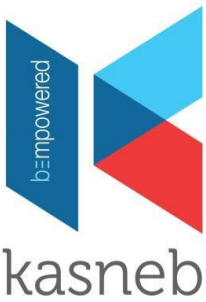

CERTIFIED INFORMATION SYSTEMS SOLUTIONS EXPERT (CISSE)

EXAMINATION SYLLABUS

JULY 2021

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JULY 2021

FOREWORD

One of the cardinal objectives of any education system is to ultimately provide the economy with competent, self-driven and morally upright human capital for sustainable growth and prosperity. In order to effectively achieve this, it is important that the education system continuously adapts to market dynamics at global, regional and national levels.

For professional examination bodies such as the Kenya Accountants and Secretaries National Examinations Board (Kasneb), this translates to the need to regularly review their syllabuses to match and, in an ideal setting, surpass market expectations. The drivers of syllabuses change are wide and diverse and transcend various factors including economic, legal, social and technological spheres.

It is in the above context that The National Treasury and Planning, as the parent Ministry of Kasneb, is pleased to note the significant milestone in the completion of the major review process for Kasneb, having also participated with other stakeholders in the review process. This latest review has afforded Kasneb the opportunity to address emerging trends that define the next generation of professionals, including data mining and analytics, digital competence, soft skills and a global perspective in strategic decision making.

With the revised syllabuses, Kasneb is expected to continue playing a leading role in providing the economy with competent professionals in the areas of accounting, finance, governance and corporate secretarial practice, credit management, forensic investigations, information communication technology and related areas. This is further expected to boost the Government's development agenda as defined under the Kenya Vision 2030 development blueprint and the Big Four Agenda.

The successful implementation of the revised syllabuses will require the support of all stakeholders. I wish therefore to urge for the continued support to Kasneb including from various Government Ministries and Departments, regulatory bodies, employers, professional institutes, universities and other training institutions, among others.

It is my conviction that the revised syllabuses will reshape the professional qualifications frontier in the region and beyond and firmly place Kenya as one of the leading countries in the provision of globally competitive professionals.

Dr Julius M. Muia, PhD, CBS

The Principal Secretary/The National Treasury
The National Treasury and Planning

August 2021

PREFACE

Kasneb has been undertaking a major review of its examination syllabuses every five years and a mid-term review every two and a half years. The prime focus of the just completed major review was the need to produce enhanced, integrated and competence based curriculums whose graduates will remain well positioned to meet the dynamic global market demands for the next five years and beyond.

The major review process commenced in earnest in August 2019 with an intensive stakeholder engagement across various counties in Kenya. This was supplemented by study visits and surveys conducted in various parts of the globe, including in the USA, UK, Canada, Malaysia, Singapore, Australia and India. Further engagements with employers, practitioners and the market at large culminated in the development of a competence framework for the professional qualifications of Kasneb. A competence framework is a structure that sets out and defines each individual competency required by persons working in an organisation. The framework defines the knowledge, skills and attributes needed for people within an organization.

Complementing the competence framework were occupational standards developed for the vocational, certificate and diploma programmes. Similar to the competence frameworks for professionals, the occupational standards for various technician qualifications are statements of work performance reflecting the ability to successfully complete the functions required in an occupation, as well as the application of knowledge, skills and understanding in an occupation.

With the development of the competence frameworks and occupational standards, the next logical step was the development of the detailed syllabuses content addressing the identified required competencies. The syllabuses content was developed by various subject matter experts drawn from both public and private sectors, industry and academia, employers and practitioners among others.

As noted above, stakeholder engagement formed a critical pillar in each step of the review process. At the final stretch, stakeholders were invited to validate the syllabuses on Friday, 7 May 2021 during a national virtual conference. This paved the way for the launch of the syllabuses on Friday, 23 July 2021.

As part of the new competence-based system, Kasneb will use various assessment modes through a partnership model with other institutions to test the achievement of key competencies and skills. Among other key areas of focus is the introduction of practical experience and work-simulation, together with a requirement for students to attend workshops where matters of ethics, values, attitudes and other soft skills will be developed.

The major review of the syllabuses also witnessed the expansion of the qualifications spectrum for Kasneb to include four vocational courses, one certificate course, three diploma courses, five professional courses and one post-professional specialisation course.

We are confident that the new qualifications of kasneb will address the current and emerging skills requirements in the national, regional and international markets.

Finally, I wish to take this opportunity to thank all our partners and stakeholders for their contribution in various ways to the successful completion of the major syllabuses review.

Dr Nancy N. Muriuki, PhD
Chairman of the Board of Kasneb

August 2021

ACKNOWLEDGEMENT

I wish to take this opportunity to express our deepest appreciation to all our key stakeholders who, through their expert advice, comments, other feedback and general support contributed to the development of the revised syllabuses together with the supporting competence frameworks and occupational standards.

We are particularly grateful to the Government of Kenya through the National Treasury and Planning, the Ministry of Education, Ministry of Foreign Affairs incorporating various Kenyan Embassies and High Commissions, among others; various regulatory bodies including the Kenya National Qualifications Authority (KNQA), Technical and Vocational Education and Training Authority (TVETA), Commission for University Education (CUE), Central Bank of Kenya (CBK), Capital Markets Authority (CMA); professional bodies including the Institute of Certified Public Accountants of Kenya (ICPAK), Institute of Certified Secretaries (ICS), Institute of Certified Investment and Financial Analysts (ICIFA), Institute of Credit Management Kenya (ICM-K), Law Society of Kenya (LSK) - Nairobi Chapter; Federation of Kenya Employers (FKE) and individual employers; the Ethics and Anti-Corruption Commission (EACC); practitioners, subject matter experts and trainers, various consultants engaged; students, parents and guardians; past and present members of the Board, Committees and Sub-Committee; members of staff of Kasneb among other stakeholders.

We also extend our appreciation to all foreign regulatory and professional bodies who facilitated the study visits and provided valuable insights on global trends and emerging issues in areas relevant to the examinations of Kasneb. In this connection, we wish to highlight the following institutions for special mention:

1. United Kingdom (UK): Chartered Governance Institute; Chartered Institute of Management Accountants; Chartered Institute of Marketers; Institute of Chartered Accountants in England and Wales; Pearson Vue Limited.
2. United States of America (USA): American Institute of Certified Public Accountants; Chartered Financial Analysts Institute; International Federation of Accountants; Society for Corporate Governance.
3. Singapore and Malaysia: Chartered Secretaries Institute of Singapore; Malaysian Association of Chartered Secretaries and Administrators; Malaysian Institute of Accountants.
4. Canada: CPA Canada; Board of Canadian Registered Safety Professionals.
5. Australia: CPA Australia; Pearson Vue Australia.
6. India: Indira Gandhi National Open University; Institute of Chartered Accountants of India; Institute of Company Secretaries of India, Institute of Cost Accountants of India.
7. South Africa: South Africa Institute of Chartered Accountants (SAICA).

Kasneb remains forever grateful to all our stakeholders for your role in ensuring the development of quality and globally benchmarked syllabuses, competence frameworks and occupational standards. We look forward to your continued support in the implementation of the revised syllabuses.

Dr Nicholas K. Letting', PhD, EBS
Secretary/Chief Executive Officer, Kasneb

August 2021

TABLE OF CONTENTS

BACKGROUND INFORMATION ABOUT kasneb

1.1 Legal Foundation and Status of kasneb

kasneb was established as a state corporation under the National Treasury by the Government of Kenya on 24 July 1969. The establishment and operations of kasneb are governed by the following main Acts:

(a) The Accountants Act, No. 15 of 2008 (which repealed the Accountants Act, Cap 531 of 1977).

(b) The Certified Public Secretaries of Kenya Act, Cap 534 of 1988.

(c) The Investment and Financial Analysts Act, No. 13 of 2015.

1.2 Functions of kasneb

Section 17(1) of the Accountants Act, 2008 of the Laws of Kenya defines the functions of kasneb. These functions are:

(a) To prepare syllabuses for professional, diploma and certificate examinations in accountancy, company secretarial practice and related disciplines;

(b) To make rules with respect to such examinations;

(c) To arrange and conduct examinations and issue certificates to candidates who have satisfied examination requirements;

(d) To promote recognition of its examinations in foreign countries;

(e) To investigate and determine cases involving indiscipline by students registered with the Examinations Board;

(f) To promote and carry out research relating to its examinations;

(g) To promote the publication of books and other materials relevant to its examinations;

(h) To liaise with the Ministry of Education, Science and Technology in accreditation of institutions offering training in subjects examinable by the Examinations Board, and

(i) To do anything incidental or conducive to the performance of any of the preceding functions.

1.3 Professional Institutes/Registration Board for Kasneb graduates

1.3.1 Institute of Certified Public Accountants of Kenya (ICPAK)

ICPAK is established under Section 3 of the Accountants Act, 2008. One of the functions of ICPAK is to advise kasneb on matters relating to examination standards and policies. The Act also makes provisions for the establishment of a Registration and Quality Assurance Committee (Registration Committee) under Section 13. One of the functions of the Registration Committee is to register eligible persons as Certified Public Accountants.

1.3.2 Institute of Certified Secretaries (ICS)

ICS is established under Section 3 of the Certified Public Secretaries of Kenya Act (Cap. 534) of the Laws of Kenya. One of the functions of ICS is to advise kasneb on matters relating to examination standards and policies.

1.3.3 Registration of Certified Public Secretaries Board (RCPSB)

RCPSB is established under Section 11 of the Certified Public Secretaries of Kenya Act (Cap. 534) of the Laws of Kenya. One of the functions of RCPSB is to register eligible persons as Certified Secretaries.

1.3.4 Institute of Certified Investment and Financial Analysts (ICIFA)

ICIFA is registered under the Investment and Financial Analysts Act, No. 13 of 2015 of the Laws of Kenya. One of the functions of ICIFA is to advise kasneb on matters relating to examination standards and policies. The Act also makes provisions for the establishment of a Registration Committee under Section 13. One of the functions of the Registration Committee is to register eligible persons as Certified Investment and Financial Analysts.

1.3.5 Institute of Credit Management Kenya [ICM (K)]

ICM (K) is registered under the Societies Act, (Cap.108) of the Laws of Kenya.

1.4 Vision, Mission, Mandate and Core Values

The vision, mission, mandate and core values of kasneb are as follows:

1.4.1 Vision

Global leader in examination and certification of business professionals.

1.4.2 Mission

Empowering professionals globally by offering quality examinations and undertaking research and innovation.

1.4.3 Mandate

The mandate of kasneb is the development of syllabuses; conduct of professional, diploma and certificate examinations and certification of candidates in accountancy, finance, credit, governance and management, information technology and related disciplines; promotion of its qualifications nationally, regionally and internationally and the accreditation of relevant training institutions in liaison with the ministry in charge of education.

1.4.4 Core Values

- Integrity
- Professionalism
- Customer focus
- Teamwork
- Innovativeness

2.0 EXAMINATIONS OF kasneb

kasneb currently offers the following examinations:

(a) Vocational certificate courses

These are short-term, skills-based programmes currently in the areas of entrepreneurship and innovation, graphic design, information and cyber security and block chain technology. The courses are ideal both for fresh high school graduates and established professionals in various areas willing to diversify their knowledge and competencies in the above areas.

