



# Certified Information Communication Technologists (CICT)

## Examination Syllabus

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## **PART I**

### **SECTION 1**

#### **PAPER NO.1 INTRODUCTION TO COMPUTING**

##### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to apply computing skills in an organisation.

##### **1.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Select appropriate computer hardware and software
- Apply data processing principles
- Demonstrate competence in basic computer operations
- Select appropriate information systems in an organisation
- Control information systems threats.

##### **CONTENT**

##### **1.1 Introduction to information communication technology (ICT)**

- Components of a computer system
- Classification of computers
- Evolution of computers
- Computer peripherals and interfaces
- Application areas of computer systems
- Impact of ICT in society
- Careers in ICT

##### **1.2 Computer hardware**

- Input devices
- Processing devices
- Memory
- Storage devices
- Output devices
- Communication devices
- Selection of computer hardware

##### **1.3 Computer software**

- Classification of computer software
- Systems software
- Application software
- User interface
- Selection and acquisition of computer software

##### **1.4 Computer start up/booting**

- Types of power supply
- Power supply unit
- Power protection
- Booting process
- BIOS setup

- 1.5 **Keyboard and mouse skills**
- Types of keyboards
  - Keyboard layout
  - Typing skills
  - Keyboard ergonomics
  - Mouse skills
- 1.6 **Software installation**
- Installation procedures
  - Operating system installation
  - Application software installation
  - Types of installations
  - Installers
  - Configuration
  - Uninstalling software
- 1.7 **Number systems, computer arithmetic and set theory**
- Computer codes (BCD, ASCII, UNICODE and EBCDIC)
  - Zoned decimal and packed decimal formats
  - Number systems
  - Number systems conversions and compliments
  - Binary arithmetic
  - Sets and set theory
  - Error codes
- 1.8 **Data processing cycle**
- Introduction to data processing
  - Stages in data processing
  - Data input, output and control
  - File organisation and access
  - Data collection methods
  - Data capture methods
  - Methods of data processing
  - Data processing systems
  - Data processing modes
  - Data hierarchy
  - Data security
- 1.9 **Logic, truth tables and circuits**
- Statements
  - Conjunction
  - Disjunction
  - Negation
  - Propositions and truth tables
  - Tautologies and contradictions
  - Logical equivalence
  - Conditional and bi-conditional statements
  - Arguments and logical implications
  - Simplification of logic circuits: Boolean expressions AND, OR and NOT circuits
- 1.10 **Basic computer networking**
- Networking terms
  - Components of computer networks
  - Types of computer networks

- Advantages and disadvantages of networking
- Internet use and benefits

#### 1.11 **Basic troubleshooting**

- Hardware errors
- Hardware troubleshooting techniques
- Hardware troubleshooting tools
- Software errors
- Software trouble shooting techniques
- Software troubleshooting tools

#### 1.12 **Emerging issues and trends**

## **PAPER NO. 2 COMPUTER APPLICATIONS - PRACTICAL**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to use computer applications.

#### **2.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Install and uninstall appropriate software
- Use an operating system for file management
- Use a word processor
- Make a presentation using presentation packages
- Use a spreadsheet
- Use a database package
- Use a desktop publishing package
- Use application packages to create business solutions.

### **CONTENT**

#### **2.1 Basic computer operations**

- Introduction to operating systems and application programs
- Starting up the computer
- Managing files and folders
- Plugging in, preparing and ejecting storage devices
- Loading applications

#### **2.2 Peripheral devices**

- Types of keyboards
- Keyboard layouts
- Keyboard ergonomics
- Touch screen
- Adding / removing printer
- Setting up default printer
- Projectors

#### **2.3 Word processing software**

- Using features of a word processor window
- Creating and retrieving existing documents
- Setting page setup features
- Using toolbars
- Formatting and editing text
- Manipulating a document using shortcut keys
- Creating and formatting tables
- Creating and formatting images and drawing
- Inserting and editing headers and footers
- Inserting footnote, endnotes, citation and bibliography
- Proofreading tools
- Using mail merge tool
- Tracking changes and comments
- Converting documents
- Linking and embedding
- Creating table of content, list of figures and list of tables
- Saving a document
- Using templates
- Automating simple tasks

- Printing a document

#### 2.4 **Spreadsheet software**

- Using features of a spreadsheet window
- Creating , saving and retrieving existing workbook
- Cell editing and navigation
- Freezing and unfreezing pane
- Formatting worksheets
- Manipulating data using different cell referencing methods
- Using formulae and functions
- Sorting, filtering and data validation
- Analysing data using “what if” analysis
- Inserting charts and graphs including pivot tables
- Summarising, consolidating and outlining data
- Automating simple tasks
- Protecting and sharing workbooks
- Printing worksheets

#### 2.5 **Presentation software**

- Using features of a presentation program window
- Inserting a slide, typing and formatting text in a slide
- Importing and exporting content
- Working with master slides and templates
- Editing slide content
- Drawing and formatting various objects
- Working with graphics and charts
- Inserting and formatting images
- Animation effects
- Reviewing presentation
- Saving, copying and deleting slides
- Presentation views
- Automating simple tasks
- Printing handouts and slides

#### 2.6 **Database software**

- Overview of databases
- Using features of a database window
- Creating, saving and retrieving existing database
- Identifying tables, fields, data types and records
- Establishing relationships between tables
- Creating forms and queries
- Manipulating data
- Searching data
- Sorting and filtering
- Adding charts, diagrams, tables and attachments
- Securing a database
- Automating simple tasks
- Configuring database start up options
- Printing from a database

#### 2.7 **Using a desktop publishing software**

- Overview of desktop publishing software
- Using features of desktop publishing software
- Creating different types of publications

- Creating, saving and retrieving publications
- Setting page layout
- Using frames (textbox)
- Typing and manipulating text
- Working with toolbars
- Identifying and using various icons in toolbars of the program including toolbox
- Drawing and manipulating various shapes
- Inserting and using the colour palette
- Inserting and manipulating images
- Importing and exporting files
- Setting borders
- Using merge tool
- Working with tables
- Linking and embedding
- Designing and creating simple websites
- Automating simple tasks
- Printing a publication

## **2.8 Emerging issues and trends**



## **PAPER NO.3 ENTREPRENEURSHIP AND COMMUNICATION**

### **GENERAL OBJECTIVE**

This paper intends to equip the candidate with knowledge, skills and attitudes that will enable him/her to apply entrepreneurship knowledge in business and other environments.

### **3.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify viable business opportunities
- Prepare a business plan
- Demonstrate entrepreneurial orientation skills
- Communicate effectively in a business environment
- Apply entrepreneurial knowledge in response to the emerging business trends.

