

DOCTOR OF PHILOSOPHY (PhD) IN INFORMATION SECURITY AND AUDIT

1.0 INTRODUCTION

Data and system security have become critical concerns in nearly every industry and government sector, creating a demand for high-level information security expertise. This Information Security and Audit programme provides opportunities for advanced skill development and doctoral research in information security topics such as information confidentiality, integrity, governance, compliance, audit assurance, and risk management. In the first year students will undertake course works to enable them acquire the necessary theoretical grounding before embarking on independent research in the second year. In the third year, the candidates will get an opportunity to write their thesis. Hence the combination of the Coursework as a practical research training and independent research equip graduates with the requisite theoretical knowledge and skills required of a Doctorates in Information Security and Audit. People who choose this specialization are often pursuing senior leadership, consulting, or faculty positions in information security within military, government, education, and private sectors.

Target Group: those who pursue this doctorate programme are often IT professionals who wish to move into leadership positions. Graduates of doctorate programs in information security might pursue the following careers: Security consultant, Senior security professional, Information Assurance and Auditing, Consultant, Professor, and Senior government security professional.

2. OBJECTIVES

The overall objective of the programme is to produce skilled, motivated and internationally competitive information security and audit graduates to work in academic, private and public informatics sector of the economy. The specific objectives of the programme are:

- a) To develop graduates with the ability to apply information security and audit knowledge, skills, techniques and tools to create best-possible solutions to practical problems of varying complexity, in a wide range of contexts.

- b) To facilitate the acquisition, adoption and adaptation of information security best practices and audit knowledge, techniques and tools to improve organizations' security and performance.
- c) To equip students with specialized, advanced skills and capacity to enable them to pursue careers in research & development, academics, consultancy services and industry.

3. ADMISSION REQUIREMENTS

To qualify for admission into the Doctoral programme, candidates shall be:

- a) Holders of at least a Masters degree from Maseno University, with specialization in Computer Science or related areas.
- b) Holders of relevant Masters degree of any other recognized University.

4. CREDIT TRANSFER

A candidate may be exempted from some course units and credit(s) transferred from institutions recognized by the Senate, subject to the following conditions:

- a) Must have passed in similar course units at PhD level. Request for exemption should be made in writing to the Director, Board of Postgraduate Studies through the Dean of the School of Informatics and Innovative Systems and must be accompanied by officially endorsed supporting documents.
- b) Candidates may be allowed to transfer up to one third (1/3) of the total number of course units.
- c) Application for transfer will be processed only after payment of the prescribed fees.

4. COURSE STRUCTURE AND DURATION

- a) A full-time student for the PhD in Information Security and Audit shall normally be registered for a minimum of three years and maximum of five years. A candidate may be registered as a

part-time student for the Doctoral degree for a minimum of four years and a maximum of seven years. The degree culminates in a dissertation, which is a work of original research that is overseen by an advisory committee.

- b) The Board of Postgraduate Studies (BPS) will review registration from time to time. Continuance of registration will depend on evidence of satisfactory progress.
- c) Courses shall be offered in units. A course unit is defined as that part of a semester subject described by coherent syllabus and taught normally over a period of a semester. It is designated as a total of 42 hours of study in a semester. For this purpose, one 1-hour lecture is equivalent 2-hours tutorial or 3-hours practical or any combination as may be approved by the Board of the School of Informatics and Innovative Systems.
- d) All course units will be taught for a total of 42 contact hours, including examinations except project work which will take 480 hours of practical work and project writing.

5. EXAMINATIONS REGULATIONS

Bondo University College and Maseno University Examinations rules and regulation shall apply.

7. COURSE DISTRIBUTION

A semester shall comprise minimum of four (4) units and a maximum of six (6) units.

To satisfy the breadth requirement of the PhD degree, each student must pass a set of qualifying examinations designed to test a student's fundamental knowledge.

