NATIONAL CERTIFICATE (VOCATIONAL)

SUBJECT GUIDELINES

SYSTEMS ANALYSIS AND DESIGN
NQF level 4

Implementation: January 2020
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INTRODUCTION

A. What is Systems Analysis and Design?
Systems Analysis and Design provides the student with an understanding of how to conduct a systems analysis, and based on the findings, how to design and implement systems.

B. Why is the subject important in the Information Technology programme?
Systems Analysis and Design is an integral component of Information Technology and is often seen as the starting point of many decisions that occur not only in the ICT department but in the organisation as a whole.

C. The link between the Systems Analysis and Design Learning Outcomes and the critical and developmental outcomes
The student will be able to identify and solve problems, collect, analyse, organise, critically evaluate information that is related to information systems. The student will also be able to demonstrate an understanding of the world as a set of related systems by recognizing that problem solving contexts do not exist in isolation.

D. Factors that contribute to achieving the Systems Analysis and Design Learning Outcomes
- The ability to think logically and analytically, as well as holistically and laterally; and
- Be able to transfer skills from familiar to unfamiliar situations
- Keen powers of observation
- 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 the assessment requirements. Course preparation should consider students with special education needs.

2 SUBJECT LEVEL FOCUS
Apply knowledge and understanding of information technology systems analysis and design.

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (50 percent)

3.1.1 Theoretical Component
The theoretical component will form 60 percent of internal assessment.
Internal assessment of the theoretical component of Systems Analysis and Design Level 4 will take the form of observation, class questions, group work, (informal group competitions with rewards), individual discussion with students, class, topic and semester tests, and internal examinations. Daily observation can be made when marking exercises of the previous day and conducting questioning in class. 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 will form 40 percent of internal assessment.
The practical component includes applications and exercises. All practical components must be indicated in a Portfolio of Evidence (PoE).
Internal assessment of the practical component of Systems Analysis and Design Level 4 will take 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. The practical examination can form part of the 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
  - Guest speaker presentations
  - Research
  - Task performance in a simulated/structured environment

• Definition of “Structured environment”
“Structured environment” for the purposes of assessment refers to an actual or simulated workplace, or workshop environment.

• Evidence in practical assessments
All evidence pertaining to evaluation of practical work must be reflected in the student’s PoE. The assessment instruments used for the purpose of conducting such assessments must be part of the evidence contained in 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 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: Systems Analysis and Design (Level 4).

4 WEIGHTED VALUES OF TOPICS

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>WEIGHTED VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ethics and professionalism for the computer industry in South Africa</td>
<td>6%</td>
</tr>
<tr>
<td>2. ICT risks and threat management</td>
<td>6%</td>
</tr>
<tr>
<td>3. Information gathering techniques for computer systems development</td>
<td>16%</td>
</tr>
<tr>
<td>4. Analysing information systems</td>
<td>35%</td>
</tr>
<tr>
<td>5. Principles of designing computer system inputs and outputs</td>
<td>20%</td>
</tr>
<tr>
<td>6. Implementing and maintaining an information system</td>
<td>7%</td>
</tr>
<tr>
<td>7. New trends in System Analysis and Design</td>
<td>10%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
</tr>
</tbody>
</table>

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 for purposes of reporting.

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 Systems Analysis and Design Level 3 the student should have covered the following topics:

- Topic 1: Ethics and professionalism for the computer industry in South Africa
- Topic 2: ICT risks and threat management
- Topic 3: Information gathering techniques for computer systems development
- Topic 4: Analysing information systems
- Topic 5: Principles of designing computer system inputs and outputs
- Topic 6: Implementing and maintaining an information system
- Topic 7: New trends in Systems Analysis and Design

**Topic 1: Ethics and professionalism for the computer industry in South Africa**

**Subject Outcome 7.1:** Describe professionalism for the computer industry in South Africa.

**Learning Outcomes**

The student should be able to:
- Discuss acceptable and unacceptable professional practices found in the computer industry.
- Identify and briefly describe known professional bodies available for the computer industry in South Africa.

**Subject Outcome 7.2:** Describe the codes of practice for professionalism in the IT industry in South Africa.

**Learning Outcomes**

The student should be able to:
- Identify general codes of practice for the IT industry in South Africa.
- Discuss the codes of practice identified.
Subject Outcome 7.3: Describe the code of ethics of the computer industry in South Africa.