The vocational certificate courses are administered in two levels, with each level requiring an average of three months, thus a total of six months.

Entrants with high school certificates will start with Level I which covers basic skills. Other entrants with post-high school qualifications covering the basic skills will enter at Level II.

The minimum entry for the vocational certificates is a KCSE certificate. The courses can be pursued through a tuition-based programme or privately. Tuition-based programmes (physical or virtual classes) are however recommended due to the interactiveness with facilitators and other students which are key in imparting the requisite technical and soft skills.

The examinations will be administered primarily on a computer-based platform.

The details on each of the vocational programmes are summarised below:

(i) Vocational Certificate in Entrepreneurship and Innovation

The course imparts basic knowledge, skills, values and attitudes to apply entrepreneurship skills and generate innovative ideas to start and manage a new business or grow an existing entity.

(ii) Vocational Certificate in Graphic Design

The course imparts basic knowledge, skills, values and attitudes to generate and enhance graphic designs according to set specifications.

(iii) Vocational Certificate in Information and Cyber Security

The course imparts basic knowledge, skills, values and attitudes to identify information and cyber threats and risks and implement programmes to protect information and databases.

(iv) Vocational Certificate in Blockchain Technology

The course imparts knowledge, skills, values and attitudes to develop a simple blockchain program and undertake blockchain transactions.

(b) Certificate in Accounting and Management Skills (CAMS) course

The course imparts knowledge, skills, values and attitudes to prepare basic accounts and financial statements for a small enterprise or non-complex environment and apply basic management and marketing skills in business.

The course is mainly for persons who wish to qualify and work as entry level accounting and management personnel.

The CAMS course is administered in two levels, with each level requiring an average of six months, thus a total of one year.

The minimum entry requirement is KCSE mean grade D or a vocational certificate.

The course is fully tuition based with requirements for students to sit for continuous assessment tests (CATs), which constitute 15% of the final score for assessment purposes.

The examinations will be administered primarily on a computer-based platform.

(c) **Diploma Courses**

Kasneb currently administers three diploma programmes; Accounting Technicians Diploma (ATD), Diploma in Data Management and Analytics (DDMA) and Diploma in Computer Networks and Systems Administration (DCNSA).

The diploma courses are administered in two levels, with each level requiring an average of one year, thus a total of two years.

The minimum entry for the diploma courses is KCSE mean grade C-. Persons with certificate and other higher qualifications from recognised institutions are also eligible for entry. The courses can currently be pursued through a tuition-based programme or privately. Tuition-based programmes (physical or virtual classes) are however recommended due to the interactiveness with facilitators and other students which are key in imparting the requisite technical and soft skills.

A summary on each of the diploma programmes is presented below:

(i) **Accounting Technicians Diploma (ATD) course**

The course imparts knowledge, skills, values and attitudes to prepare financial and management accounts and financial statements for small and medium sized enterprises and compute basic taxes for a business.

The course is aimed at persons who wish to qualify and work as middle level accountants providing technical support to professional accountants, auditors, tax practitioners and related areas.

(ii) **Diploma in Data Management and Analytics (DDMA) course**

The course imparts knowledge, skills, values and attitudes to undertake non-complex design of databases, mine and analyse data for decision making.

The DDMA will be administered on a computer-based platform.

(iii) **Diploma in Computer Networks and Systems Administration (DCNSA) course**

The course imparts knowledge, skills, values and attitudes to design, configure, test and secure and manage non-complex networks.

The DCNSA will be administered on a computer based platform.

(d) Professional Courses

Kasneb currently administers five professional courses, as summarised below:

(i) Certified Public Accountants (CPA)

(ii) Certified Secretaries (CS)

(iii) Certified Investment and Financial Analysts (CIFA)

(iv) Certified Credit Professionals (CCP)

(v) Certified Information Systems Solutions Expert (CISSE)

The professional courses are administered at Foundation, Intermediate and Advanced Levels. Each level requires an average of one year, though candidates are advised to provide for an additional one year to meet requirements for internship/practical experience

The minimum entry requirement for the professional courses is KCSE mean grade C+. Persons with diplomas or other higher-level qualifications from recognised institutions are also eligible for entry. The courses can be pursued through a tuition-based programme or privately. Tuition-based programmes (physical or virtual classes) are however recommended due to the interactiveness with facilitators and other students which are key in imparting the requisite technical and soft skills.

A summary on each of the professional courses is presented below:

(i) Certified Public Accountants (CPA) course

The course imparts knowledge, skills, values and attitudes to, among other competencies:

- Prepare accounts and financial statements including for complex entities in both the private and public sectors.
- Use computerised accounting systems
- Practically apply data analytical tools analyse data and reach conclusions.
- Undertake audit and assurance services
- Apply advanced financial management skills to evaluate various financial aspects of a business for decision making
- Prepare management accounts
- Apply leadership and management skills in practice to manage teams and achieve results

The course is aimed at persons who wish to qualify and work or practice as professional accountants, auditors, finance managers, tax managers and consultants in related areas in both public and private sectors.

Assessment will be conducted in a variety of ways, including examinations, practical papers, workshops attendance and practical experience.

In addition to the above papers, prior to certification, candidates will be required to

- Attend workshops on ethics, soft skills and emerging issues organised by Kasneb and ICPAK and earn IPD hours)

- Obtain 1-year practical experience, or alternatively attend workshops on work based simulation organised by Kasneb and ICPAK.

In order to assist CPA students to obtain the requisite practical experience and internship opportunities, they will be registered as student members of the Institute of Certified Public Accountants of Kenya (ICPAK) under a programme called the Trainee Accountants Practical Experience Programme (TAPEF). Through TAPEF, ICPAK working in consultation with Kasneb will assist students as much as possible to link with professional accountants who will mentor them towards obtaining the necessary practical experience.

(ii) **Certified Secretaries (CS) course**

The course imparts knowledge, skills, values and attitudes to, among other competencies:

- Practice and promote principles of good governance within public and private sector entities
- Implement and comply with legal, regulatory and ethical requirements in practice
- Ensure proper conduct and management of meetings
- Undertake consultancy and advisory services in corporate secretarial and related practices
- Manage boardroom dynamics
- Undertake governance and compliance audits

The course is aimed at persons who wish to qualify and work or practice as corporate secretaries, policy formulators and consultants in governance, governance and compliance auditors and administrators at county and national levels and in the private sector.

Assessment will be conducted in a variety of ways, including examinations, projects and workshops attendance.

(iii) **Certified Investment and Financial Analysts (CIFA) course**

The course imparts knowledge, skills, values and attitudes to, among other competencies:

- Apply financial tools and concepts in analysis and valuation of investment and securities
- Manage and grow portfolios of investments
- Analyse various types of investments including equity investments, fixed income investments and derivatives
- Manage corporate finances
- Apply financial modelling and analytical tools in investments analysis

The course is aimed at persons who wish to qualify and work or practice as investment, securities and financial analysts, portfolio managers, investment bankers, fund managers, consultants on national and global financial markets and related areas.

(iv) **Certified Credit Professionals (CCP) course**

The course imparts knowledge, skills, values and attitudes to, among other competencies:

- Manage the credit cycle for trade credit providers
- Manage credit risk for different entities
- Undertake credit analysis for various corporate entities
- Undertake debt collection in a professional manner
- Comply with various requirements in debt management including governance, ethical, legal and regulatory requirements.

The course is aimed at persons who wish to qualify and work or practice in various fields of credit management including credit analysis, debt management and recovery, corporate lending and related areas in both formal and informal sectors.

(v) **Certified Information Systems Solutions Expert (CISSE) course**

The course imparts knowledge, skills, values and attitudes to, among other competencies:

- Develop information systems solutions for a business
- Design and operationalise database management systems
- Design, configure and trouble shoot computer networks
- Implement ICT projects
- Manage and analyse big data

(e) **Post-professional specialisation course**

Kasneb has introduced the Certified Forensic Fraud Examiner (CFFE). The course imparts knowledge, skills, values and attitudes to, among other competencies:

- Apply analytical techniques in fraud detection
- Design and implement preventive and detective controls
- Apply and ensure compliance with the appropriate laws in fraud investigations
- Apply the burden and standards of proof in civil and criminal proceedings
- Apply the various methods and techniques of conducting fraud investigations
- Write standard investigations and expert witness reports
- Develop fraud prevention programs
- Conduct a fraud prevention health check up
- Develop and implement a fraud risk management program

The course is aimed at persons who wish to qualify and work or practice in the fields of financial fraud and corruption investigations, fraud prevention, fraud risk analysis and related areas.

The CFFE is administered in three modules, with an integrated case study and workshops at the end of the course. Each module is expected to last for three months. Examinations

for the CFFE course will be administered three times in a year, thus the course is meant to last on average one year.

The minimum entry requirement to pursue the CFFE course is:

- Kasneb professional qualification; or
- Bachelor's degree from a recognised university; or
- Any other qualification considered equivalent to the above.

The course can be pursued through tuition-based learning or self-study.

Kasneb working with other partners will be rolling out another post-professional specialisation area in public financial management.

(f) **Examinations for holders of foreign qualifications wishing to be registered and practice in Kenya**

(i) **Examination for holders of foreign accountancy qualifications (FAQs)**
In consultation with the Council of ICPAK under Section 26 Sub-Sections (2) and (3) of the Accountants Act, 2008, kasneb examines holders of foreign accountancy qualifications who have applied for registration as Certified Public Accountants (CPAs) of Kenya and they are required to demonstrate their knowledge of local law and practice.

(ii) **Examination for holders of foreign secretaries qualifications (FSQs)**
In consultation with the Council of ICS under Section 20 Sub-Sections (2) and (3) of the Certified Public Secretaries of Kenya Act, Cap 534, kasneb examines holders of foreign secretaries qualifications who have applied for registration as Certified Secretaries (CSs) of Kenya and they are required to demonstrate their knowledge of local law and practice.

(iii) **Examination for holders of foreign investment and financial analysts qualifications (FIFAQs)**
In consultation with the Council of ICIFA under Section 16 Sub-Sections (2) and (3) of the Investment and Financial Analysts Act, No. 13 of 2015, kasneb examines holders of foreign qualifications who have applied for registration as Certified Investment and Financial Analysts (CIFA) and they are required to demonstrate their knowledge of local law and practice.

3.0 EXAMINATION RULES AND REGULATIONS

3.1 Registration and examination bookings

All applications for registration and examination booking must be in the prescribed manner. Students are advised to download the e-kasneb app for purposes of registration and examination booking. The deadline for registration and examination booking will be specified for each sitting but may not be later than thirty days to the date of the next examinations.

3.2 Exemptions

Exemptions may, on application, be granted to registered students who are holders of certain degrees and diplomas recognised by kasneb. Exemptions will be granted on a paper by paper basis. Details on available exemptions can be accessed on the kasneb website www.kasneb.or.ke.

3.3 Retention of Credits

Credits for papers passed by candidates will be retained without limit.

3.4 Progression Rule

A candidate will not be allowed to enter a higher level of the examination before completing the lower level.

3.5 Registration Renewal

3.5.1 A registered student must renew the studentship registration annually on the first day of July provided that newly registered students will be required to renew their registration on the first day of July following the examination sitting to which they are first eligible to enter.