YEAR ONE: SEMESTER ONE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
IIT 6111	Advanced Issues in Information Security	28	14	42	1C
IIT 6112	Secure Software Design and Programming	28	14	42	1C

IIT 6113	Emerging Issues in Cyber Security	28	14	42	1C
IIT 6114	Assurance Controls and Compliance Management	28	14	42	1C
IIT 6115	Organizations Corporate Computer and Network Security	28	14	42	1C
IIT 6116	Research Design	28	14	42	1C
Total		168	84	252	6

YEAR ONE: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
IIT 6121	Database and Distributed Systems Security	28	14	42	1C
IIT 6122	Advanced Risk Management in Information Assurance and Security	28	14	42	1C
IIT 6123	Information Security and Outsourcing Computer Systems	28	14	42	1C
IIT 6124	Security Audit and Compliance Testing	28	14	42	1C
IIT 6125	Disaster Recovery and Contingency Planning for the Security Professional	28	14	42	1C
IIT 6126	Information Technology Research and Practice	28	14	42	1C
Total		168	84	252	6

YEAR TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
IIT 6211	Independent Research	0			3C

YEAR THREE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
IIT 6311	Project	0			3C

8. COURSE DESCRIPTION

YEAR ONE: SEMESTER ONE

IIT 6111 Advanced Issues in Information Security (42 hrs)

Policies, models, and mechanisms for secrecy, integrity, and availability. Operating system models and mechanisms for mandatory and discretionary controls, data models, concepts and mechanisms for database security, basic cryptography and its applications, security in computer networks and distributed systems, controlling and preventing viruses and other rogue programs. Authentication, access control, non-repudiation; and their integration in network protocols. Key management, cryptographic protocols and their analysis. Access control, delegation and revocation in distributed systems. Security architectures, multilevel systems, and security management and monitoring.

IIT 6112 Secure Software Design and Programming (42 hrs)

Theory and practice of software security, Common software security risks: buffer overflows, race conditions and random number generation, identification of potential threats and vulnerabilities early in the design cycle. The emphasis is on methodologies and tools for identifying and eliminating security vulnerabilities, techniques to prove the absence of vulnerabilities, and ways to avoid security holes in new software and on essential guidelines for building secure software: how to design software with security in mind from the ground up and to integrate analysis and risk management throughout the software life cycle.

IIT 6113 Emerging Issues in Cyber Security (42 hrs)

This seminar course provides a student team-based learning experience based on topics selected by leading experts in the area of applications of Information Security Concepts in the real-world scenarios. The (five to six) invited lecturers will lead a discussion followed by two days of project work after each lecture. Case studies: teams of students will be assigned to discuss different applications of the concept of discussion. Students develop the critical skills of applying security concepts and analysis to real world scenarios.

IIT 6114 Assurance Controls and Compliance Management (42 hrs)

Overview of management processes and organizational controls required for data protection: Review of national, and other governmental and industry standards companies required to be compliant in safeguarding data. Analyze the depth and breadth of compliance management research, investigation of different approaches to data protection control and compliance.

IIT 6115 Organizations Corporate Computer and Network Security (42 hrs)

Critical security concepts that organizational executives need to understand. Vulnerabilities: sabotage, financial fraud, electronic attacks, blended attacks, and other malicious activity, Counter terrorism; Development policy to minimize attacks. Countermeasures: access controls and biometrics, and finally to develop a security plan to protect the organization.

IIT 6126 Research Design (42 hrs)

Interpretation and application of quantitative, qualitative, and mixed methods research. Formal research process: practical applications and skill development. Critical concepts and principles intrinsic to research paradigms, study designs, and methods of inquiry: research formulation, and research questions interpretation.

YEAR ONE: SEMESTER TWO

IIT 6121 Database and Distributed Systems Security (42 hrs)

capabilities in various organizations. Demonstration and understanding of the principles of disaster recovery planning for physical security consideration, host applications, and network security measures.

IIT 6126 Information Technology Research and Practice (42 hrs)

Overview of technical foundations of information technology research and practice. Examine current and emerging research and practice technologies, processes, and methods; compare quantitative and qualitative methodologies; and identify the research methodologies commonly used in IT research. Identify and develop a research topic, define a research problem, describe the purpose of the research study, and establish associated research question(s). Preparation of Topic Paper and a preliminary annotated bibliography for the dissertation topics.

YEAR TWO

IIT 6211 Independent Research (960hrs)

The student selects a research topic and conducts a literature review in relation to the topic.

YEAR THREE

IIT 6311 Project (1440hrs)