Learning Outcomes
The student should be able to:
• Explain how the computer industry supports the concept of equal opportunity.
• Explain the policy against computer software piracy.
• Identify ways in which piracy is addressed in South Africa.

Topic 2: ICT risks and threat management.

Subject Outcome 2.1: Describe risk management.

Learning Outcomes
The student should be able to:
• Describe the term risk assessment.
• Explain the term risk management.
• Describe the implications of risk and threats to IT project development.
• Identify the reasons for the failure of project(s).
• Identify major risk factors.
• Define the term contingency plan.
• List possible actions that can be taken relevant to various risks and threats identified.

Subject Outcome 2.2: Recommend simple security solutions.

Learning Outcomes
The student should be able to:
• Define the term computer security.
• Explain the purpose of security controls within software environments.
• Describe the main security control areas.
• Describe and recommend hardware and software controls to enforce security controls.
• Explain security and usage policies and procedures.
• Explain acceptable and unacceptable ICT usage.
• Explain the penalties for unacceptable use of ICTs.

Topic 3: Information gathering techniques for computer systems development

Subject Outcome 3.1: Outline the role of the Systems analyst in interacting with the various users of a system

Learning Outcomes
The student should be able to:
• Describe the purpose and role of a systems analyst as a creative problem solver and systems user within the organisation
• Discuss the concept of a user as part of an information system
• Outline the different types of users and their typical interaction with an IS (Information System)
• Define the term actor
• Explain the role that the users have in the analysis design process of a system

Subject Outcome 3.2: Design and conduct an interview for gathering information for computer system development.

Learning Outcomes
The student should be able to:
• Explain the purpose of using an interview as part of the information gathering process
• Outline the advantages and possible disadvantages of using interviews
• Outline the various interview guidelines and their purpose
• Explain the purpose of using an interview checklist
• Explain how question themes could be utilised in the development an interview guide
• Explain how source documentation and observation of organisational procedure could contribute to the design of an interview guideline
• Design a section that explains the objectives of the interview to the interviewee.
• Explain and demonstrate how the interviewee’s understanding of the interview questions will be confirmed.
Subject Outcome 3.3: Design and use a questionnaire for gathering information.

Learning Outcomes
The student should be able to:
- Explain the purpose of using a questionnaire as part of the information gathering process
- Outline the advantages and possible disadvantages of using questionnaires
- Design a section that explains the objectives of the questionnaire to respondents.
- Explain and demonstrate how the respondents' understanding of the questionnaire will be confirmed.
- Outline the typical elements and components of a questionnaire
- Explain how question themes could be utilised in the development of a questionnaire
- Design a questionnaire using various elements
- Explain and demonstrate how to ensure that the respondents' provision of answers will meet the questionnaire objectives.
- Explain and demonstrate how to summarise the questionnaire responses
- Compare actual questionnaire responses to expected responses.
- Draw justifiable conclusions about the population sample.

Subject Outcome 3.4: Gather data from documents for computer system development.

Learning Outcomes
The student should be able to:
- Define the concept of a business source document
- List examples of different business source documents
- Explain and demonstrate how various source documents could be used as part of the analysis and data gathering process
- Identify documents that meet the specified information requirements using an industry recommended format.
- Identify documents that show characteristics of the data and relationships between data items.
- Identify documents that show data items and facilitate access to those data items.
- Identify various possible actors from the analysis of a source document
- Identify different processes from the analysis of a source document
- Identify various data elements and entities (data sources) from the analysis of a source document

Subject Outcome 3.5: Observe personnel behaviour to gather information for computer system development.

Learning Outcomes
The student should be able to:
- Explain how observation could be used as an information gathering technique
- Outline different forms of observation
- Outline the benefits and possible disadvantages of using observation
- Identify a record of behaviour of events that meet the specified information requirements and outline those events.
- Compile a report on the observation.
- Compare the outcome of the observation with original objectives.

Subject Outcome 3.6: Consolidate the information gathered via different techniques.

Learning Outcomes
The student should be able to:
- Compare information gathered through different techniques for similarities and differences.
- Contrast the various information gathering techniques in terms of use and suitability
- Demonstrate how the differences are resolved and justified by reviewing the information gathering techniques.
Present the findings and requirements are analysed and a summary of the findings and or requirements are presented in a consolidated form

**Topic 4: Analysing information systems**

**Subject Outcome 4.1:** Describe information systems analysis.

**Learning Outcomes**
The student should be able to:
- Explain the purpose of information systems analysis.
- Outline the functions of the information systems analyst (SA).
- Discuss the role of the SA as an strategic planner
- Outline the importance of ethics and ethical behaviour as part of the acumen of a SA
- Define and describe the purpose of joint application development (JAD).