### **CONTENT**

#### **3.1 Entrepreneurial mindset**

- Definition of entrepreneurship
- Historical development of entrepreneurship
- Characteristics of entrepreneurs
- Types of entrepreneurs
- Distinction between entrepreneurs and small business owners
- Approaches to entrepreneurship
- Importance of entrepreneurs to development

#### **3.2 Entrepreneurship and innovation**

- Creativity and innovation
- Corporate entrepreneurship and innovation
- Qualities of entrepreneurial firms
- Social enterprises and sustainability
- Entrepreneurial ethics, responsibility and leadership
- Case study on corporate entrepreneurship

#### **3.3 Opportunity identification and development**

- Methods of generating ideas
- Sources of innovative ideas
- Qualities of viable business opportunities
- Evaluating business opportunities
- Challenges of starting new ventures
- Why new ventures fail
- Business incubation
- Role of government in promoting entrepreneurship

#### **3.4 Creating and starting a new venture**

- Approaches to creating new ventures
- Acquiring an established business venture
- Business planning
- Overview of the business plan
- Scope and value of a business plan
- Practical experience in writing of a business plan

- 3.5 **Business growth strategies**
- Penetration, market and product development strategy
  - Public and private placements
  - Joint ventures
  - Diversification
  - Loans and equity financing
  - Venture capitalists
  - Informal risk capitalists
  - Crowd funding and crowding sourcing
- 3.6 **Entrepreneurship and technology**
- Internet and e-commerce
  - The enterprise website
  - Impact of globalisation
  - Global entrepreneurs
  - Business process outsourcing
  - Electronic and mobile money transfers
  - Business networking
- 3.7 **Nature of business communication**
- Meaning of communication
  - Purposes of business communication
  - Internal and external communication
  - The communication process
  - Methods of communication
  - Communication systems and networks
  - Principles of effective communication
  - Barriers to effective communication
- 3.8 **Written communication**
- Rules of effective writing
  - Business correspondence
  - Reports
  - Memorandum
  - Proposal writing
  - Forms and questionnaire design
  - Circulars and newsletters
  - Notices and advertisements
  - Publicity materials
  - Press releases
  - Graphic communication
- 3.9 **Oral and non-verbal communication**
- Oral communication in business
  - Effective listening
  - Interviews
  - Non-verbal communication
  - Interpersonal relationships
  - Presentations skills

### **3.10 Meetings**

- Notice
- Agenda
- Role of the chairperson
- Role of the secretary
- Role of participants
- Conduct of meetings
- Minutes of meetings

### **3.11 Information technology and communication**

- The internet
- Teleconferencing
- Wireless technologies
- Electronic postal services
- Use of E-mails

### **3.12 Ethics and integrity in business communication**

- Concept of ethics and integrity
- Significance of ethical communication
- Factors influencing ethical communication
- Ethical dilemmas in communication
- Guidelines to handle communication ethics dilemmas
- Business ethics in communication

### **3.13 Emerging issues and trends**

## SECTION 2

### PAPER NO. 4 OPERATING SYSTEMS - PRACTICAL

#### GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to administer operating systems.

#### 4.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Install, update and uninstall operating systems
- Configure operating systems to handle various tasks
- Manage user accounts
- Manage directories and files using an operating system
- Enforce operating system security
- Handle maintenance and performance issues of an operating system
- Troubleshoot operating systems.

#### CONTENT

##### 4.1 Introduction to operating systems

- Definition of an operating system
- History of operating systems
- Types of operating systems
- User Interfaces
- Functions of operating systems
- System calls
- Operating system structures
- Selecting an operating system

##### 4.2 Installing an operating system

- Installation procedure
  - Pre installation tasks
  - Installation tasks
  - Installation methods
  - Installation process
- Uninstalling operating systems
- Reinstalling operating systems
- Upgrading operating systems
- Multibooting
- Troubleshooting operating systems

##### 4.3 Processes and threads

- Processes
- Threads
- Inter-process communication
- Classical IPC problems
- Scheduling
- Overview of memory management

##### 4.4 Deadlocks

- Resources
- Introduction to deadlocks

- The Ostrich algorithm
  - Deadlock detection and recovery
  - Deadlock avoidance
  - Deadlock prevention
- 4.5 **Workgroups and domains**
- Overview of workgroups and domains
  - Workgroups
  - Joining a workgroup
  - Domains
  - Joining a domain
  - Creating user accounts
- 4.6 **Using management console and scheduler**
- Overview of management consoles
  - Snap-ins
  - Using consoles
  - Using schedulers
- 4.7 **Control panel**
- Overview of control panels
  - Accessing control panel items
  - Changing the settings of the control panel items
- 4.8 **Configuring hardware settings**
- Viewing hardware profiles
  - Creating or modifying hardware profiles
  - Activating and deactivating hardware profiles
  - Plug and play hardware
  - Add/remove hardware
  - Troubleshooting hardware
- 4.9 **Configuring the display**
- Setting display properties
  - Setting multiple display
  - Using multiple display
  - Troubleshooting
- 4.10 **Configuring operating system settings**
- Performance option
  - Environment variables
  - Start up and recovery settings
  - Error reporting
  - Updates
  - Troubleshooting operating systems
- 4.11 **Using registry**
- Accessing the registry
  - Structure of the registry
  - Using the registry editor
- 4.12 **Disk management**
- Installing a hard disk
  - Formatting a hard disk
  - Setting up hard drives
  - Analysing hard disks

- Defragmenting hard disks
- Partitioning a hard disk
- Working with different volume types
- Upgrading a hard disk
- Managing disks on a remote computer
- Managing disk quarters

#### 4.13 **File systems management**

- Overview of file systems
- Creating files and directories
- Mounting drives on different file systems
- Sharing files and folders
- Securing files and folders
- Securing resources using NTFS permissions

#### 4.14 **Emerging issues and trends**

## **PAPER NO. 5 PRINCIPLES OF ACCOUNTING**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to prepare and interpret financial statements for different entities.

### **5.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Prepare books of original entry and basic ledger accounts under double entry system
- Prepare basic financial statements of sole traders, partnerships, companies and manufacturing entities and not for profit organisations
- Comply with the regulatory framework in the accounting field
- Account for assets and liabilities
- Analyse financial statements by use of ratios and statement of cash flows.