3.5.2 A student who without good cause fails to renew the registration within three months of the renewal date will be deemed to have allowed the registration to lapse and may thus forfeit the right to write the examination until the renewal position is regularised. The registration number of a student who fails to renew the registration for three consecutive years will be deactivated, that is, removed from the register of students and will thus not be able to book for examinations until the registration number is reactivated.

3.5.3 A student whose registration number is deactivated for failure to renew the registration may apply for reactivation provided that if the application is accepted, the student shall:

(a) Pay the registration reactivation fee.

(b) Pay three years of registration renewal fees.

3.6 Rules Governing the Conduct of Students in the Examination Room

Kasneb will conduct examinations on both computer-based and paper-based platforms. The following rules mainly relate to paper-based examinations. Kasneb will be issuing additional rules specific to computer-based examinations in due course**.**

3.6.1 Candidates should present themselves for the examination at least 30 **minutes** before the scheduled time for the commencement of the examination they are taking.

3.6.2 A candidate who arrives half an hour or later after the commencement of the examination will not be allowed to take the examination nor will a candidate be permitted to leave the examination room until after the end of the first half hour since the commencement of the examination.

3.6.3 Each candidate is assigned a registration number upon registration as a student of kasneb. The candidate must sit at the place indicated by that number in the examination room. The registration number must be entered in the space provided at the top right-hand corner of each answer sheet.

3.6.4 The name of the candidate **must not** appear anywhere on the answer sheet.

3.6.5 Each answer sheet has a serial number indicated on the top, left hand side of the answer sheet. Each candidate must indicate the serial number of the answer sheet(s) used for each examination paper in the signature register.

3.6.6 Examination stationery will be provided in the examination room, but candidates must bring their own blue or black ink pens, pencils, and rulers.

3.6.7 **Mobile phones are strictly not allowed in the examinations room.**

3.6.8 No stationery whatsoever may be removed from the examination room.

3.6.9 Candidates **must not** carry the examination question papers from the examination room.

3.6.10 Candidates are allowed to use calculators provided that such calculators are noiseless, cordless and non-programmable.

3.6.11 Candidates will be required to positively identify themselves to the chief invigilator by producing their student identification cards and the national identity cards. Non-Kenyan candidates will be required to produce other relevant identification documents such as passports.

3.6.12 Strict **silence** must be observed during the entire duration of the examination.

3.6.13 Candidates **must not** possess any notes, printed paper or books in the examination room, but must leave any such material with the chief invigilator. Candidates using clipboards must ensure that such clipboards have no writing on them whatsoever.

3.6.14 Smoking is **not** allowed in the examination room.

3.6.15 Candidates **must not** collude in the examination room by exchanging notes or keeping the answer booklet in such a way that another candidate can read or copy from the booklet.

3.6.16 Impersonation in the examination room is not only a serious offence but also a criminal offence.

3.6.17 During the course of the examination, no candidate may leave the examination room without permission from the chief invigilator. Any candidate who does so will not be allowed to return to the examination room.

3.6.18 Candidates who finish the paper before the chief invigilator announces the end of the examination and wish to leave the examination room while the

examination is in progress must inform the invigilator and hand in their scripts to the invigilator before leaving the examination room. However, no candidate will be allowed to leave the examinations room during the last fifteen (15) minutes of the examination.

3.6.19 Candidates **must not** leave the examination room with any answer booklet or answer sheets.

3.6.20 Candidates **must not** leave the examination room before their answer booklets are collected by the invigilators.

3.6.21 Candidates **must not** write notes on the examination timetable (Authority to sit the Examination).

3.6.22 Candidates with confirmed disabilities may apply to kasneb to be allowed extra time during examinations. Such application should be made at least two months prior to the examination.

3.6.23 Candidates must produce the timetables (Authority to sit the Examination) in order to be allowed to take the examination. Candidates may download their timetables (Authority to sit the Examination) from the kasneb website or through the e-kasneb. The downloaded timetables may be used as authority to sit the examination.

3.7 Action for Breach of Examination Rules and Regulations

3.7.1 kasneb is mandated by the Accountants Act, 2008 under Section 17 (1)(e) to investigate and determine cases involving indiscipline by students registered with kasneb. Section 42 of the Act further defines examination offences that are punishable under the law and the applicable penalties.

3.7.2 Disciplinary action will be taken against candidates who breach the examination rules and regulations of kasneb. A breach of the examination rules and regulations of kasneb shall include but is not limited to the following:

(a) Deficiency in identification.

(b) Impersonation.

(c) Collusion.

(d) Possession of a mobile phone in the examination room.

(e) Possession of notes in the examination room.

(f) Taking away answer booklets.

(g) Writing of names on the scripts.

(h) Possession of mobile phones in the examination room.

(i) Carrying the examination question papers from the examination room.

3.7.3 The action for breach of the examination rules and regulations of kasneb shall include but not limited to the following:

(a) De-registration as a student of kasneb.

(b) Cancellation of registration number.

(c) Nullification of candidate's results.

(d) Prohibition from taking examinations of kasneb.

(e) Written reprimand and warning.

3.7.4 Certain breaches of the rules and regulations amount to breaches of the law. In such cases, candidates will be handed over to the police for investigations and appropriate legal action.

Section 42 of the Accountants Act, 2008 provides that a person who:

(a) gains access to examinations materials and knowingly reveals the contents, whether orally, in writing or through any other form, to an unauthorised party, whether a candidate or not;

(b) wilfully and maliciously damages examinations materials;

(c) while not registered to take a particular examination, with intent to impersonate, presents or attempts to present himself to take the part of an enrolled candidate;

(d) presents a forged certificate to a prospective employer or to an institution of learning with intent to gain employment or admission; or

(e) introduces unauthorised materials into the examinations room, whether in writing or in any other form, whether a candidate or not, commits an offence and is liable on conviction to imprisonment for a term not exceeding three years, or to a fine not exceeding one hundred thousand shillings, or to both.

CERTIFIED INFORMATION SYSTEMS SOLUTIONS EXPERT (CISSE)

FOUNDATION LEVEL

PAPER NO. 1 COMPUTING SYSTEMS

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to perform basic computing operations.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Demonstrate knowledge of computing systems and their applications in practice
- Apply data processing knowledge in business solutions
- Develop specific information system solutions for business
- Manage transactions and use reports for decision making in an organization
- Apply emerging trends in information systems to real world environment
- Set up a simple but secure peer-to-peer network

CONTENT

1. **Overview of Computing Systems**
   - 1.1 Introduction to computer systems
   - 1.2 Computer hardware
   - 1.3 Computer software
   - 1.4 Relationship between hardware and software

2. **Data Processing**
   - 2.1 Types of files
   - 2.2 Data processing cycle
   - 2.3 Methods of data processing
   - 2.4 Modes of data processing

3. **Computer Networks**
   - 3.1 Types of computer networks
   - 3.2 Network topologies
   - 3.3 Network configuration
   - 3.4 Network communication media
   - 3.5 Networking software
   - 3.6 Peer-to-peer networks
   - 3.7 Cyber security

4. **Developing Information System Solutions**
   - 4.1 Systems Development Life Cycle (SDLC)
   - 4.2 Rapid application development
   - 4.3 End-user Development /User Experience Design
   - 4.4 Computer-Aided Software Engineering (CASE)
   - 4.5 Outsourcing Information Systems/Advantages and Disadvantages of Outsourcing

5. **Types of Information Systems**
   - 5.1 Transaction processing systems - Differences between Online Transaction
   - 5.2 Processing (OLTP) and Online Analytical Processing (OLAP)
   - 5.3 Management Information Systems
   - 5.4 Decision Support Systems
   - 5.5 Executive Information Systems

6. **Application areas of Information and Communication Technologies (ICT)**
   - 6.1 Commerce
   - 6.2 Government
   - 6.3 Education
   - 6.4 Entertainment
   - 6.5 Science and research
   - 6.6 Artificial intelligence
   - 6.7 Communication
   - 6.8 Trading / Marketing

7. **Impact of ICT on Society**
   - 7.1 Impact of ICT in the workplace
   - 7.2 Impact of ICT away from Workplace (e.g., Working from Home)
   - 7.3 Health issues and ICT
   - 7.4 Ethical concerns

8. **Elementary Programming Principles**
   - 8.1 Introduction to computer programming
   - 8.2 High level and low-level programming languages
   - 8.3 Program development cycle
   - 8.4 Program and Business Workflow Diagrams
   - 8.5 Development of algorithms using data flow diagrams/flowcharts and pseudocodes

Sample reading and reference material

1. Laudon, K.C., & Laudon, J. P. (2020). Management Information Systems: Managing the Digital Firm (16th edition). London: Pearson.
2. Rainer Jr. R. K., Prince, B. & Cegielski, C. (2019). Introduction to Information Systems. (8th edition). London: John Wiley & Sons, Inc.
3. Kroenke, D. M. & Boyle R. J. (2019): Experiencing MIS, (8th edition). Washington: Pearson Education.
4. Kasneb e-learning resources (link on the kasneb website).
5. Kasneb approved study packs.

PAPER NO. 2 INFORMATION SYSTEMS SUPPORT AND INTEGRATION

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to provide information systems support and integration services in an organization.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Assemble a computer system and install operating system and application programs
- Troubleshoot computer hardware and software
- Disassemble, clean and reassemble the computer
- Identify and replace faulty computer components
- Undertake effective selection and acquisition of a computer system
- Backup and restore data in a computer system
- Undertake the system integration process in an organization
- Apply system integration technologies
- Integrate applications for businesses

CONTENT

1. **Introduction to Computer Support and Maintenance**
    - 1.1 Computer electronic components
    - 1.2 Physics of electronics
    - 1.3 Computer Digital Logic
    - 1.4 Use of maintenance tools and equipment
    - 1.5 Standard operating and maintenance procedures
    - 1.6 Safety precautions

2. **Computer System Assembly and Disassembly**
    - 2.1 Selection and compatibility issues
    - 2.2 Assembly, disassembling, cleaning and reassembling
        - 2.2.1 Personal computers
        - 2.2.2 Portable and mobile devices
        - 2.2.3 Printers
    - 2.3 Identifying hardware problems and replacing hardware parts
    - 2.4 Upgrading computers
    - 2.5 Electronic waste management

3. **ICT Support Services**
    - 3.1 Computer support (Email, Remote Access, Wireless networks, Printing)
    - 3.2 On-line support
    - 3.3 Help desk management
    - 3.4 Planning and providing staff training
    - 3.5 Health and safety

4. **Troubleshooting guide**
    - 4.1 Hardware Issues & Solutions
    - 4.2 Software issues & Solutions
    - 4.3 Improving the performance of slow computer

5. **Fundamentals of Computer Security**
   - 5.1 Level of computer security
   - 5.2 Data protection
   - 5.3 Backup and restoration procedure
   - 5.4 Overview of data recovery

6. **Computer Cyber Security**
   - 6.1 Application security
   - 6.2 Information Security
   - 6.3 Network Security
   - 6.4 Disaster Recovery Planning
   - 6.5 Operational Security
   - 6.6 End User Education

7. **Overview of System Integration**
   - 7.1 Information Systems concepts and definitions.
   - 7.2 Components of Information Systems
   - 7.3 Role of Information Systems & Integration
   - 7.4 Integration requirements and architecture
   - 7.5 System integration process
   - 7.6 System Integration issues

8. **Integrating Technology**
   - 8.1 XML Technologies
   - 8.2 Web Service Technologies
   - 8.3 "WS-"Web Service Technologies