**Subject Outcome 4.2:** Identify and explain different techniques and tools used for documenting system analysis.

**Learning Outcomes**
The student should be able to:
- Discuss the typical steps and stages involved as part of the traditional (or structured) analysis and development process/methodology
- Explain the processes involved as part of each of the steps or stages of the structured analysis and development process/methodology
- Describe the concept Agile Modelling
- Discuss the typical steps involved as part of the Object Oriented Analysis and Design (OOAD) process/methodology
- Explain the iterative nature of the OOAD process in relation to agile principles
- Contrast the traditional structured analysis approach with the OOAD approach
- Identify and explain different techniques and tools and models used as part of the structured approach and the Object Oriented approach
- Identify and explain different techniques used for describing data structures.
- Identify and explain different techniques used for documenting business process flows.
- Identify and explain different techniques used for documenting data flows.
- Identify and explain different analysis tools used to assist with documentation.

**Subject Outcome 4.3:** Describe the purpose, deliverables from and contractual implications of the systems requirements document.

**Learning Outcomes**
The student should be able to:
- Describe the purpose of the systems requirements document.
- Describe the purpose of a request for proposal document
- Differentiate between a request for proposal and a request for quotation document
- Identify the deliverables from the systems requirements document.
- Identify and explain the elements of the systems requirements document that could have contractual implications.

**Subject Outcome 4.4:** Demonstrate the application of the Structured development technique

**Learning Outcomes**
The student should be able to:
Discuss the concept, components and origins of the Relational Model
- Analyse various source documents (or descriptions) towards the identification of entities, attributes and relationships
- Differentiate between different types of relationships
  - (Range: 1:1, 1:M, M:N)
- Differentiate between different types of entities
  - Range( Strong Entity, Weak Entity and an Associate Entity (Bridging entity))
Subject Outcome 4.5: Demonstrate the application of the Object Oriented Technique

Learning Outcomes
The student should be able to:

- Discuss the concept of requirements modelling within the OOAD context
- Discuss how object oriented analysis could be used to describe the requirements and functionality of a system
- Explain the functional principles of OOAD in relation to Object Oriented systems
- Explain the concept of a use case
- Explain how use cases are implemented as part of the functional requirements definition process
- Explain and demonstrate the use of different techniques for identifying use cases
- Develop a use case diagram
- Explain and demonstrate the use of various notations and symbols as part of the development of a use case diagram
  
Range (Actor, Use case, boundary, include and extend use cases)
- Discuss the typical parts, components and purpose of a use case description
- Develop a use case description based on a set of requirements or specifications
- Construct a use-case description table
- Explain the purpose of an activity diagram as part of the design specification process
- Outline the use of the various symbols which constitute an activity diagram.
  
Range (Start – Stop symbol, Swim lines, Processes, Decision blocks, loop constructs and alternate paths and combinations)
- Design an activity diagram based on a scenario or use case description
- Explain the purpose of a Systems Sequence Diagram (SSD)
- Outline the various symbols and components used as part of an SSD
• Outline the use of messages, parameters, and method calls as part of the development and construction of an SSD
• Construct a SSD indicating the various messages (input and output) as well as the actor, system loop and alternate path indications
• Explain the concept and use of a Class diagram as part of OOAD
• Describe various concepts relating to Object Orientation and modelling relating to, classes and objects, attributes, methods, instantiation, inheritance, composition, message passing
• Outline the various concepts relating to the development of an object relationship diagram (class diagram)
  Range: Object, Associations, Multiplicity, Composition, Aggregation, and inheritance.
• Explain the relationship between an ERD diagram and a Class diagram (Object relationship diagram)
• Construct an object relationship diagram (class diagram), which indicates all attributes, methods, possible associations, multiplicity, inheritance and aggregations
• Explain the purpose of the use of CRC (Class Responsibility Collaboration) cards as part of OOAD
• Draw a CRD card (or set of CRC cards)
• Explain the concept off a State Machine Diagram in relation to the analysis process
• Construct a state machine diagram

Topic 5: Principles of designing computer system inputs and outputs

Subject Outcome 5.1: Explain the implications of input and output design principles

Learning Outcomes
The student should be able to:
• Distinguish between the appearance and the underlying structure and processes.
• Identify the purpose of user involvement in creating designs.
• Compare the online computer functions with manual forms and offline data entry.
• Discuss input and output.
• Compare graphical input and output functions with text based input and output functions.
• Differentiate between system and user interfaces

Subject Outcome 5.2: Design input and output functions.

