </ul>	<ul style="list-style-type: none"> <li>Explain and demonstrate the script using a diagram</li> </ul>
<ul style="list-style-type: none"> <li>The configuration of the operating environment of the computer and associated applications and software is explained so that it may be used as outlined in the plan</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<ul style="list-style-type: none"> <li>Writing one or more scripts using standard features of scripting languages is explained and demonstrated</li> </ul>	<ul style="list-style-type: none"> <li>Explain and demonstrate how one or more scripts are written using standard features of a scripting language.</li> </ul>
<ul style="list-style-type: none"> <li>Testing, error identification and correction for most likely conditions in scripts is explained and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>Explain and demonstrate how the scripts are tested, errors identified and corrected for most likely conditions.</li> </ul>
<b>ASSESSMENT TASKS OR ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

SUBJECT OUTCOME	
5.5 Assemble a multimedia, web-based application including scripts	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> <li>The way in which the assembly of a multimedia, web-based application using the saved text, graphics and animation, and written application scripts conforms to the planned specification and user requirements is explained and demonstrated.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<ul style="list-style-type: none"> <li>The consistency of the content and the function of the application with the design specification and specified computer system environment are explained.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how the content and function of the application are consistent with the design specification and specified computer system environment</li> </ul>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> <li>Class tests</li> <li>Projects/Practical work</li> <li>Assignments</li> <li>Group work</li> </ul>	

#### 4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN COMPUTER PROGRAMMING - LEVEL 4

##### 4.1 Integrated summative assessment task (ISAT)

A compulsory component of the external assessment (ESASS) is the **integrated summative assessment task (ISAT)**. The integrated summative assessment task (ISAT) draws on the students' cumulative learning achieved throughout the year. The task requires **integrated application of competence** and is executed and recorded in compliance with assessment conditions.

Two approaches to the integrated summative assessment task (ISAT) may be as follows:

- The students are assigned a task at the beginning of the year which they will have to complete in phases during the year to obtain an assessment mark. A final assessment is made at the end of the year when the task is completed.

**OR**

- Students achieve the competencies during the year but the competencies are assessed cumulatively in a single assessment or examination session at the end of the year.

The integrated summative assessment task (ISAT) is set by an externally appointed examiner and is conveyed to colleges in the first quarter of the year.

The integrated assessment approach enables students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

##### 4.2 National Examination

A national examination is conducted annually in October or November by means of a paper(s) set and moderated externally. The following distribution of cognitive application is suggested:

LEVEL 4	KNOWLEDGE AND COMPREHENSION	APPLICATION	ANALYSIS, SYNTHESIS AND EVALUATION
	40%	40%	20%