9. **Integrating Applications**
   - 9.1 Application Integration
   - 9.2 Legacy Integration
   - 9.3 Enterprise Integration
   - 9.4 Integration Strategies

Sample reading and reference material

1. Baltzan, P. (2019). Information System (5th edition). New York: McGraw-Hill Education.
2. Haag, S., & Cummings, M. (2012). Managing Information Systems for the Digital Age. Boston: Irwin/McGraw-Hill.
3. Turban, E. (2021). Information Technology Management (12th edition). New Jersey: Wiley.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

PAPER NO. 3 COMMUNICATION SKILLS AND ETHICS IN INFORMATION SYSTEMS

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to communicate effectively orally and in writing as well comply with ethical requirements at both personal and professional levels.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Demonstrate written and spoken communication skills and ethics
- Use visual aids in written communication
- Prepare and deliver an oral presentation and a public speech
- Conduct interviews
- Apply ICT in report writing, editing and disseminating
- Plan and conduct meetings
- Present reports using power point presentations

CONTENT

1. **Introduction to communication**
   - 1.1 Definition of terms and concepts used in communication
   - 1.2 Internal and external communication
   - 1.3 Formal and informal communication
   - 1.4 Intrapersonal and interpersonal communication
   - 1.5 Small group and public communication
   - 1.6 Purpose of communication
   - 1.7 Essential skills for effective communication
   - 1.8 Benefits of effective communication
   - 1.9 Factors contributing to the importance of communication

2. **Communication process**
   - 2.1 key elements enabling communication process
   - 2.2 Stages in the communication process
   - 2.3 Principles of effective communication
   - 2.4 Barriers to effective communication
   - 2.5 Strategies for overcoming barriers to effective communication
   - 2.6 Choosing a channel of communication

3. **Written communication and visual communication**
   - 3.1 Sentence construction and paragraph development
   - 3.2 The writing process
   - 3.3 Business letters
   - 3.4 C.V and cover letters
   - 3.5 Memorandum
   - 3.6 Circulars and newsletters
   - 3.7 Forms and questionnaires
   - 3.8 Advertisements and publicity materials

3.9 Posters and notices
3.10 E-mail
3.11 Visual communication - graphs/charts/tables/diagrams/pictures

4. **Verbal/oral communication**
   4.1 Meaning of oral communication
   4.2 Importance of oral communication
   4.3 Means of oral communication-face to face and telephone conversations
   4.4 Effective listening-The listening process, principles of effective listening, listening techniques, barriers to effective listening
   4.5 Persuasive communication- meaning, objectives, creating persuasive messages, approaches to persuasion

5. **Non-verbal communication**
   5.1 Meaning of non-verbal communication
   5.2 Importance of non-verbal communication
   5.3 Forms of non-verbal communication
   5.4 Effective use of non-verbal communication
   5.5 Advantages and disadvantages of non-verbal communication
   5.6 Barriers to effective non-verbal communication`

6. **Presentation skills**
   6.1 Effective presentation skills
   6.2 Audience analysis
   6.3 Preparation and organization of an effective presentation
   6.4 Structure of presentation
   6.5 Public speeches
   6.6 Use of visual aids in presentation

7. **Planning and conducting interviews**
   7.1 Meaning of interview, interviewer, interviewee
   7.2 Purpose of interviews
   7.3 Types of interviews
   7.4 Preparation for an interview
   7.5 Conducting an interview

8. **Planning and conducting meetings**
   8.1 Purpose of meetings
   8.2 Types of meetings
   8.3 Planning for meetings
   8.4 Conducting meetings
   8.5 Role of members in a meeting- Role of the chair, secretary and participants
   8.6 Documents used in meetings- notice, agenda and minutes
   8.7 Online meetings- Teleconferencing, video conferencing, webinar

9. **Report writing**
   - 9.1 Meaning of reports
   - 9.2 Purpose of reports
   - 9.3 Types of reports
   - 9.4 Structure and content of reports
   - 9.5 Preparation for report writing
   - 9.6 Writing, editing and dissemination of reports
   - 9.7 Use of power point presentations

10. **Technology and Communication**
   - 10.1 Role and impact of technology in communication
   - 10.2 Communication networks- internet, intranet and extranet
   - 10.3 Wireless technology
   - 10.4 Websites
   - 10.5 Blogs
   - 10.6 Social media

11. **Ethics and integrity in communication**
   - 11.1 Meaning of ethics and integrity
   - 11.2 Significance of ethics and integrity in communication
   - 11.3 Principles of ethical communication
   - 11.4 Factors influencing ethical communication
   - 11.5 Ethical dilemmas in communication
   - 11.6 Handling ethical dilemmas in communication

12. **Ethical issues in Information Communication and Technology - ICT**
   - 12.1 Privacy and integrity of data
   - 12.2 Manipulation of information- merging of information, repackaging information and altering information
   - 12.3 Inappropriate use of data collected
   - 12.4 Credibility and accuracy of information
   - 12.5 Plagiarism
   - 12.6 Other emerging ethical issues in ICT
   - 12.7 Managing ethical issues in ICT

Sample reading and reference material

1. Warner, T. (1995). Communication Skills for Information Systems. Prentice Hall.Sen. L. Communication Skills (2007). PHI Learning.
2. Payne, J. 2001). Communication for Personal and Professional Applications. Perfection Learning.
3. Kasneb e-learning resources (link on the Kasneb website)
4. Kasneb approved study packs

PAPER NO. 4 COMPUTING INFORMATION SYSTEMS APPLICATIONS

UNIT DESCRIPTION

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

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Use a word processor to prepare documents and for online collaboration in preparation of common documents
- Use a Device Operating System for file management
- Competently choose and use free web-based application software such as Google Docs, Sheets, Slides
- Install, use and uninstall application software such as Word processors, Spreadsheets, Database applications, Presentation applications
- Use any spreadsheet package collaboratively with others
- Competently use various packages including database, presentation and publishing packages

CONTENT

1. **Basic Computer Operations**
   - 1.1. Installation of an Operating System and other Application Programs
   - 1.2 Operating systems and their relationship with application programs
   - 1.3 Managing files and folders for a Device
   - 1.4 Plugging in, preparing and ejecting storage devices
   - 1.5 Peripheral devices and their functions in relation to using common application software/programs

2. **Word Processing Software**
   - 2.1 Common features of word processors
   - 2.2 Common toolbars in word processors
   - 2.3 Using templates
   - 2.4 Creating, saving and retrieving existing documents
   - 2.5 Formatting and editing text
   - 2.6 Page setup features
   - 2.7 Manipulating a document using shortcut keys
   - 2.8 Creating and formatting tables
   - 2.9 Creating and formatting images and drawing
   - 2.10 Inserting and editing headers and footers
   - 2.11 Inserting footnote, endnotes, citation and bibliography
   - 2.12 Proofreading tools
   - 2.13 Using mail merge tool
   - 2.14 Tracking changes and comments
   - 2.15 Inserting and manipulating shapes, clipart, pictures, graphics in word processing
   - 2.16 Converting documents using different word processors
   - 2.17 Generating table of content, list of figures and list of tables

2.18 Automating simple tasks
2.19 Protecting documents with passwords
2.20 Printing documents

3. **Spreadsheet Software**
3.1 Common features of spreadsheets
3.2 Concepts of cells, worksheets and workbooks
3.3 Creating, saving and retrieving workbooks
3.4 Cell editing and navigation
3.5 Formatting worksheets
3.6 Using formulae and functions
3.7 Manipulating data using different cell referencing methods
3.8 Sorting, filtering and data validation
3.9 Analysing data using “what if” analysis
3.10 Freezing and unfreezing pane
3.11 Creating and manipulating charts/graphs including pivot tables
3.12 Summarizing, consolidating and outlining data
3.13 Automating simple tasks
3.14 Protecting and sharing workbooks
3.15 Printing worksheets

1. **Database Software**
4.1 Overview of database concepts
4.2 Common features of a database
4.3 Creating, saving and retrieving databases
4.4 Identifying tables, fields, data types and records
4.5 Establishing relationships between tables
4.6 Creating forms and queries
4.7 Data manipulation in database applications
4.8 Data sorting and filtering
4.9 Adding charts, diagrams, tables and attachments
4.10 Securing a database
4.11 Automating simple tasks
4.12 Configuring database start-up options
4.13 Printing from a database

5. **Presentation Software**
5.1 Common features of presentation applications
5.2 Working with master slides and templates
5.3 Creating presentations from scratch
5.4 Inserting a slide, typing and formatting text in a slide
5.5 Importing and exporting content
5.6 Editing slide content
5.7 Drawing and formatting various objects
5.8 Working with graphics and charts
5.9 Inserting and formatting images
5.10 Animation effects

5.11 Reviewing presentation
5.12 Saving, copying and deleting slides
5.13 Presentation views
5.14 Automating simple tasks
5.15 Collaboration in creating presentations
5.16 Printing handouts and slides

6. **Using a Desktop Publishing Software**
   6.1 Overview of desktop publishing software
   6.2 Common features of desktop publishing software
   6.3 Creating different types of publications
   6.4 Creating, saving and retrieving publications
   6.5 Setting page layout
   6.6 Using frames
   6.7 Typing and manipulating text
   6.8 Identifying and using various icons in toolbars of the program including toolbox
   6.9 Drawing and manipulating various shapes
   6.10 Inserting and using the colour palette
   6.11 Inserting and manipulating graphics
   6.12 Importing and exporting files
   6.13 Setting borders
   6.14 Using merge tool
   6.15 Working with tables
   6.16 Linking and embedding
   6.17 Automating simple tasks
   6.18 Printing a publication

7. **Using the Internet**
   7.1 World Wide Web
   7.2 Features of a Web Browser
   7.3 Using search engines
   7.4 Internet protocols
   7.5 Sending electronic mail
   7.6 Internet that effectively meet project goals

Sample reading and reference material

1. Laudon, K.C., & Laudon, J. P. (2020). Management Information Systems: Managing the Digital Firm (16th edition). London: Pearson.
2. Rainer Jr. R. K., Prince, B. & Cegielski, C. (2019). Introduction to Information Systems. (8th edition). London: John Wiley & Sons, Inc.
3. Kroenke, D. M. & Boyle R. J. (2019): Experiencing MIS, (8th edition). Washington: Pearson Education.
4. Kasneb e-learning resources (link on the kasneb website).
5. Kasneb approved study packs.

PAPER NO. 5 ENTREPRENEURSHIP AND INNOVATION

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to sustain and grow a business by making use of Information Communication Technology (ICT).