### **CONTENT**

#### **5.1 Introduction to Accounting**

- The nature and purpose of accounting
- Users of accounting information and their respective needs
- Accounting Standards and their purposes
- Regulatory framework (ICPAK, IASB, IAESB, IPSASB)
- Professional ethics
- Principles; concepts and conventions underlying the preparation of accounting statements

#### **5.2 Accounting procedures and techniques**

- Double entry book-keeping
- The cash book; two and three column including cash journal
- The ledger and their role in recording and summarising, classifying accounting data
- Books of original entry
- Petty cash book
- Balancing accounts and preparing the trial balance
- Introduction to simple statements of financial performance
- Statements of financial position

##### **5.2.1 Computerised accounting**

- Different accounting packages
- Rationale for computerised accounting system
- Components of a computerised accounting system
- Selecting a good computerised accounting system
- Challenges of a computerised accounting system
- Current trends in computerised accounting software

#### **5.3 Preparation of financial statements and year-end adjustments**

- Depreciation of non-current assets including their disposal (by part exchange; ordinary sale; accident)
- Methods and reasons of providing for depreciation
- Preparation of movement of property, plant equipment (as per International Financial Reporting Standards)
- Trade receivables, bad debts write-offs and provision for bad and doubtful debts

- Accruals, prepayments, reserves and provisions
  - Necessary adjustments in statements of financial performance to record increase and decrease in provision for bad and doubtful debts
- 5.4 Confirming and correcting mechanism**
- Bank reconciliation statements
  - Control accounts
- 5.5 Errors and correction of errors**
- Errors affecting and not affecting the agreement of the trial balance
  - Use of the suspense accounts
  - The effect of errors on statement of financial performance and statement of financial position
- 5.6 Sole traders accounts**
- Income statements
  - Statements of financial position
- 5.7 Partnership accounts**
- Basic contents of a partnership agreement
  - Provisions of the Partnership Act
  - Partnership statement of financial performance and appropriation account
  - Partners current account and statement of financial position
  - Financial statements to reflect elementary changes in partnership such as admission, retirement and dissolution
- 5.8 Introduction to simple company accounts**
- Share capital and reserve
  - Issue of shares at par; premium; discount
  - Over and under subscriptions
  - Allotment and calls on shares, forfeiture of shares
  - Preparation of statements of financial performance and appropriation account and the statement of financial position
  - Published accounts: Components of a complete set of published financial statements only
- 5.9 Manufacturing accounts**
- Elements of cost and cost behaviour
  - Preparation of manufacturing accounts, statement of financial performance and statement of financial position
  - Accounting treatment of manufacturing profit or loss and unrealised profit on closing stock
- 5.10 Financial statements of a not-for-profit organisation**
- What non-profit making organisations are
  - Receipts and payments accounts
  - Income and expenditure accounts and statement of financial position
- 5.11 Incomplete records and single entry book keeping**
- Why incomplete records
  - Preparation of statement of affairs
  - Preparation of financial statements



**5.12 Analysis of financial statements**  
**Introduction to accounting ratios**

- Profitability ratios
- Revenue ratios
- Liquidity ratios

**Preparation of cash flow statements (International Accounting Standard 7)**

**5.13 Public sector accounting**

- Features of public sector entities (as compared to private sector)
- Structure of the public sector and examples of entities in public sector
- Objectives of public sector financial statements
- Users of public sector financial statements and officers (treasury, accounting officers, public accounts committee, auditor general)
- IPSAS on inventory, property, plant and equipment and intangible assets (the ledger accounts of central and county governments are not examinable)
- Accounting techniques in public sector (budgeting, cash, accrual, commitment and fund)

**5.14 Emerging issues and trends**

## **PAPER NO. 6 COMPUTER SUPPORT AND MAINTENANCE**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her support and maintain computers.

#### **6.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Maintain computer hardware components and software
- Identify and apply the tools and equipment associated with computer support and maintenance
- Install and uninstall operating systems and application programs
- Troubleshoot computer hardware and software
- Disassemble and reassemble computer systems
- Identify and replace faulty components
- Undertake effective selection and acquisition of computer systems
- Back-up data and information

### **CONTENT**

#### **6.1 Introduction to computer support and maintenance**

- Computer electronic components
- The physics of electronics
- The use of maintenance tools and equipment
- Standard operating and maintenance procedures
- Safety precautions

#### **6.2 Power supply**

- Overview of power supply
- Power supply protection devices
- Power supply sources
- Power supply protection devices
- Using power supply devices
- Power supply problems and trouble shooting

#### **6.3 Motherboards**

- Computer cases
- Types of motherboards
- Motherboard components
- Installing Motherboard
- Using expansion slots and connectors

#### **6.4 Microprocessors**

- Microprocessor overview
- Types of processors
- Processor modes
- Selecting and upgrading a processor

#### **6.5 Memory**

- Memory characteristics
- Memory types and packages

- Memory mapping
  - BIOS Set up
  - Selecting and upgrading memory
- 6.6 **Disks and drives**
- Types of storage
  - Disk types
  - Disk drives
  - Disk organisation
  - Disk management
  - Techniques and tools for disk management
  - Selecting disk drives
  - Maintenance of disks and disk drives
- 6.7 **Display technology**
- Display adapters
  - Care and maintenance
  - Overlay techniques
  - Performance measures
  - Troubleshooting
- 6.8 **Computer system assembly and disassembly**
- Selection and compatibility issues
  - Assembly, disassembling and reassembling
  - Personal computers
  - Portable and mobile devices
  - Printers
  - Upgrading computers
  - Electronic waste management
- 6.9 **Hardware and software installation**
- Installation concepts
  - Installing hardware components
  - Installing peripheral devices
  - Installing operating systems
  - Installing application programs
  - Installing utility software
  - Upgrading utility software
- 6.10 **Fault finding and troubleshooting**
- Fault finding principles
  - Common equipment faults
  - Physical inspection
  - Hardware and software diagnostics
  - Repairing and testing
  - Uninstalling and reinstalling software
- 6.11 **Computer support**
- On-line support
  - Help desk management

- Planning and providing staff training
- Health and safety

**6.12 Computer system selection and acquisition**

- Selection and procurement process
- Analysing requirements
- Evaluation and testing
- Cost benefit analysis
- Equipments costing
- Training costs
- Warranties
- Service level agreements
- Technical Checklist
- Purchasing

**6.13 Computer security**

- Level of computer security
- Data protection
- Back up and restoration procedure.
- Overview of data recovery

**6.14 Emerging issues and trends**

**PART II**  
**SECTION 3**

**PAPER NO.7 DATABASE SYSTEMS**

**GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to design, develop, administer and manage databases.

**7.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Create databases to solve business problems
- Write structured query language (SQL) statements to manipulate data in databases
- Handle transactions and concurrency controls
- Administer databases
- Integrate databases and other applications
- Manage database integrity issues.