Learning Outcomes
• Create a design that meets the specification for the function
  Range: Form design, Report design, Document design
• Ensure that the design can be implemented in the specified computer environment.
  Range: Workplace and interface design
• Explain how the design conforms to an industry recommended format for the function.
  Range: Simulation, documentation.
• Explain the concept of HCI (Human computer interaction)
• Outline how HCI principles effect UI design (which include input and output design)
• Define system inputs in relation to the requirements if the system to be developed.
• Outline the various platforms and technologies relating to input design.
  Range: (Designing for desktop, mobile and web based applications)
• Describe the various guidelines relating to input design for various platforms
• Outline common controls and symbols used as part of input and output design
• Construct a wireframe or screen based prototype based on a set of design specifications
• Design an User Interface based on a set of requirements and standards
• Analyse the suitability of a given UI (User Interface)
• Alter a given UI to a new set or requirements or improvements
• Describe the purpose of reports in relation to output design and use within the organisation
• Differentiate between different types of reports and their characteristics
• Design printed and on screen reports according to a set of requirements
• Analyse the suitability of a given report based on a set of requirements
• Alter a given report to a new set or requirements or improvement specifications

Subject Outcome 5.3: Create system input and output functions.

Learning Outcomes
• Explain and demonstrate how to ensure that the format of system input and output functions corresponds to the design.  
  Range: Uniqueness, Uniform size and format, Stability, Meaningfulness, Operability.
• Explain and demonstrate how to ensure that the function behaviour corresponds to the design.

**Topic 6: Implementing and maintaining an information system**

**Subject Outcome 6.1:** Describe systems testing, installation and changeover.

**Learning Outcomes**
The student should be able to:
• Describe the types of testing, and the goal of each type, that should be concluded before a system is installed.
• Identify appropriate test data and test procedures that should be performed successfully before the user accepts a system.
• Explain the steps in installing information systems and who is responsible for each step.
• Explain the advantages and disadvantages of the types of systems conversion/methods of changeover.

**Subject Outcome 6.2:** Describe post-implementation.

**Learning Outcomes**
The student should be able to:
• Determine and justify appropriate time frames to follow different types of post implementation review procedures.
• Explain the factors which must be considered during a post implementation review.
• Compare the actual performance of system components with their expected performance.
• Measure the success of the system

**Subject Outcome 6.3:** Describe system maintenance.

**Learning Outcomes**
The student should be able to:
• Name the causes of changes that may need to be made to installed systems.
• Identify and describe the types of maintenance and when each type is appropriate.
• Explain the interrelation between maintenance and design.
• Describe and determine the financial implications of maintenance.

**Topic 7: New trends in Systems Analysis and Design**

**Subject Outcome 7.1:** Describe current trends and methodologies

**Learning Outcomes**
• Describe various methodologies and approaches as part of current trends in Agile systems analysis and development.  
  Range, (not limited to) Extreme Programming, Unified Process, Scrum methodology
• Compare and contrast various agile methodologies
• Explain how the internet as a platform influences current trends towards systems development and deployment
• Describe various methods for the deployment of application software

**Subject Outcome 7.2:** Describe the concept of Software Engineering

**Learning Outcomes**
• Describe the concept of software engineering
• Define the concept of a CASE tool
• Explain how CASE tools are implemented in a CASE environment
• Outline the various concepts and terms of a CASE environment.
  Range (Repository, Modelling tools, engineering tools, documenting tools, development tools
• Describe current trends in the utilisation of case tools
8 RESOURCE NEEDS FOR THE TEACHING OF SYSTEMS ANALYSIS AND DESIGN LEVEL 4

8.1 Physical resources
The following teaching aids should be made available, if possible:
• Lecture room
• Computer library

8.2 Human resources
• The facilitator must have Information Technology related subjects at NQF level 5.
• It will be to the advantage of facilitator if they have already been declared competent as assessor and/or moderator.

8.3 Other resources
• File per learner for PoE
• Printing paper