LEARNING OUTCOMES

The candidate who passes this paper should be able to:

- Recognize and identify viable business opportunities in any environment
- Apply entrepreneurial skills to implement a viable business opportunity
- Prepare a business plan of a viable business idea
- Demonstrate entrepreneurial orientation skills
- Exploit entrepreneurship opportunities in ICT

CONTENT

1. **Introduction to Entrepreneurship**
   - 1.1 Definition of entrepreneur and entrepreneurship
   - 1.2 Type of entrepreneurs, distinction between entrepreneurs and small business owners
   - 1.3 Nature and history of entrepreneurship,
   - 1.4 Characteristics of entrepreneurs, benefits of becoming an entrepreneur,
   - 1.5 Challenges faced by entrepreneurs, the role of an entrepreneur in business, changing demographics of entrepreneurs

2. **Entrepreneur and Entrepreneurial Process**
   - 2.1 Approaches to entrepreneurship
   - 2.3 Entrepreneurial mind – set, how entrepreneurs think, entrepreneur background and characteristics, role models, support systems
   - 2.4 Entrepreneurial culture
   - 2.5 Corporate entrepreneurship; Profile of corporate entrepreneurship, causes for interest in corporate entrepreneurship, managerial versus entrepreneurial decision making, leadership characteristic of corporate entrepreneurship
   - 2.6 Successful sustainable entrepreneurship
   - 2.7 Importance of entrepreneurs to development

3. **Creativity**
   - 3.1 Creativity and the business idea
   - 3.2 The creative process, the role of creativity, creative problem solving
   - 3.3 Trends in creativity and the business ideas,
   - 3.4 Barriers to creativity and sources of new ideas,
   - 3.5 How to enhance creativity, enhancing organizational creativity
   - 3.6 Encouraging and protecting new ideas

4. **Innovation**
   - 4.1 Entrepreneurship and innovation; definition of innovation,
   - 4.2 stages of innovation process, types and sources of innovation, invention and innovation
   - 4.3 Opportunity recognition, innovation and sustainability
   - 4.4 Relationship between entrepreneurship and innovation
   - 4.5 Research and development
   - 4.6 The role of creativity and innovation in both established business and entrepreneurial context
   - 4.7 Role of ICT in enhancing innovation

5. **Assessing entrepreneurial opportunities**
   - 5.1 Problems encountered in selecting new ventures
   - 5.2 Factors considered in setting up a new venture
   - 5.3 Factors that determine success of a new venture
   - 5.4 Reasons why new ventures fail
   - 5.5 Importance of business incubators

6. **The Business Plan**
   - 6.1 Definition of business plan
   - 6.2 Reasons for writing a business plan
   - 6.3 Guidelines for writing a business plan
   - 6.4 Components of a business plan – general format
   - 6.5 Guidelines for oral presentation of a business plan
   - 6.6 Presenting the business plan to investors
   - 6.7 Preparing the elevator pitch

7. **Sources of Entrepreneurial Finance**
   - 7.1 Debt financing
   - 7.2 Equity financing
   - 7.3 Personal finances
   - 7.4 Venture capitalists; Business Angels,
   - 7.5 Government Agents,
   - 7.6 Choosing an appropriate source of Financing

8. **Business Entry Options**
   - 8.1 Forms of business organizations
   - 8.2 Buy an existing business
   - 8.3 Franchising a business
   - 8.4 Inheritance
   - 8.5 Hired to be a professional manager
   - 8.6 Part-time entrepreneurship

9. **Entrepreneurial Marketing**
   - 9.1 Market research
   - 9.2 Segmenting the market
   - 9.3 Selecting a target market

9.4 Crafting a unique positioning strategy
9.5 Marketing strategy
9.6 Risk management

10. **Business Ethical Values and Dilemmas**
10.1 Definition of business ethical values and dilemmas
10.2 An organization's code of ethics
10.3 Ethics in corporate entrepreneurship
10.4 Ethical conduct of entrepreneurs and managers
10.5 Ethics in generating and exploiting new entries
10.6 Ethics in International Business
10.7 Aligning corporate social responsibility with company operations

11. **Current issues**
11.1 The internet of things and e-business
11.2 Technopreneurships
11.3 Crowd computing and big data analytics, digital nomadism
11.4 Cyber security and protection of entrepreneurial ventures
11.5 Social media marketing and selling
11.6 Green entrepreneurship, ecopreneurship, social entrepreneurships and sustainable development
11.7 Artificial intelligence/robotics and entrepreneurships
11.8 Coping with innovation and knowing when to change
11.9 Entrepreneurship opportunities in ICT
11.10 Succession planning and exit strategies

Sample reading and reference material

1. Brännback, M., & Carsrud, A .L. (2016). Fundamentals for Becoming a Successful Entrepreneur: From Business Idea to Launch and Management. Pearson Education, Inc. Old Tappan, New Jersey.
2. Scarborough, N., & Cornwall, J. (2018). Essentials of Entrepreneurship and Small Business Management (9th edition). Pearson.
3. Hisrich, R.D., Peters, M.P., & Shepherd, D.A. (2017). Entrepreneurship (11th edition) New York: McGraw-Hill Education.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

INTERMEDIATE LEVEL

PAPER NO.6 INFORMATION SYSTEMS STRATEGY, GOVERNANCE AND ETHICS

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her formulate effective strategies in the context of organisational information systems while complying with governance and ethical requirements.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Demonstrate understanding of how information systems (IS) can be leveraged to meet organizational strategic goals.
- Apply the knowledge of governance and ethical requirements as they relate to information systems.
- Apply information systems strategy with overall organisational strategy.
- Analyse the key strategic trends in information systems management.
- Evaluate best practices and standards in information systems governance.
- Apply key elements and principles of information systems governance in an organizational context.

CONTENT

1. **Introduction**
   - 1.1 Introduction to the concepts - system, strategy, governance and ethics
   - 1.2 The role of management in strategy, governance and ethics
   - 1.3 Information Systems and the role of IS Manager
   - 1.4 Aligning IS Strategy with business strategy

2. **Corporate Level IS Strategy**
   - 2.1 Framework
   - 2.2 Objectives
   - 2.3 Strategies

3. **Information Systems Strategy Triangle**
   - 3.3 Business strategy
   - 3.4 Organizational strategy
   - 3.5 Information strategy

4. **Organizational Strategy and Information Systems**
   - 4.1 Information systems and business processes
   - 4.2 Business value of information Systems
   - 4.3 Planning technology investment
   - 4.4 Assessing information systems productivity

6. **Information Systems and Governance**
   - 5.1 Information technology governance
   - 5.2 Pillars of IT governance
   - 5.3 IT governance frameworks and models
   - 5.4 IS and Project Management

7. **IS Risk Management**
   - 6.1 Application of risk management practices to information systems
   - 6.2 Assessing information risks and controls
   - 6.3 Data security strategies
   - 6.4 Securing digital assets
   - 6.5 IT security policies
   - 6.6 Social engineering

8. **Managing Innovations**
   - 7.1 Technological innovation and business strategy
   - 7.2 Managing disruptive innovations and technological transitions
   - 7.3 The Technology S-curve and its implications on IS strategies

9. **Ethics in Information Systems**
   - 8.1 Information systems ethics & their role
   - 8.2 Intellectual property protections
   - 8.3 Data Privacy and Ethics

10. **Selected Industry Practices and Case Studies**
   - 9.1 Adobe: Royal Bank of Scotland.
   - 9.2 BrightEdge: Stanley.
   - 9.3 LeadGnome: Host Analytics.
   - 9.4 Bitly: Vissla.
   - 9.5 Taboola: The Line.
   - 9.6 OutBrain: Lane Bryant.
   - 9.7 Google Analytics: Optimizely.

10. **Emerging Issues in IS Strategy, Governance and Ethics**
   - 10.1 AI/Artificial intelligence holds significant potential for businesses
   - 10.2 Blockchain
   - 10.3 Cybersecurity as Critical Business Function. ...
   - 10.4 Drones
   - 10.5 Edge Computing. ...
   - 10.6 IoT
   - 10.7 Quantum Computing
   - 10.8 Virtual Reality/Augmented Reality.

Sample reading and reference material

1. Goodhue, D. L. & Thompson, R. L.: Task-Technology Fit and Individual Performance. MIS Quarterly (19:2), pp. 213-236 (1995)
2. Hardy, G.: Coordinating IT Governance--A New Role for IT Strategy Committees. Information Systems Control Journal. 4 (2003).
3. Haes, S. D. & Grembergen, W. V.: IT Governance and Its Mechanisms. Information Systems Control Journal, 1 (2004)
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

PAPER NO.7 DATA MANAGEMENT INFORMATION SYSTEMS

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to oversee and control data management information systems and provide technical details to manage and implement organisational databases.

LEARNING OUTCOMES

A candidate who completes this paper should be able to:

- Design and implements Database Management Systems
- Develop entity-relationship diagrams, relational schemas, and data dictionaries for a database using a given set of business rules
- Analyse Data Management Systems
- Investigate new technologies that are transforming businesses in data management information systems
- Determine the necessary application in an Enterprise Setup

CONTENT

1. **Introduction to Data Management Information Systems**
   - 1.1 Overview of data management and information systems
   - 1.2 Data, Information, Knowledge and Wisdom (DIKW) pyramid
   - 1.3 Functions of MIS
   - 1.4 Database systems applications
   - 1.5 Type of databases
   - 1.6 DBMS architecture
   - 1.7 Components of a DBMS
   - 1.8 Facilities of a DBMS

2. **Introduction to Management Information Systems**
   - 2.1 Elements of information systems
   - 2.2 Characteristics of valuable information
   - 2.3 Types of Information Systems
   - 2.4 Business process and functions
   - 2.5 Concepts and types of information systems
   - 2.6 Elements of Information systems
   - 2.7 Categories of information system

3. **Data Management**
   - 3.1 Introduction to Data Management
   - 3.2 Hierarchy of data and data types
   - 3.3 Data organization techniques
   - 3.4 Software Process models

4. **Database Design and Entity-Relationship Model**
   - 4.1 Overview of database design process
   - 4.2 Entity-Relationship (E-R) model
   - 4.3 E-R diagrams
   - 4.4 Relationships: One-to-one; one-to-many; many-to-many relationships

4.5 E-R design issues
4.6 Weak entity sets
4.7 Unified Modelling Language(UML)
4.8 Case Study Implementation

5. **Relational Database Design**
5.1 Set operations
5.2 Aggregate functions
5.3 Features of a good relational design
5.4 Atomic design and first normal form
5.5 Decomposition using functional dependence
5.6 Functional decomposition theory
5.7 Algorithms for decomposition
5.8 Case study implementation

6. **Structured Query Language (SQL)**
6.1 Overview of SQL
6.2 Basic structure of SQL queries
6.3 Null values
6.4 Nested sub-queries
6.5 SQL data types and Schema
6.6 Integrity constraints
6.7 Data Definition Language
6.8 Data Manipulation Language
6.9 Joins
6.10 Authentication in SQL
6.11 Case study implementation

7. **Database Storage and Querying**
7.1 Storage and file structure
7.2 Indexing and hashing
7.3 Query processing
7.4 Query optimization
7.5 Case study implementation

8. **Transaction Processing**
8.1 Transactions and atomicity, consistency, isolation, durability (ACID) Properties
8.2 Transaction types and states
8.3 Concurrent access, control and recovery
8.4 Serializability and concurrency control
8.5 Concurrency control and locking techniques
8.6 Locking algorithms
8.7 Recovery systems

9. **Data Integration**
9.1 Data integration approaches
9.2 Overview of the data warehouse
9.3 Data modelling for warehouses

9.4 Building a data warehouse
9.5 Types and functions of data warehouses
9.6 Challenges in implementing and managing data warehouses
9.7 Overview of data mining
9.8 Classification and clustering
9.9 Tools, techniques and applications of data mining
9.10 Virtual data integration
9.11 Case studies in Data Integration e.g. A Case Study on Model Driven Data
9.12 Integration for Data Centric Software Development