**CONTENT**

**7.1 Introduction to databases**

- Overview of records, files and databases
- History of database systems
- Traditional file systems versus the database approach
- Characteristics, importance and limitations of database systems
- Database components and architecture

**7.2 File organisation techniques**

- Storage structures and blocking
- Structured and unstructured data
- Unordered files
- Sequential files
- Indexing

**7.3 Database models**

- The role of data modelling
- The hierarchical model
- The network model
- The relational model
- The object-oriented model
- The object-relational model
- Database model selection criteria

**7.4 Database development life cycle**

- Data and user requirements
- Specification of database requirements
- Stages of database development
- Conceptual, logical and physical database design
- Testing the database functionality

## 7.5 **Relational database model**

- Relational database concepts and properties
- E-R database design
- Database design anomalies
- Normalisation and denormalisation
- Relational algebra
- Creating database design
- Implementing database design

## 7.6 **Structured query language (SQL)**

- Data definition language
- Data manipulation language
- Structure of SQL statements
- Data control
- In-built functions
- Writing SQL statements
- Using SQL functions
- Optimising SQL queries

## 7.7 **Transaction management and concurrency control**

- Overview of transaction management
- Properties of a transaction
- Serialisability and concurrency control
- Lock-based and timestamp-based protocols
- Types of transaction failures
- Transaction recovery concepts and mechanisms

## 7.8 **Database administration**

- Overview of database administration
- Types of database users
- Functions and roles of database administrators
- Monitoring database performance
- Database tuning

## 7.9 **Database security and integrity**

- Security and integrity concepts
- Social, ethical and legal database issues
- Threats to database security and integrity
- Managing threats
- Establishing data backup and restore procedures

## 7.10 **Distributed database systems**

- Overview of distributed database systems
- Distribution methods – fragmentation and replication
- Concurrency control mechanisms in distributed systems
- Two-tier database architecture
- Three-tier database architecture

## 7.11 **Data warehousing and data mining**

- Overview of data warehousing

- Characteristics of a data warehouse
- Components of a data warehouse
- Types of data warehouses
- Overview of data mining
- Tools and techniques of data mining

#### **7.12 Integrating databases with other applications**

- Importance of integrating databases with other applications
- Integrating databases with other applications
- Basics of developing web enabled database applications

#### **7.13 Emerging issues and trends**

## **PAPER NO.8: SYSTEMS ANALYSIS AND DESIGN**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her analyse and design information systems.

#### **8.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Assess the need for an information system in an organisation
- Use conventional methodologies in systems analysis and design
- Apply the activities of the system analyst and systems designer
- Identify the applicable standards in systems analysis and design
- Implement information systems

### **CONTENT**

#### **8.1 Introduction to systems analysis and design**

- Elements of information systems
- Systems theory
- Types of information systems
- Personnel involved in systems analysis and design
- Systems analysis and design concepts

#### **8.2 Systems thinking**

- Hard systems thinking
- Hard systems methodology
- Soft systems thinking
- Soft systems methodology
- Applications of soft and hard systems

#### **8.3 Systems development life cycle (SDLC)**

- Definition of systems development life cycle
- Phases of SDLC
- Advantages and disadvantages of SDLC

#### **8.4 Requirements elicitation**

- Stakeholder analysis
- Need for requirements gathering
- Process for requirements gathering
- Requirements gathering tools and techniques
- Gap analysis
- Prioritisation of requirements

#### **8.5 Systems analysis**

- Information systems project initiation
- Feasibility and risk analysis
- Stages in system analysis
- Tools and techniques in system analysis
- System analysis report
- Using software tool to assist in systems analysis

#### **8.6 Systems design**

- System design approaches



- Logical and physical design
- Modelling techniques
- User interface design
- Case tools
- Designing test cases
- Writing and documenting design specification
- Using software tools to assist in systems design

#### 8.7 **SAD approaches and methodologies**

- Structured system analysis and design methodology (SSADM)
- Object-oriented design methodologies
- Rapid application development (RAD)
- Joint application development (JAD)
- Alternative software analysis and design approaches
- Strengths and limitations of the approaches and methodologies

#### 8.8 **Systems implementation**

- Assessing the platform for the system to be implemented
- User training
- Data conversion methods
- System changeover

#### 8.9 **Systems analysis and design standards**

- Roles and examples of standards in SAD projects
- Components and development of documentation in a systems project
- Challenges in meeting standards in SAD projects

#### 8.10 **Systems analysis and design environment**

- Security requirements, precautions and procedures in SAD
- System maintenance
- Integration problems

#### 8.11 **Emerging issues and trends**

## **PAPER NO. 9 STRUCTURED PROGRAMMING**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to apply structured programming to develop programs.

#### **9.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Analyse a problem and design an appropriate programming solution
- Write programs using C programming language
- Test and debug structured programs
- Produce documentation, both user and technical, to support programs.

### **CONTENT**

#### **9.1 Introduction to structured programming**

- Overview of programming
- Types of programming languages
- Generations of programming languages
- Programming approaches
- Program translators
- Basic concepts of structured programming
- Problem definition, structure and design
- Integrated development environment (IDE)

#### **9.2 Programming basics**

- Variables and data types
- Input/output statements
- Identifiers
- Namespaces
- Comments
- Program formatting
- Pre-processor directives
- Expressions and operators
- Control structures
- Writing simple programs
- Testing and debugging

#### **9.3 Functions/sub-programs**

- Functions versus procedures
- Function declaration
- Function definition
- Recursion
- Function calls
- Arguments and parameters
- Parameter passing
- Writing and running a program using functions

#### **9.4 Data structures**

- Overview of data structures
- Arrays
- Structures
- Pointers

- Linked lists
  - Writing programs using data structures
- 9.5 **File handling (input/output)**
- Overview of files
  - Opening files
  - Writing to files
  - Reading from files
  - Closing files
- 9.6 **Application development**
- Overview of mobile application development
  - Collaborative application development
- 9.7 **Documentation**
- Developing user manuals
  - Developing technical manuals
- 9.8 **Emerging issues and trends**

## SECTION 4

### PAPER NO.10 OBJECT ORIENTED PROGRAMMING

#### GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to develop object oriented programs using Java.

#### 10.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Analyse a problem and develop an appropriate solution using the object oriented programming language
- Write programs using the object oriented programming language
- Test and debug object oriented programs
- Handle errors in object oriented programs

#### CONTENT

##### 10.1 An overview of programming techniques and paradigms

- Introduction to object oriented programming
- Strengths of object oriented programming over other paradigms

##### 10.2 Introduction to Java programming language

- Java language specification
- Java JDK, IDE and API
- Identifiers, data types and variables

##### 10.3 Concepts of object oriented programming

- Methods and messages
- Abstract data types
- Classes
- Objects
- Class relationships
- Encapsulation
- Abstraction
- Inheritance
- Polymorphism
- Interfaces

##### 10.4 Functions/methods

- Function declaration
- Function prototype and type checking
- Arguments and parameters
- Inline functions
- Function overloading
- Pure virtual functions
- Reference and argument passing
- Writing programs using functions

##### 10.5 Class implementation

- Overview of classes
- Member data and functions
- Data encapsulation

- Abstract classes and interfaces
  - Organising codes for classes
  - Writing simple programs using classes
- 10.6 **Constructors and destructors**
- Constructors and initialisations
  - Object creation
  - Multiple constructors in a class
  - Hidden constructors
  - Destructors
  - Object destruction
  - Virtual destructions
  - Writing a program using constructors and destructors
- 10.7 **Memory management**
- Static, automatic and heap memory
  - New and delete operators
  - Handling memory allocation errors
  - Hiding details of memory management in a class
  - Implementing a dynamic string class
- 10.8 **Scope and access control**
- Variable and function scope
  - Friend functions
  - Constant and enumeration types
  - Static members
- 10.9 **Introduction to inheritance**
- Inheritance for modelling and reuse
  - Class derivation
  - Access control
  - Base class initialisation
  - Composition
  - Initialising class type members
- 10.10 **Polymorphism and operators**
- Function overriding
  - Operator overloading
  - Type casting and conversions
  - Pointer conversion
- 10.11 **Templates and generics**
- Template mechanism
  - Function templates
  - Class templates
  - Generic programming
  - Implementing a general array class
  - Standard template library
  - Writing programs using standard temporary library (STL)
- 10.12 **Serialized data and objects**
- Streams and files
  - Input and output streams

- File streams
- Object streams
- Object serialisation
- Readers and writers
- Writing programs using input/output streams

#### 10.13 **Object oriented application development**

- Introduction to mobile application development
- Overview of object relational programming

#### 10.14 **Exception handling and error handling**

- Overview of errors and exceptions
- Exception mechanism
- Error handling mechanism
- Exceptions compared to other error handling techniques
- Throw, try, catch and finally
- Exception context and stack unwinding
- Custom exceptions
- Uncaught exceptions
- Automatic cleanup in exception handling

#### 10.15 **Emerging issues and trends**

## **PAPER NO.11 WEB DEVELOPMENT AND e-COMMERCE**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to develop a web application and implement e-commerce.

#### **11.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Use contemporary website development tools and techniques
- Use graphics and animations to enrich websites
- Create functional websites incorporating various HTML components
- Create dynamic websites
- Design and develop an e-commerce website and comply with e-commerce regulations
- Implement cloud based solutions
- Implement various risk and security strategies in web applications.

### **CONTENT**

#### **11.1 Introduction to web application development**

- Web application development concepts
- Web application design principles
- Overview of web application development languages
- Introduction to mark-up language
- Phases of web application development process
- Mobile web applications

#### **11.2 HTML**

- Basic structure of HTML
- Basic tags and corresponding attributes
- HTML elements
- HTML coding
  - Text
  - Links
  - Lists
  - Images
  - Tables
  - Forms
  - Frames
  - URLs

#### **11.3 Cascading Style Sheets (CSS)**

- Introduction to CSS
- Types of style sheets
- CSS selectors and properties
- Incorporating colour techniques
- Understanding layers and positioning
- Creating and modifying objects
- Objects on multiple layers
- Complex objects on a single layer
- Placing type in an image
- Using layers to refine images

- Creating special effects
  - Behaviour modification
- 11.4 Flash, video and audio**
- Introduction to media elements in web application development
  - Incorporating flash into a web application
  - Embedding video and audio content into a web application
  - Implications of incorporating media content in web applications
- 11.5 Graphics and animations**
- Fundamentals of graphics and animations
  - Types of graphics
  - Animation basics
  - Animation tools
  - Methods of animation
  - Animations with motion and shape tweening
  - Interactivity with frame action and buttons
  - More complex animation tasks
- 11.6 Web application development platforms**
- Overview of web application development platforms
  - Overview of web application development software tools
  - Tools of automating web applications
  - Drawing timelines and customising web application development tools
  - Plugins, add-ons and active content
  - Web application testing
  - Content management systems
  - Implications of incorporating graphics and animations in web applications
- 11.7 Scripting**
- Overview of script development
  - Scripting languages
  - Overview of client side and server side scripting
  - Incorporating script into HTML
  - Basic command syntax/blocks
  - Functions and objects
  - Built in objects and functions
  - Looping
  - Frames, documents and windows
  - Events and cookies
  - Page redirect and page printing
  - Void keyword
  - Database connectivity
- 11.8 Publishing web applications**
- Web hosting
  - Domain name registration
  - Setting up a web application
  - Managing web applications
  - Content management
  - Search engine optimisation
  - Web application security



### **11.9 Introduction to e-commerce**

- e-commerce concepts
- Features of e-commerce
- e-commerce business models
- Benefits and limitations of e-commerce
- Future of e-commerce

### **11.10 e-Commerce infrastructure**

- Telecommunication
- Internet Service Providers (ISPs)
- Website design companies
- Human resources
- Computing resources
- Payment gateways
- Electronic Data Interchange (EDI)
- Value-added network (VAN)

### **11.11 e-Commerce implementation**

- Size of enterprise
- e-commerce products and services
- e-commerce website hosting options
- e-procurement

### **11.12 e-Commerce security**

- e-commerce security concepts
- Digital signatures/e-signatures
- e-commerce security standards: SSL, TSL, HTTPS
- Implementing e-commerce security

### **11.13 Electronic transactions law**

- Internet applications
- e-commerce and e-marketing approach
- Digital technology
- e-contracts
- e-signatures
- Electronic records
- Electronic data
- Electronic messages
- Third parties
- Data protection laws

### **11.14 Cloud computing**

- Overview of cloud computing
- Cloud computing models
- Cloud computing security
- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)
- Business Process as a Service (BPaaS)
- Enterprise cloud based high performance computing (HPC) application
- Implementing cloud based solutions

### **11.15 Emerging issues and trends**

## **PAPER NO. 12 DATA COMMUNICATION AND COMPUTER NETWORKS - PRACTICAL**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to set up, configure and maintain computer networks.

#### **12.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Use data communication and computer networking devices
- Setup, configure and test a LAN
- Implement security and audit policies in a networking environment
- Backup and restore network data
- Set up and test routers
- Configure and test various protocols in a computer network
- Monitor and troubleshoot a network
- Design internet of things (IoT) – based applications

### **CONTENT**

#### **12.1 Data communication concepts**

- Overview of data communication concepts
- Data terminology
- Data transmission technologies
- OSI (open system interconnection) models and layer protocols
- TCI/IP model and layer protocols
- Types of networks
- Network topologies
- Roles of network personnel

#### **12.2 Networking components**

- Hardware
- Software
- Bounded media
- Server/clients
- Wireless media

#### **12.3 Data signal analysis**

- Overview of data signal analysis
- Analogue and digital signals
- Modulation and demodulation
- Transmission modes
- Data and line encoding
- Viewing data signal characteristics using oscilloscope, spectrum analyser and level tracers
- Sampling ASCII and EBCDIC coding techniques using binary and hexadecimal mathematics
- Nyquist Shannon theory

#### **12.4 Routing and switching**

- Overview of switching and routing
- Types of switches
- Switching techniques
- Router components