10. **Object-based databases and Extensible Mark-up Language (XML**)
10.1 Overview and complex types
10.2 Object–relational database management system (ORDBMS)
10.3 Structured types and inheritance in SQL
10.4 Overview, Structure of XML data
10.5 XML document schema
10.6 Querying and transformation
10.7 Application programming interface (API) to XML
10.8 XML data storage and XML Applications

11. **Online Transactions Processing (OLTP), Online Analytical Processing (OLAP) and Data Warehousing**
11.1 Overview of OLTP, OLAP and Data Warehouse
11.2 OLTP and OLAP difference
11.3 The role of OLAP in business intelligence
11.4 Overview of servers and data warehouse
11.5 Data warehouse characteristics and architecture
11.6 Multidimensional data model
11.7 Schemas of Multidimensional data models
11.8 Data Warehouse implementation

12. **Data Mining for Business Intelligence**
12.1 Overview of data mining concept
12.2 Knowledge Discovery in Databases (KDD) Process
12.3 Cross Industry Standard Process for Data Mining (CRISP-DM)
12.4 Key performance indicators (KPI) dashboards
12.5 Data Visualization
12.6 Case Study e.g. Implementing Business Intelligence System – A Case Study

13. **Business processes, Innovations and process re-engineering**
13.1 Overview of business process steps
13.2 Business processes documentation and management
13.3 Business process improvement
13.4 Business Process Management and International Organization for Standardization (ISO) Standards Alignment
13.5 Factors leading to innovations
13.6 Overview Business re-engineering and steps
13.7 Business Continuity Plan (BCP), objectives and phases

14. **Emerging issues in Data Management Information Systems**
    - 14.1 Databases that bridge SQL/NoSQL
    - 14.2 Databases in the cloud/Platform as a Service
    - 14.3 Automated management
    - 14.4 Automated management
    - 14.5 In-memory databases
    - 14.6 Big Data
    - 14.7 Business intelligence:

Sample study and reference material

1. Connolly, T. M. & Begg, C. E. (2014): Database Systems – A Practical Approach to Design Implementation and Management (6th edition.). New Delhi: Pearson.
2. Date, C. J. (2003): An Introduction to Database Systems (8th Edition). Pearson.
3. Silberschatz, A., Korth, H. F & S. Sudarshan, S. (2019). Database System Concepts (7th edition). McGraw-Hill Higher Education.
4. Kasneb e-learning resources (link on the Kasneb website)
5. Kasneb approved study packs.

PAPER NO.8 RESEARCH AND PROJECT MANAGEMENT

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her undertake research in ICT related areas and manage small to medium sized Information Systems development projects.

LEARNING OUTCOMES

A candidate who completes this paper should be able to:

- Understand the business context of an Information Systems development project
- Develop a realistic plan
- Monitor and control resources against a plan
- Implement procedures required to ensure the successful delivery of the end product

CONTENT

1. **Business Context of an Information Systems Development Project**
   - 1.1 Types of information systems projects
   - 1.2 Relationship between business strategy and information system projects
   - 1.3 Content and format of a business case
   - 1.4 The framework of a project
   - 1.5 Role of a programme and project support office
   - 1.6 Development lifecycles
   - 1.7 Principles of PRINCE2

2. **Content and Format of a Business Case**
   - 8.1 Content and format of a business case
   - 8.2 Investment appraisal
   - 8.3 Presenting the business case
   - 8.4 Benefits realisation and management

3. **Project management Process**
   - 3.1 Development lifecycles
   - 3.2 Approaches to systems development
   - 3.3 Project Selection
   - 3.4 Planning and scheduling
   - 3.5 Design
   - 3.6 Development
   - 3.7 Commissioning
   - 3.8 Closure
   - 3.9 Project management software

4. **Project Scoping**
   - 4.1 Project constraints
   - 4.2 Scope definition
   - 4.3 The Scope triangle
   - 4.3 Supply chain total cost of Ownership (TCO)

5. **Developing a Realistic Plan**
   - 5.1 Describe the work that needs to be planned before starting a project
   - 5.2 Project requirements
   - 5.3 Work breakdown structure
   - 5.4 Product breakdown structure
   - 5.5 Product descriptions and work packages
   - 5.6 Dependencies
   - 5.7 Planning for quality
   - 5.8 Tolerances
   - 5.9 The use of planning tools

6. **Developing an estimate for a Project**
   - 6.1 IS project estimation
   - 6.2 Estimating in engineering disciplines
   - 6.3 Comparison of estimating methods
   - 6.4 Estimating supporting activities

7. **Developing a Schedule**
   - 7.1 Scheduling – effort and elapsed time
   - 7.2 Schedule development
   - 7.3 Project milestones and “overhead” tasks
   - 7.4 Resource plans development
   - 7.5 Contingencies
   - 7.6 Plan documentation
   - 7.7 Budgets
   - 7.8 PRINCE2™ plans

8. **Monitoring and control against a plan**
   - 8.1 Critical path method
   - 8.2 Monitoring costs
   - 8.3 Milestone slip, Chart
   - 8.4 Earned value analysis
   - 8.5 Challenges of effective project management
   - 8.6 Evaluate the current situation and identify possible
   - 8.7 Corrective actions
   - 8.8 Change control and configuration management
   - 8.9 Project Reporting
   - 8.10 Exercising control in PRINCE2™

9. **Risk Analysis**
   - 9.1 Risk management process
   - 9.2 Risk management planning and control
   - 9.3 Risk register
   - 9.4 Risk ownership
   - 9.5 Risk management in PRINCE2

10. **Human dimension and the importance of team leadership**
    - 10.1 Maximising the relationship between leadership and performance
    - 10.2 Explain how to manage a project team
    - 10.3 Managing stakeholders and customers
    - 10.4 Managing expectations and conflict
    - 10.5 Selection and role of the project manager
      Role of a Programme and Project Support Office (PPSO**)**
    - 10.6 Work standards relevant to the practice of project management
    - 10.7 Negotiation techniques
    - 10.8 Selling a Project
    - 10.9 Change management

11. **Quality Management**
    - 11.1 Explain how quality is managed
    - 11.2 Quality concepts
    - 11.3 Quality management, TQM and the quality plan
    - 11.4 Quality control methods
    - 11.5 The cost of poor quality
    - 11.6 Inspection versus testing
    - 11.7 The management of software testing
    - 11.8 Metrics and statistical control
    - 11.9 Configuration management
    - 11.10 Managing quality with PRINCE2™

12. **Managing Suppliers**
    - 12.1 Setting up the contract
    - 12.2 The contractual framework
    - 12.3 Monitoring supplier performance
    - 12.4 Quality control and subcontractors
    - 12.5 Legal aspects

Sample reading and reference material

1. Schwalbe, K. (2018). Information Technology Project Management (9th edition). Australia: Cengage Learning.
2. Bentley, C.(2010): PRINCE2™ Revealed (2nd edition). Butterworth – Heinemann.
3. Kasneb e-learning resources (link on the Kasneb website).
4. Kasneb approved study packs.

PAPER NO. 9 NETWORKING AND DATA COMMUNICATION

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to design, configure and administer networks.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Design and configure a Computer Network
- Select appropriate Components and infrastructure for Network design
- Administer IPV4 and IPV6 addresses
- Configure IPV4 and IPV6 addresses and perform Subnetting
- Troubleshoot Networks for Service Delivery
- Use an emulation and/or simulation software to design and configure networks

CONTENT

1. **Data Communication and Networks Overview**
   - 1.1 Need for Data Communications and Networks
   - 1.2 Network Services
   - 1.3 Network types
   - 1.4 Domain and Workgroup concepts
   - 1.5 Data Transmission modes
   - 1.6 Digital and Analog Transmission
   - 1.7 Wireless Transmission

2. **Network Devices**
   - 2.1 Network Adapters
   - 2.2 Intermediary Devices
   - 2.3 End Devices
   - 2.4 Peer-to-peer

3. **Transmission Media**
   - 3.1 Guided Transmission Overview
   - 3.2 Wireless Transmission
   - 3.3 Cable Termination

4. **Network Layered Models**
   - 4.1 Open Systems Interconnect (OSI) and Transmission Control Protocol with Internet
   - 4.2 Protocols (TCP / IP) Models Comparison
   - 4.3 Benefits of Layered Model
   - 4.4 TCP/IP Protocol Suite
   - 4.5 TCP/IP Communication Process
   - 4.6 Standards Organizations
   - 4.7 Internet Standards

5. **Network Topologies**
   - 5.1 Physical Topologies
   - 5.2 Logical Topologies
   - 5.3 Optical Network Topologies (PONs)

6. **IP Addresses**
   - 6.1 IPV4 Address classes
   - 6.2 Classless Inter-domain Routing (CIDR)
   - 6.3 Subnetting IPV4 Addresses
   - 6.4 IPV6 Address types
   - 6.5 Subnetting IPV6
   - 6.6 IPV4 and IPV6 Configuration

7. **Transport and Internet Layer**
   - 7.1 Transmission Control Protocol (TCP) and User Datagram Protocols (UDP)
   - 7.2 Overview
   - 7.3 Port Number groups
   - 7.4 Netstat Command utility
   - 7.5 Routing protocols
   - 7.6 Static routing configuration

8. **Network Protocols**
   - 8.1 DHCP (Dynamic Host Control Protocol)
   - 8.2 DNS (Domain Naming Services)
   - 8.3 SSH (Secure Shell)
   - 8.4 TELNET
   - 8.5 FTP (File Transfer Protocol)

9. **Routing and Switching Technology**
   - 9.1 Collision and Broadcast Domains
   - 9.2 VLAN Networks
   - 9.3 Router vs Multilayer Switch
   - 9.4 Inter-VLAN Routing Configuration

10. **WLAN (Wireless LAN)**
   - 10.1 WLAN Components
   - 10.2 WLAN Threats
   - 10.3 Shared key Authentication Methods
   - 10.4 Graphical User Interface Configuration of a Wireless Router

11. **WAN Overview**
   - 11.1 WAN Standards
   - 11.2 Public and Private WANs
   - 11.3 Ethernet WANs
   - 11.4 WAN Technologies

12. **Network Management and Monitoring**
    - 12.1 Syslog Usage and Facilities.
    - 12.2 NTP (Network Time Protocol) Operation modes.
    - 12.3 Protocol Analysers
    - 12.4 Configure and Verify NTP using Layer 3 device.
    - 12.5 Configure syslog timestamp using Layer 3 device.

13. **Network Troubleshooting**
    - 13.1 Network Documentation
    - 13.2 Troubleshooting Process
    - 13.3 Software and Hardware troubleshooting tools.
    - 13.4 Troubleshooting Internet Protocol (IP) Connectivity

14. **Design and Implement a Local Area Network (LAN)**
    - 14.1 Identify cables to use in a network.
    - 14.2 Cable a physical/Simulated/Emulated topology to Create an Internetwork
    - 14.3 Enter Static IP Address on the LAN
    - 14.4 Configure Static Routing protocol
    - 14.5 Verify End devices are able to communicate using appropriate utilities
    - 14.6 Configure the Router and Switch to be accessed remotely using Telnet and SSH application layer protocols
    - 14.7 Configure the Router to act as a DHCP server and verify connectivity on the End Devices.