- Router interfaces and protocols
  - IPv4 and IPv6 configuration
- 12.5 **Setting up a LAN**
- Setting up Wireless LAN
  - Connecting to WLAN
  - Preparation of networking cables
  - Testing connectivity
  - Connecting LAN to the Internet
  - Configuring TCP/IP and other protocols
  - Setting up static and dynamic addressing
  - Testing TCP/IP and other protocols configurations
  - Configuring a domain name service (DNS)
  - Domain controllers setup
- 12.6 **Administering user accounts**
- Local user accounts
  - Domain user accounts
  - Built in user accounts
- 12.7 **Configuring network printers and other resources**
- Adding and sharing a local printer
  - Adding and sharing a network printer
  - Downloading printer drivers
  - Setting up a printer pool
  - Setting up priorities between printers
  - Administering network printers
  - Managing other network resources; Files, Ports, Drives
- 12.8 **Implementing security and audit policies**
- Setting up security controls
  - Configuring password policy
  - Configuring account lock out policy
  - Planning for audit policy
  - Using audit policy
  - Using event viewer
  - Auditing access to files and folders
  - Auditing access to printers and other network resources
- 12.9 **Data backup and restoration**
- Planning backup
  - Backing up data
  - Restoring data
- 12.10 **Monitoring network resources**
- Monitoring access to network resources
  - Monitoring communication among network devices
  - Monitoring utilisation of network resources
  - Monitoring network users
- 12.11 **Network troubleshooting**
- Identifying network faults
  - Physical methods of troubleshooting

- Using software tools to troubleshoot
- Fixing network faults
- Protocols and utilities commands

#### 12.12 **Internet of things (IoT)**

- Overview of IoT
- Elements of IoT
- Radio-frequency identification (RFID)
- Sensor network
- Localization of IoT
- Big data
- Cloud computing
- Business ecosystem, scenarios and model
- IoT application areas and solutions

#### 12.13 **Emerging issues and trends**

## **PART III**

### **SECTION 5**

#### **PAPER NO.13 STRATEGY, GOVERNANCE AND ETHICS**

##### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to formulate and implement strategies and demonstrate good governance and ethical practices.

##### **13.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Analyse the environment and its impact on strategic decision making
- Formulate and implement a strategic plan
- Practice the tenets and principles of good governance
- Comply with ethical principles in an organisation

##### **CONTENT**

##### **13.1 Overview of management**

- Importance of management
- Principles of management
- Management as a science, an art or a profession
- Functions and roles of management
- Levels of management and managerial skills
- Management and administration
- Overview of management functions

##### **13.2 Development of management thought**

- Pre-industrial revolution management theories
- Classical theories, neo-classical theories
- Contemporary theories

##### **13.3 Overview of corporate strategy, governance and ethics**

- Meaning of strategy, management and strategic management
- Scope of strategic management
- Levels of strategic management
- Benefits of strategic management
- Limitations of strategic management
- Meaning of Governance and Ethics
- Importance of Governance and Ethics
- Principles of good governance
- Overview of theories in governance and ethics

##### **13.4 Strategy formulation**

- Environmental analysis
- Organisational vision and mission
- Organisational goals and objectives
- Development of corporate strategy and business strategy
- Strategic options
- Strategy formulation constraints
- Competitive advantage

### 13.5 **Strategy implementation**

- Organisational structure
- Resource allocation
- Organisational culture
- Role of leadership on strategy implementation
- Innovation and knowledge management
- Constraints to strategy implementation
- Management of strategic change

### 13.6 **Strategic monitoring and evaluation**

- Purpose and role of strategic monitoring and evaluation
- Process of strategic monitoring and evaluation
- Tools of strategic monitoring and evaluation
- Role of management information systems
- Performance measurement; balance scorecard and benchmarking
- Features of good strategic monitoring and evaluation systems
- Review and feedback
- Continuous improvement

### 13.7 **The Board of Directors**

- Appointment, composition and size
- Role and functions
- Executive, non-executive and independent directors
- Committees of the Board
- Board meetings
- Board work plan
- Board induction and continuous skills development
- Board manual and charter
- Board performance evaluation
- Board remuneration
- Term limits for non-executive Board members
- Succession planning
- Liability and insurance indemnity
- Appointment of the Chief Executive Officer
- Appointment of the Certified Secretary
- Separation of roles
- Role of the board in performance management
- Role of the Board in stakeholders management

### 13.8 **Accountability, risk management and internal control**

- Financial reporting
- Integrated reporting
- Strategies and processes in enterprise risk management
- Board's role in enterprise risk management
- Internal controls
- Internal auditor
- Audit Committee
- External auditor
- Internal Audit Charter and work plan
- Role of the Board in the procurement process

### 13.9 **Sustainability and social investment**

- Sustainability goals and strategy

- Triple bottom line
- Social responsibility investments
- Corporate social responsibility
- Environmental management
- Ethical issues in CSR
- Strategies and policies on CSR
- Creating and registering foundations to manage CSR
- The impact of CSR on shareholder value
- Social audit
- Corporate reputation and image

#### 13.10 **Ethics and corporate disclosure**

- Ethical norms, morality, values and ethical culture
- Role of the board in promotion of ethical conduct
- Professional judgement
- Code of ethics
- Standards of conduct and personal integrity
- Ethical dilemmas
- Ethics committee
- Ethics training
- Conflict of interests and related party transactions
- Insider trading
- Policy and guidelines on payments and gifts
- Corporate disclosure policy and strategy
- Benefits of disclosures and transparency
- Disclosure barriers
- Financial and non-financial disclosures
- Whistle blowing

#### 13.11 **Case studies in strategy, governance and ethics**

#### 13.12 **Emerging issues and trends**

## **PAPER NO.14 SOFTWARE ENGINEERING**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to implement and manage the software engineering process.

#### **14.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify appropriate software system design tools
- Design appropriate software systems
- Describe software system testing
- Document and commission a software
- Evaluate software acquisition techniques
- Maintain a software.

### **CONTENT**

#### **14.1 Introduction to software engineering**

- Overview of software engineering
- Software engineering concepts
- Software development life cycle (SDLC)
- Legal aspects in software process models

#### **14.2 Software process models**

- Linear/waterfall model
- Rapid prototyping
- Evolutionary models
- Component based models
- Other models

#### **14.3 Software requirements analysis**

- Overview of requirements concepts
- Requirement analysis process
- Stakeholders analysis
- Need for requirement gathering techniques
- Gap analysis
- Prioritization of requirements
- Requirements specification

#### **14.4 Design tools and methods**

- System flowcharts
- Case tools
- Functional decomposition
- Modules design
- Structured walkthrough
- Decision tables
- Structured charts
- Data flow diagrams
- Object oriented design tools

#### **14.5 Software coding**

- Coding platforms



- Approaches to software coding
  - Coding styles and characteristics
  - Coding in high level languages
  - Coding standards
  - User interface
- 14.6 Software testing**
- Testing and debugging
  - Testing platforms
  - Software testing lifecycle
  - Software testing methods
    - Black box testing
    - White box testing
  - Software testing levels
    - Unit
    - Integration
    - System
    - Acceptance
  - Other forms of testing
- 14.7 Conversion strategies**
- Conversion planning
  - Parallel running
  - Direct changeover
  - Pilot study
  - Phased approach
- 14.8 Software quality**
- Control and assurance
  - Software quality factors and metrics
  - Formal technical reviews
  - Verification and validation
  - Cost of quality
- 14.9 Software acquisition methods**
- Software outsourcing
  - Open-source software engineering and customisation
  - In- house development
  - Commercial off the- shelf software (COTS)
  - Factors to consider in software acquisition
- 14.10 Budgeting for information systems**
- Financial cost benefit analysis
  - Business case approach
  - Total cost of ownership
  - Balance score card
  - Activity based costing and expected value
  - Tracking and allocations costs
- 14.11 Documentation and commissioning**
- Objectives of systems documentation
  - Use of systems documentation
  - Qualities of a good documentation
  - Types of documentation

- Software commissioning

#### 14.12 **Software maintenance and evolution**

- Types of software changes
- Software change identification
- Software change implementation

#### 14.13 **Auditing information systems**

- Overview of information systems audit
- Auditing computer resources
- Audit techniques
- Audit applications

#### 14.14 **Emerging issues and trends**

## **PAPER NO.15 MOBILE APPLICATION DEVELOPMENT**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to develop and deploy mobile applications

#### **15.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify mobile applications, platforms and architecture
- Develop mobile applications using development tools and strategies
- Implement mobile applications
- Secure mobile applications

### **CONTENT**

#### **15.1 Mobile devices and applications**

- Overview of mobile computing
- Types of mobile devices
- Uses of mobile devices
- Overview of mobile applications
- Mobile browsers

#### **15.2 Introduction to mobile application development**

- Mobile application challenges
- Mobile application development tools
- Mobile application programming languages
- Mobile application management
- Mobile application best practices
- Overview of mobile database management systems

#### **15.3 Mobile platforms and architectures**

- Internet protocols for mobile applications
- Mobile application distribution platforms and environments
- Mobile application development architectures
- Styles of mobile architecture

#### **15.4 Mobile application development**

- Mobile application development lifecycle
- Functions, arrays and objects
- Control structures and modes of execution
- Using HTML, CSS, XML, Javascript and JQuery

#### **15.5 iOS application development**

- Window-based application and MUC
- Swift programming
- User Interface Design
- Introduction to graphics on the iPhone
- Core data and localisation
- Multi-threading and multi-tasking
- Web services and networking

#### **15.6 Android application development**

- Java reviews

- Android SDK
  - Resources and views
  - Intents and services
  - Storage and threads
- 15.7 **Unstructured supplementary service data (USSD)**
- Overview of USSD code
  - USSD broker
  - POST request, response and status
  - USSD pull
- 15.8 **Mobile application testing**
- Merits and demerits of mobile application testing
  - Challenges of mobile application testing
  - Types of mobile application testing
  - Testing tools
- 15.9 **Mobile application security**
- Overview of mobile application threats
  - Reducing mobile risks
  - Cloud based assessments and solutions
  - Security strategies
  - Security testing techniques and certification
- 15.10 **Emerging issues and trends**

## SECTION 6

### PAPER NO.16 SYSTEMS SECURITY

#### GENERAL OBJECTIVE

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to secure ICT systems.

#### 16.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Identify types of threats to ICT systems
- Adopt different security mechanisms
- Prepare business continuity planning (BCP) strategies
- Develop and implement a systems security policy
- Undertake basic computer forensic audits
- Demonstrate social-ethical and professional values in computing.

#### CONTENT

##### 16.1 Introduction to systems security

- Overview of systems security
- Principles of system security
- Classifications of systems security
- Security core concepts
- Security mechanisms

##### 16.2 Security threats and controls

- Sources of threats
- Types of threats
- Crimes against ICT and computer criminals
- Controlling security threats
- Ethical hacking

##### 16.3 Systems security errors

- Overview of system security errors
- Human errors
- Procedural errors
- Software errors
- Electromechanical problems
- Dirty data

##### 16.4 Systems security measures

- Physical security
- Logical security(authentication, access rights, passwords, others)

##### 16.5 Data and software security

- Overview of data and software security
- Data and software security precautions
- Vulnerability assessment
- Employing virus security precautions

##### 16.6 Network security

- Overview of network security
- Duplicate and alternate routing
- Network intrusion, detection and prevention
- Secure socket layer and transport layer security
- IPv4 and IPv6 security

- Wireless network security
  - Mobile device security
  - Wireless protected access
- 16.7 Introduction to cryptography**
- Overview of cryptography
  - Encryption and decryption
  - Cryptography tools and techniques
  - Cryptographic attack
  - Security services of cryptography
  - Public key infrastructure
- 16.8 ICT risk management**
- Risk management concepts
  - Risk analysis
  - Risk assessment
  - Risk monitoring and review
  - Risk mitigation
  - Corporate risk document
- 16.9 Business continuity planning (BCP)**
- BCP scope, teams and roles
  - Backup types and strategies
  - Hot and cold sites
  - Disaster recovery plans
- 16.10 Systems security policy**
- Components of systems security policy
  - Systems security policy development
  - System security policy implementation
  - Systems security strategies
  - Systems audit
- 16.11 Introduction to computer forensics**
- Computer forensics concepts
  - Incidence handling
  - Investigating desktop incidents
  - Investigating network incidents
  - Securing and preserving evidence
- 16.12 Professional values and ethics in computing**
- Intellectual property and fraud
  - Information systems ethical and social concerns
  - Telecommuting and ethical issues of the worker
  - Codes of ethics for IT professionals
  - Professional ethics and values on the web and Internet
  - Objectivity and integrity in computing
  - The role of professional societies in enforcing professional standards in computing
  - Vetting of ICT employees
- 16.13 Emerging issues and trends**

## **PAPER NO. 17 INFORMATION SYSTEMS PROJECT MANAGEMENT**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to manage information systems projects.