Sample reading and reference materials

1. Forouzan, B. A. (2012). Data Communications and Networking. (5th Edition). New York: McGraw-Hill Education.
2. FitzGerald, J., Dennis, A., & Durcikova, A. (2020). Business Data Communications and Networking (14th edition). New Jersey: Wiley.
3. Graziani, R. (2017). IPv6 Fundamentals: A Straightforward Approach to Understanding IPv6 (2nd edition). Indianapolis: Cisco.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

PAPER NO.10 PROGRAMMING AND SYSTEMS ANALYSIS AND DESIGN

UNIT DESCRIPTION

To equip the candidate with the knowledge, skills and attitudes that will enable him/her to analyse and design information systems and develop object-oriented programs using Java.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Analyse information systems problems and design solutions using Java
- Write programs using object-oriented software development methodology
- Test, debug and handle error in object-oriented programs
- Describe conventional methodologies in systems analysis and design
- Integrate and deploy information systems

CONTENT

1. **Information Systems Concept and Technology**
   - 1.1 Information systems overview and concepts
   - 1.2 Systems theory
   - 1.3 Systems thinking and applications
   - 1.4 Components of an information system
   - 1.5 Types of information systems
   - 1.6 Overview of programming languages
   - 1.7 Types of programming languages
   - 1.8 Characteristics of a good information system
   - 1.9 Personnel involved in Systems Analysis and Design

2. **Systems Development Life Cycle (SDLC)**
   - 2.1 Definition of systems development life cycle
   - 2.2 Phases of SDLC
   - 2.3 Advantages and disadvantages of SDLC
   - 2.4 Software development Methodologies

3. **Requirements Elicitation**
   - 3.1 Stakeholder analysis
   - 3.2 Need for requirements gathering
   - 3.3 Strategies and process for requirements gathering
   - 3.4 Requirements gathering tools and techniques
   - 3.5 Gap analysis
   - 3.6 Prioritisation of requirements
   - 3.7 Systems specifications

4. **Systems Analysis**
   - 4.1 Overview of systems analysis concepts
   - 4.2 Information systems project initiation
   - 4.3 Feasibility and risk analysis
   - 4.4 Stages in system analysis
   - 4.5 Techniques in system analysis

4.6 Tools for systems analysis
4.7 System analysis report
4.8 Using software tool to assist in systems analysis

5. **Systems Design**
   5.1 Overview of system design and concepts
   5.2 System design approaches
   5.3 Logical and physical design
   5.4 Modelling techniques and applications
   5.5 User interface design
   5.6 Business logic design
   5.7 Database design
   5.8 Case tools
   5.9 Designing test cases
   5.10 Writing and documenting design specification
   5.11 Using software tools to assist in systems design

6. **Systems Implementation**
   6.1 Systems implementation and concepts
   6.2 Assessing the platform for the system to be implemented
   6.3 User training
   6.4 Data conversion methods
   6.5 System changeover
   6.6 System Evaluation and Optimization

7. **System Testing and Deployment**
   7.1 Software testing approaches
   7.2 Black box and white box testing
   7.3 Software testing strategies
   7.4 Systems deployment and configuration
   7.5 User Documentation and Training

8. **System Maintenance**
   8.1 Overview of software maintenance
   8.2 Software maintenance approaches
   8.3 Legacy systems
   8.4 Systems management and support

9. **Other Software Development Methodologies**
   9.1 Waterfall
   9.2 Prototype
   9.3 Agile Software Development
   9.4 Rapid Application development
   9.5 Extreme Programming
   9.6 Spiral
   9.7 LEAN
   9.8 SCRUM

10. **Overview of Programming Techniques and Paradigms**
    - 10.1 Introduction to programming and concepts
    - 10.2 High level and low-level languages
    - 10.3 Translators and program translation
    - 10.4 Source Code and object code
    - 10.5 Generation of Programming Languages
    - 10.6 Programming approaches
    - 10.7 Strengths of object-oriented programming over other paradigms

11. **Introduction to Java Programming Language**
    - 11.1 Java language specification
    - 11.2 Java JDK, IDE and API
    - 11.3 Java program structure
    - 11.4 Identifiers, data types, variables and constants
    - 11.5 Statements and blocks
    - 11.6 Expressions and operators
    - 11.7 Control structures
    - 11.8 Memory management
    - 11.9 Arrays
    - 11.10 Dictionaries

12. **Object-Oriented Programming**
    - 12.1 Methods and messages
    - 12.2 Abstract data types
    - 12.3 Classes
    - 12.4 Objects
    - 12.5 Class relationships
    - 12.6 Setters and getters
    - 12.7 Constructors and destructors
    - 12.8 Scope and access control
    - 12.9 Encapsulation
    - 12.10 Abstraction
    - 12.11 Inheritance
    - 12.12 Polymorphism
    - 12.13 Interfaces

13. **Functions / Methods**
    - 13.1 Function declaration
    - 13.2 Function prototype and type checking
    - 13.3 Arguments and parameters
    - 13.4 Parameter passing
    - 13.5 Inline functions
    - 13.6 Function overloading
    - 13.7 Recursion
    - 13.8 Pure virtual functions
    - 13.9 Reference and argument passing
    - 13.10 Writing programs using functions

14. **File Input / Output**
    - 14.1 Streams and files
    - 14.2 Input and output streams
    - 14.3 File streams
    - 14.4 Object streams
    - 14.5 Object serialization
    - 14.6 Readers and writers
    - 14.7 Writing programs using Input / Output streams

Sample reading and reference material

1. Satzinger, J. W., Jackson, R. B., & Burd, S. D. (2016). Systems Analysis and Design in a Changing World (7th edition). Australia: Cengage Learning.
2. Tilley, S., & Rosenblatt, H. J. (2019). Systems Analysis and Design (12th edition) . Boston : Cengage Learning.
3. Deitel, H., & Deitel, P. J. (2018). Java: How to Program (11th edition). New York: Pearson.
4. Ogihara, M. (2018). Fundamentals of Java Programming. Bern: Springer.
5. Kasneb e-learning resources (link on the Kasneb website).
6. Kasneb approved study packs.

ADVANCED LEVEL

ELECTIVE AREAS

ELECTIVE I

PAPER NO.11(E1) BIG DATA MANAGEMENT

UNIT DESCRIPTION

To equip the candidate with the knowledge, skills and attitudes that will enable him/her to understand the role of policy in the Big Data ecosystem and to apply current tools and technologies for managing and processing Big Data within a business environment.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Identify the technological and business needs for Big Data management
- Explore the infrastructure and architectures for Big Data
- Describe the Big Data and Hadoop ecosystem and its management
- Utilise relevant technologies to deploy structured and unstructured data
- Design and manage Big Data storage structures
- Apply data regulatory frameworks and policy trends for Big Data management

CONTENT

1. **Introduction to Big Data**
   - 1.1 Big Data concepts, drivers and techniques
   - 1.2 Trends in Big Data management
   - 1.3 Big Data applications
   - 1.4 Challenges and opportunities for Big Data

2. **Big Data Architectures**
   - 2.1 Relational systems architecture
   - 2.2 Data warehousing architectures
   - 2.3 Service- oriented architecture
   - 2.4 The Lambda architecture

3. **Big Data Acquisition, Cleaning and Storage**
   - 3.1 Big Data gathering
   - 3.2 Big Data filtering and cleaning
   - 3.3 Big Data quality considerations
   - 3.4 Extract Transform Load (ETL)Tools

4. **Big Data Mining and Warehousing**
   - 4.1 Exploration of massive datasets
   - 4.2 Big Data mining
   - 4.3 Volume management
   - 4.4 Velocity management
   - 4.5 Case study in Data Mining and Data Warehousing

5. **Big Data and Hadoop ecosystem**
   - 5.1 Overview and difference between Hadoop and traditional data manage system
   - 5.2 Data Storage: Hadoop Distributed File System (HDFS) and HBASE
   - 5.3 Data processing: MapReduce and YARN
   - 5.4 Data Access: Hive, Pig, Mahout, Avro and Sqoop
   - 5.5 Data Management: Oozie, Flume and Zookeper
   - 5.6 Spark framework
   - 5.7 Big Data exploration and visualization
   - 5.8 Case Study

6. **Pattern Mining over Big Data**
   - 6.1 Candidate generation
   - 6.2 Identification of patterns and growth
   - 6.3 Sequential data
   - 6.4 Temporal data
   - 6.5 Understanding uncertainty in data
   - 6.6 Case study in pattern mining

7. **Big Data Processing Pipelines**
   - 7.1 Pipelining and parallelism
   - 7.2 Big data synchronization
   - 7.3 Multi-tenancy schemes
   - 7.4 Resilient data sets

8. **Big Data Design**
   - 8.1 Schema less database design
   - 8.2 Wide column structures
   - 8.3 Document stores
   - 8.4 NoSQL data stores (Hive, MongoDB)
   - 8.5 Case study in Big Data design

9. **In-memory Data Management**
   - 9.1 Columnar data storage
   - 9.2 Late reconstruction
   - 9.3 Light-weight compression

10. **Distributed Computing**
    - 10.1 Features and reference model
    - 10.2 Capacity requirement for distributed systems
    - 10.3 Concurrency control and mutual exclusion mechanisms
    - 10.4 Security issues for distributed applications
    - 10.5 Integration of distributed applications
    - 10.6 Case study in distributed computing

11. **Big Data Policy Frameworks**
    - 11.1 Policy, Law and Institutions
    - 11.2 Data privacy and protection

11.3 Big Data ethics
11.4 Selected case studies on policies

12. **Deployment of Big Data**
    12.1 Information technology (IT) infrastructures for Big Data
    12.2 Dedicated versus shared resources
    12.3 On-premise versus public cloud services
    12.4 Open-source software versus Proprietary software deployment
    12.5 Selected case studies on Big Data deployment

Sample study and reading material

1. Hu, W.-C. (2013). Big Data Management, Technologies, and Applications: Advances in Data Mining and Database Management. IGI Global.
2. Li, K.-C., Jiang, H., & Zomaya, A. Y. (2017). Big Data Management and Processing . CRC Press.
3. Ghavami, P. (2020). Big Data Management: Data Governance Principles for Big Data Analytics. De Gruyter.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

PAPER NO.12 (E1) BIG DATA ANALYTICS

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to apply relevant Big Data analytical tools and techniques to generate insight from large volumes of data for informed decision making.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Explore the Big Data analytics and machine learning approaches
- Utilize exploratory and predictive data analysis techniques for massive datasets
- Apply Big Data analytics and related technologies and present visual outcomes for decision making
- Deploy applications that leverage Big Data analytics for sustainable impact.
- Evaluate ethical or public policy concerns and emerging issues in Big Data analytics

CONTENT

1. **Introduction to Big Data Analytics**
   - 1.1 Concepts of Big Data analytics
   - 1.2 Artificial intelligence
   - 1.3 Challenges and opportunities
   - 1.4 Applications of Big Data analytics
   - 1.5 Introduction to Python programming language

2. **Mathematics for Big Data Analytics**
   - 2.1 Linear algebra
   - 2.2 Tensor and matrix implementation
   - 2.3 Transposition and matrix multiplication
   - 2.4 Eigenvalue and eigenvector
   - 2.5 Determinant and singular value decomposition
   - 2.6 Probability theory
   - 2.7 Least squares
   - 2.8 Gradient descent implementation
   - 2.9 Implementation with python