#### **17.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Manage project scope using various techniques
- Use information systems project management software
- Initiate, develop and manage information systems projects
- Identify, monitor and control project risks
- Prepare project schedules using project management software tools
- Manage information systems project procurement process

### **CONTENT**

#### **17.1 Introduction to information systems project**

- Overview of a project
- Characteristics of project
- Examples of information systems projects
- Project management principles
- Purpose of project management
- Information systems project environment
- Project personnel roles and responsibilities

#### **17.2 Information systems project lifecycle**

- Project identification and selection
- Project planning
- Feasibility study
- Project objectives
- Project proposal
- Project design
- Project development
- Project implementation
- Project monitoring and control
- Project review and evaluation

#### **17.3 Project scope management**

- Scope definition
- Scope verification
- Scope control
- Constraints and assumptions
- Using software tools to assist in project scope management

#### **17.4 Project planning and scheduling**

- Overview of project planning and scheduling
- Features of a good project plan
- Work breakdown structures
- Determining project tasks
- Schedule milestones
- Establishing task dependencies and relationships
- Materials and equipment management
- Tools and techniques for project planning and scheduling
- Using software tools to assist in project planning and scheduling

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- 17.5 **IS project estimation**
- Concepts of information systems project estimation
  - Problems of overestimation and underestimation
  - Basis for information systems project estimation
  - Tools and techniques for project estimation
  - Using software tools to assist in project estimation
- 17.6 **IS project resource management**
- Overview of information systems project resources
  - Resource planning
  - Resource allocation framework
  - Information resource portfolio management
  - Resource schedules
  - Cost management
  - Materials and equipment management
  - Using software tools to assist in resource management
- 17.7 **IS project organisational structures**
- Overview of organisational structures
  - Integrating project work and project organisational structures
  - Project team lifecycle
  - Team management
  - Using software tools to assist in project organisation
- 17.8 **IS project quality management**
- Overview of IS project quality management
  - Project quality factors
  - Quality planning, assurance and control
  - Tools and techniques for quality control
  - Overview of project management standards (PRINCE 2)
  - ISO certification
  - Using software tools to assist in quality management
- 17.9 **IS project communication management**
- Overview of communication management
  - Establishing effective project communication
  - Progress reporting
  - Report writing
  - Managing communication with stakeholders
  - Using software tools to assist in project communication management
- 17.10 **IS project risk management**
- Common sources of risk
  - Risk identification process
  - Risk management tools and techniques
  - Risk analysis
  - Risk monitoring and control
  - Using software tools in risk management
- 17.11 **IS project procurement management**
- Overview of procurement planning process, tools and methods
  - Requesting for proposal and quotations
  - Evaluation of proposals and quotations
  - Contracting and contract administration
  - Using software tools in project procurement management



**17.12 IS project implementation, completion and evaluation**

- Project evaluation
- Team evaluation
- Project documentation
- Change management
- Using software tools to assist in project evaluation

**17.13 Emerging issues and trends**

## **PAPER NO. 18 RESEARCH METHODS**

### **GENERAL OBJECTIVE**

This paper is intended to equip the candidate with the knowledge, skills and attitudes that will enable him/her to design and carry out research on information systems.

#### **18.0 LEARNING OUTCOMES**

A candidate who passes this paper should be able to:

- Identify and analyse problems for which research is required
- Identify the major types of research designs
- Formulate clearly defined research objectives and research questions
- Analyse key issues and themes from existing literature
- Conduct research
- Present research findings
- Apply ethics in research

### **CONTENT**

#### **18.1 Introduction to research**

- Meaning of research
- Types of research
- Significance of research
- The research process
- Challenges in carrying out research
- Types of research designs
- Format of research project
- Research methodology

#### **18.2 The research problem**

- Problem identification
- Salient features of a good problem statement
- Background and context of the problem
- Problem statement
- Research objectives: General and specific objectives
- Research questions
- Research hypothesis/formulation of hypothesis
- Development of theoretical/conceptual framework

#### **18.3 Literature review**

- Meaning and importance of literature review
- Theoretical review and empirical review
- Critical review of major issues
- Theoretical and conceptual framework

#### **18.4 Research methodology**

- Target population
- Sampling techniques and sample size
- Data collection
- Data collection method
- Reliability and validity of data

#### **18.5 Analysis and presentation of findings**

- Analysis of findings
- Presentation of findings

- Testing of hypothesis
  - Summary, conclusions and recommendations
- 18.6 **Format of research project**
- Preliminaries
  - Content chapters
  - Referencing – APA format
  - Appendices
- 18.7 **Issues in research**
- Ethical considerations in research
  - Implementation of research recommendations
- 18.8 **Emerging issues and trends**

## ICT PROJECT

The ICT Project will be undertaken by a candidate after completing Paper Nos. 1 to 18 of the CICT examination.

### GENERAL OBJECTIVE

To prepare a candidate to apply research, analytical and practical skills in solving real life information systems problems, using ICT tools and technologies.

#### 19.0 LEARNING OUTCOMES

A candidate who successfully completes the ICT project should be able to:

- Carry out independent research to address a specific ICT problem
- Identify real life information systems problems
- Analyse the identified problem
- Design a software solution to the identified problem
- Use appropriate software tools to develop and test the proposed solution
- Produce complete documentation for the developed system
- Demonstrate effective communication and presentation skills.

### CONTENT

#### 19.1 Project proposal

- Overview of project proposals
- Identification and statement of a real life ICT problem
- Investigation of the problem, stakeholder, system and user requirements
- Analysis of project feasibility and scope
- Statement of problem and project objectives
- Overview of the literature and possible solutions
- Selection of project implementation methodologies and techniques
- Project resource scheduling (budget, schedule, Gantt chart)

#### 19.2 Project and system analysis

- Limitations of the existing system
- Potential user requirements
- Project and software inputs, processes and outputs
- Functional and non-functional requirements
- Analysis of user classes and characteristics
- Analysis of system features
- Project and system objectives
- Project and system constraints
- Assumptions and dependencies
- Writing the analysis report

#### 19.3 System design

- Establishing conventions and rules for naming system objects
- Input, process and output design
- Developing the conceptual model
- Input content, format and validation
- Normalisation and design of the database schema
- Data validation strategy
- Module design
- User interface design
- Security and backup design
- Test design

#### 19.4 **System development**

- Establishing the development approach and environment
- Demonstration and description of program functional requirements
- Demonstration and description of program non-functional requirements
- Coding and code documentation

#### 19.5 **System testing**

- Establishment of test objectives
- Logical, functional, system, user acceptance and recovery testing
- Creating the test plan
- Selecting test cases
- Presenting test results

#### 19.6 **Project documentation**

- Overview of the project report structure
- Writing the title page
- Declaration of project originality
- Project abstract
- Acknowledgements
- Table of contents
- Project chapters
  - Introduction and background
  - Literature review
  - Methodology (analysis and design)
  - System demonstration
  - Appraisal of the project (achievements, limitations, recommendations)
  - Conclusion
- References
- Appendices
  - Input documents
  - Administrative documents (terms of reference, permissions, questionnaires, etc.)
  - System installation and maintenance manual
  - User manual
  - Annotated program listings
  - Test runs, annotated and cross-referenced test plan

**Note:** Candidates are advised to obtain the “**ICT Project Guidelines**” from the offices of kasneb or download the guidelines from the kasneb website ([www.kasneb.or.ke](http://www.kasneb.or.ke))