3. **Exploration of massive datasets in Python**
   - 3.1 Working with Pandas and Dask
   - 3.2 Predictor and target feature identification
   - 3.3 Techniques for handling missing values, noise and outliers
   - 3.4 Feature engineering (Feature transformation and creation)
   - 3.5 Case study in Data Exploration

4. **Social Networks Analysis in Python**
   - 4.1 Introduction to Graph Theory
   - 4.2 Modelling networks
   - 4.3 Network metrics
   - 4.4 Network library

4.5 Graph databases
4.6 Neo4j
4.7 Case studies in Social Networks Analysis

5. **Machine Learning Pipeline**
   5.1 Big Data collection
   5.2 Big Data pre-processing
   5.3 Feature extraction and selection (labelling and dimensionality reduction)
   5.4 Model validation
   5.5 Data visualization
   5.6 Using Python's NumPy, SciPy, Matplotlib and Scikit-learn

6. **Unsupervised (Clustering) Machine Learning in Python**
   6.1 Dimension reduction techniques
   6.2 K-means clustering
   6.3 K-Nearest Neighbour
   6.4 Hierarchical clustering (Divisive and Agglomerative)
   6.5 Case studies with Python

7. **Supervised (Classification) Machine Learning in Python**
   7.1 Linear regression
   7.2 Logistic regression
   7.3 Decision trees, rules and random forests
   7.4 K-nearest neighbour algorithm
   7.5 Support vector Machines
   7.6 Naive Bayes
   7.7 Linear discriminant analysis
   7.8 Case studies with Python

8. **Associative Rule Mining in Python**
   8.1 Overview of association rule mining
   8.2 A Priori algorithm
   8.3 Evaluation of candidate rules
   8.4 Applications of association rules
   8.5 Validation and testing

9. **Deep learning implementation in Python**
   9.1 Concepts of deep learning
   9.2 Introductions to biological neurons
   9.3 Artificial neural network
   9.4 Network topology
   9.5 Convolutional neural networks and architecture
   9.6 Activation functions
   9.7 Recurrent neural networks
   9.8 Case studies with Python

10. **Natural language processing in Python**
    - 10.1 Sentiment analysis
    - 10.2 Topic modelling
    - 10.3 Text analytics
    - 10.4 Social media analytics
    - 10.5 Recommender systems
    - 10.6 Case studies with Python

11. **Big Data visualization in Python**
    - 11.1 Line plots, bar, pie and donut charts
    - 11.2 Scatter plots and biplots
    - 11.3 Word clouds
    - 11.4 Kernel density estimation and Histogram plots
    - 11.5 Box and whisker plots
    - 11.6 Correlation matrix and heatmaps
    - 11.7 Clustering visualization

12. **The law and ethics in Big Data analytics**
    - 12.1 Principles of data processing
    - 12.2 Professional ethics and legal frameworks for the data profession

Sample reading and reference material

1. Sedkaoui, S. (2018). Data Analytics and Big Data: Information Systems, Web and Pervasive Computing. London: ISTE Ltd.
2. EMC Education Services. (2015). Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data. Indianapolis: Wiley.
3. Ankam, V. (2016). Big Data Analytics. Birmingham: Packt.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

ELECTIVE II

PAPER NO.11 (E2) NETWORKING AND TELECOMMUNICATIONS

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to appy the principles and techniques used in modern network and telecommunications systems.

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Demonstrate understanding of the network layered models, network communication using layered architectural approach distinguish Open Systems Interconnection (OSI) and the Internet Model.
- Apply signal and system analytical tools in both the time and frequency domains
- Convert various analog and digital modulation and demodulation techniques
- Plan, design, implement and test a telecommunication system and use analytical techniques to evaluate the performance of communication systems
- Conduct experiments on actual components, devices, equipment and systems in telecommunication

CONTENT

1. **Introduction to Network and Telecommunication Systems**
   - 1.1 Overview of networks and communication system
   - 1.2 Telecommunication model
   - 1.3 Types of networks
   - 1.4 Modes of data transmission
   - 1.5 Telecommunications information type
   - 1.6 Media performance terminologies
   - 1.7 Noise, effects and types of noise

2. **Fourier Theory and Communication Signals**
   - 2.1 Introduction to Fourier Transform
   - 2.2 Sampling and quantification
   - 2.3 Properties of Fourier Transform
   - 2.4 Discrete-Time Fourier Transform (DTFT)
   - 2.5 Discrete Fourier Transform (DFT)
   - 2.6 Fast Fourier Transform (FFT)
   - 2.7 Inverse Fast Fourier transform (IFTT).

3. **Communication Systems**
   - 3.1 Overview of Nyquist and Shannon Theorems
   - 3.2 Analogue and digital waves
   - 3.3 Waves and waves propagation
   - 3.4 Telephony network
   - 3.5 Public Switched Telephone Network(PSTN)
   - 3.6 Integrated Services Digital Network (ISDN)

4. **Modulation methods for analogue data to digital**
   - 4.1 Introduction to coding and decoding
   - 4.2 Analogue modulation parameters and formulae
   - 4.3 Amplitude Modulation
   - 4.4 Frequency Modulation
   - 4.5 Phase Modulation

5. **Encoding and modulation methods for digital data**
   - 5.1 Data encoding techniques
   - 5.2 Carrier and modulation
   - 5.3 Digital modulation techniques
   - 5.4 Amplitude Shift Keying
   - 5.5 Frequency Shift Keying
   - 5.6 Phase Shift keying

6. **Multiplexers, multiplexing and access techniques**
   - 6.1 Overview of multiplexing, de-multiplexing and types of multiplexers
   - 6.2 Types of analogue multiplexers and techniques
   - 6.3 Types of digital multiplexers and techniques
   - 6.4 Applications of multiplexing
   - 6.5 Cable modem
   - 6.6 Asymmetric Digital Subscriber Line (DSL)
   - 6.7 xDSL
   - 6.8 Multiple Channel Access

7. **Network Access**
   - 7.1 Network media, cabling and standards
   - 7.2 OSI layered Protocol suite and layering
   - 7.3 OSI versus Transmission Control Protocol and the Internet Protocol (TCP/IP) model
   - 7.4 Physical Layer Protocols
   - 7.5 Data Link Layer Protocols
   - 7.6 Media Access Control
   - 7.7 Practical on Straight through and crossover cabling and testing

8. **Fibre-optic Cabling**
   - 8.1 Fibre media cable design
   - 8.2 Types of fibre-optic cables
   - 8.3 Network fibre-optic connectors
   - 8.4 Properties of fibre-optic cabling
   - 8.5 Introduction to fibre-optic multiplexing
   - 8.6 Synchronous Optical Networking (SONET)

9. **Circuit and Packet Switching**
   - 9.1 Introduction to switched communication networks
   - 9.2 Circuit switching techniques
   - 9.3 Packet switching techniques

9.4 Time Division switching
9.5 Frame relay

10. **Asynchronous Transfer Mode (ATM) Networks**
    10.1 Overview of ATM (cell relay) concepts
    10.2 Broadband Integrated Services Digital Network (BISDN) reference model
    10.3 ATM logical connections
    10.4 ATM Cells
    10.5 Private Network-to-Network Interface(PNNI) routing

11. **Wireless Technologies**
    11.1 Types of wireless media
    11.2 WMANs, WLANs, and WPANs
    11.3 Wi-Fi IEEE standards and security
    11.4 Terrestrial microwave and microwave signals
    11.5 Communication satellites
    11.6 Wireless and broadband technologies
    11.7 Install and configure a wireless router

12. **Voice over Internet protocol (VoIP)**
    12.1 Overview of VoIP
    12.2 VoIP Equipment
    12.3 VoIP Architecture
    12.4 VoIP Components

Sample reading and reference material

1. Stallings, W. (2013). Data and Computer Communications (10th edition). Pearson.
2. Gyasi-agyei, A. (2019). Telecommunications Engineering: Principles And Practice . New Jersey: World Scientific.
3. Horak, R. (2008). Telecommunications and Data Communications Handbook (2nd edition). New Jersey: Wiley.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

PAPER NO.12 (E2) INFORMATION SYSTEMS SECURITY

UNIT DESCRIPTION

This paper is intended to equip the candidate with the knowledge, skills and attitude that will enable him/her to manage the information security in an organization

LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Develop Information Systems (IS) security policies for any organization
- Conduct penetration testing to monitor vulnerabilities and threats in IS systems
- Develop suitable countermeasures to protect organization IS
- Design and implement disaster recovery and business continuity planning systems

CONTENT

1. **Overview Information Systems Security**
   - 1.1 Objectives of IS security
   - 1.2 Organizational information assets and classifications
   - 1.3 Threats, vulnerabilities and risks
   - 1.4 Scope of IS security in an organization
   - 1.5 IS security metrics

2. **IS Security Standards and Frameworks**
   - 2.1 IS Security Frameworks
   - 2.2 IS security laws and regulations
   - 2.3 IS security governance

3. **Network and Computer Security**
   - 3.1 Intrusion detection systems
   - 3.2 Intrusion prevention
   - 3.3 Recovery from failures

4. **Data Protection**
   - 4.1 Identifying critical IS assets
   - 4.2 Data loss prevention
   - 4.3 Data privacy
   - 4.4 Local and international laws & regulations

5. **IS Security Controls**
   - 5.1 Management controls
   - 5.2 Operational controls
   - 5.3 Technological controls

6. **IS Security Policies**
   - 6.1 Organizational security policies
   - 6.2 IS security and organizational strategy
   - 6.3 IS security roles and responsibilities
   - 6.4 Evaluation of org IS security
   - 6.5 Developing and implementing an IS security policy

7. **Penetration Testing**
   - 7.1 Penetration testing tools
   - 7.2 Process of penetration testing
   - 7.3 Reporting and communication of results

8. **Designing & Building Secure Systems**
   - 8.1 Architectural risk analysis
   - 8.2 Security requirements
   - 8.3 Embedding an IS security culture in an organization

9. **Business Continuity & Disaster Recovery**
   - 9.1 Incident management
   - 9.2 Business impact analysis
   - 9.3 Business Continuity Planning
   - 9.4 Disaster recovery planning

10. **IS Security Audit**
   - 10.1 Overview of IS security audit
   - 10.2 IS audit tools and techniques
   - 10.3 IS audit process
   - 10.4 IS audit reporting

Sample reading and reference material

1. Andress, J. (2014). The Basics of Information Security: Understanding the Fundamentals of Infosec in Theory and Practice. Syngress.
2. Zhang, N. (2019). Cyber Security: The Beginners Guide to Learning The Basics of Information Security and Modern Cyber Threats. Mentor: Dana Publishing.
3. Zinatullin, L. (2016). The Psychology of Information Security: Resolving Conflicts Between Security Compliance and Human Behaviour. Cambridge: IT Governance Publishing.
4. Kasneb e-learning resources (link on the Kasneb website).
5. Kasneb approved study packs.

PAPER NO. 13: RESEARCH PROJECT

Candidates will be required to identify an ICT Project of their choice that will contribute to addressing practical challenges or opportunities in real life. The proposal will be submitted to Kasneb upon which, after approval, the candidate will progress to undertake the project and thereafter present it before a panel at Kasneb.

The candidate will be required to undertake the project under supervision. For more details on the project guidelines, please refer to our website **www.kasneb.or.ke.**