MASTER OF SCIENCE (INFORMATION SECURITY)

PROGRAMME SPECIFICATIONS

The Master of Science (Information Security) is offered on a full-time basis. The full-time mode is offered only at the UTM main campus in Johor Bahru. The duration of study for the full-time programme is 3 semesters (1.5 years), subjected to the student's entry qualifications with total number of credits is 45.

This programme bridges the gap between those information security aspects with the real world requirements. The aim of this programme is to support the global need in producing professional, dedicated and ethical information security experts who will effectively plan, design, manage and practice reliable information security mechanisms and technologies. The programme is designed based on CISSP (Certified Information Systems Security Professional) standards.

General Information

<table>
<tr><td colspan="2">1. Awarding Institution</td><td colspan="3">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="2">2. Teaching Institution</td><td colspan="3">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="2">3. Programme Name</td><td colspan="3">Master of Science (Information Security)</td></tr>
<tr><td colspan="2">4. Final Award</td><td colspan="3">Master of Science (Information Security)</td></tr>
<tr><td colspan="2">5. Programme Code</td><td colspan="3">MCSHA1AJA</td></tr>
<tr><td colspan="2">6. Professional or Statutory Body of Accreditation</td><td colspan="3">Ministry of Higher Education</td></tr>
<tr><td colspan="2">7. Language(s) of Instruction</td><td colspan="3">English</td></tr>
<tr><td colspan="2">8. Mode of Study (Conventional, distance learning, etc)</td><td colspan="3">Conventional</td></tr>
<tr><td colspan="2">9. Mode of operation (Franchise, self-govern, etc)</td><td colspan="3">Self-governing</td></tr>
<tr><td colspan="2">10. Study Scheme (Full Time/Part Time)</td><td colspan="3">Full Time/</td></tr>
<tr><td colspan="2">11. Study Duration</td><td colspan="3">Full Time
Minimum : 1.5 yrs (3 sems)
Maximum : 4 yrs (8 sems)</td></tr>
<tr><td rowspan="2">Type of Semester</td><td colspan="2">No. of Minimum Semesters</td><td colspan="2">No. of Weeks/Semester</td></tr>
<tr><td>Full Time</td><td>Part Time</td><td>Full Time</td><td>Part Time</td></tr>
<tr><td>Normal</td><td>3</td><td>-</td><td>8</td><td>-</td></tr>
<tr><td>Short</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
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Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Common Elective Course	3	6%
ii.	Core Faculty Course	3	6%
iii.	Core Courses	18	41%
iv.	Elective Courses	9	20%
v.	Project (1 and 2)	12	27%
	Total	**45**	**100%**
Total Credit Hours to Graduate		**45 credit hours**	

COURSE MENU

Pre Requisite Courses	
MCSS 0023	Computer System & Communication
MCSM 0133	Database

University Common Elective Courses (Choose 1 Only)	
UHAP 6013	Seminar on Global Development, Economic & Social Issues
ULAM 6013	Malay Language for Academic Writing
UICW 6023	Philosophy of Science and Civilization
UHAZ 6123	Malaysian Society & Culture
UCSM 1263	IT Project Management
Core Faculty Courses (Compulsory)	
MCSH 1443	Research Methodology
MCSH 2070	Information Security Seminar (HW)
Core Courses (Compulsory)	
MCSH 1413	Cryptography
MCSH 1433	Information Security Management System
MCSH 1493	Law, Investigation & Ethics
MCSH 2443	Network & Internet Security
MCSH 2453	Security Architecture & Model
MCSH 2493	Secure Software Development
Elective Courses (Choose 3 only)	
MCSH 2413	Security Audit & Assessment
MCSH 2423	Advanced Cryptography
MCSH 2433	Database Security
MCSH 2463	Wireless Security
MCSH 2473	Multimedia Security and Information Hiding
MCSH 2483	Business Continuity Planning
MCSH 2513	Penetration Testing

MCSH 2523	OS Exploitation
MCSH 2533	Malware Analysis
Project (Compulsory)	
MCSU 1015	Project 1
MCSU 2027	Project 2

Programme Structure (Full Time)

SYLLABUS	SEMESTER 1	SEMESTER 2	SEMESTER 3	TOTAL CREDIT
University Common Elective Courses			**(Choose 1)** UHAP 6013 UICW 6023 UHAZ 6123 ULAM 6013 UCSM 1263	**3**
Core Faculty Courses	MCSH 1443	MCSH 2070		**3**
Core Courses	MCSH 1413 MCSH 1433 MCSH 1493 MCSH 2443	MCSH 2493 MCSH 2453		**18**
Elective Courses		**(Choose 2)** MCSH 2433 MCSH 2423 MCSH 2463 MCSH 2473 MCSH 2413 MCSH 2513 MCSH 2523 MCSH 2533 MCSH 2483	**(Choose 1)** MCSH 2433 MCSH 2423 MCSH 2463 MCSH 2473 MCSH 2413 MCSH 2513 MCSH 2523 MCSH 2533 MCSH 2483	**9**
Project 1		MCSU 1015		**5**
Project 2			MCSU 2027	**7**
Total Credit	**15**	**17**	**13**	**45**

Programme Educational Objectives (PEO)
After having exposed to 3 to 5 years working experience, our graduates should become professionals who demonstrate the following competencies:

Code	Intended Educational Objectives
PEO1	To produce graduates who are able to plan and design an appropriate information security policy and services for an organization
PEO2	To produce graduates who are able to provide and implement an effective information security mechanism for organizations using up-to-date tools and technology
PEO3	To produce graduates who are able to generate new knowledge, idea and technique in information security
PEO4	To produce graduates who are able to consistently perform their responsibilities ethically and professionally

Programme Learning Outcomes (PLO)
After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Possess detail and in-depth knowledge on theory and professional skills of information security (*Advanced Knowledge*)
PLO2	Ability to formulate, design and apply appropriate scientific research methods, techniques and tools as new solutions for information (*Research Skills*)
PLO3	Ability to demonstrate critical thinking for effective and creative problem solving by implementing information security knowledge and skills (*Critical Thinking and Problem Solving*)
PLO4	Posses true integrity values that is consistent with the code of professional ethics and responsibility (*Ethics, Morale value, Professionalism*)
PLO5	Ability to fluently and effectively communicate ideas and knowledge within a wide range of audience (*Communications*)
PLO6	Ability to perform independent studies and adapt readily to new information security knowledge and skills (*Life Long Learning*)
PLO7	Ability to relate the impacts of research outcomes on professional practices in information security (*Social Skills*)
PLO8	Ability to manage and conduct cooperative team working in handling information security studies (*Team Working*)

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

***Please attach a copy of results for previous semesters and a copy of registration slip for current semester.**				
Courses		**Credit**	**Grade**	**Pass**
Pre Requisite Courses				
MCSS 0023	Computer System & Communication Network	3		
MCSM 0133	Database	3		
University Common Elective Courses (Choose 1 only)				
UHAP 6013	Seminar on Global Development, Economic & Social Issues	3		
ULAM 6013	Malay Language for Academic Writing	3		
UCSM 1263	IT Project Management	3		
UICW 6023	Philosophy of Science and Civilization	3		
UHAZ 6123	Malaysian Society & Culture	3		
Core Faculty Courses				
MCSH 1443	Research Methodology	3		
MCSH 2070 (HW)	Seminar in Information Security	0		
Core Courses				
MCSH 1413	Cryptography	3		
MCSH 1433	Information Security Management System	3		
MCSH 1493	Law, Investigation and Ethics	3		
MCSH 2443	Network & Internet Security	3		
MCSH 2453	Security Architecture & Models	3		
MCSH 2493	Secure Software Development	3		
Elective Courses				
MCSH 2413	Security Audit & Assessment	3		
MCSH 2423	Advanced Cryptography	3		
MCSH 2433	Database Security	3		
MCSH 2463	Wireless Security	3		

MCSH 2473	Multimedia Security and Information Hiding	3		
MCSH 2483	Business Continuity Planning	3		
MCSH 2513	Penetration Testing	3		
MCSH 2523	OS Exploitation	3		
MCSH 2533	Malware Analysis	3		
Projects				
MCSU 1015	Project 1	5		
MCSU 2027	Project 2	7		
	TOTAL CREDITS:			

CAREER OPPORTUNITIES

Security Officer/Manager, Security Analyst, Security Engineer, Security Penetration Tester, Web Security Manager, Cyber Security Expert, Digital Forensic Expert.

COURSE SYNOPSIS

PRE REQUISITE COURSES (For non-computer science students)

MCSS 0023 – Computer System & Communication
This course covers how application programs communicate independently with their physical network connections. In short, it addresses the internetworking between software and network devices. The main protocol of internetworking, which is TCP/IP that contains Transmission Control Protocol (TCP) and Internet Protocol (IP) will be detailed out. Other related network protocols are also will be covered.

MCSM 0133 – Database
It covers knowledge on how a collection of information is organized so that it can be easily accessed, managed and updated. Computer databases typically contain aggregations of data records or files, containing information about sales transactions or interactions with specific customers. This course includes the types of databases, their models and other issues related to current design and applications.

CORE FACULTY COURSES

MCSH 1443 – Research Methodology
This course will cover the fundamental steps and implementation on developing the initial ideas to formal academic writing accordingly. Students will be given the mechanisms on how to transform and digest the literature reviews that leads to the proposed title. The theoretical and practical aspects of implementing draft project proposal will be the milestone of this course.

MCSH 2070 (HW) – Seminar in Information Security
This course is designed to expose students with the industries and research experience related to information security. A seminar may be conducted that involved panel from industries and other universities. Expectation from this subject can be a research paper or report with oral presentation.

CORE COURSES

MCSH 1413 – Cryptography
Cryptography addresses the principles, means, and methods of disguising information to ensure its integrity, confidentiality and authenticity. This subject provides the background for the application and implementation of security mechanisms covered in the other courses. It deals with both theoretical and practical aspects of cryptography, to give an insight to the problems that arise in cryptography and the tools used to solve them. It introduces both symmetric key cipher system and public key cryptography, covering methods of obtaining the objectives of CIA (confidentiality, integrity and authenticity).

MCSH 1433 – Information Security Management System

The course is aimed at imparting knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an enterprise information system. It focuses on:

- Cyber security management
- Physical security management
- Operational security management
- Current security standards

MCSH 1493 – Law, Investigation and Ethics

This course takes a detailed approach to the use of computers and computer technology in the investigation of incidents, both criminal and civil, in which computer technology play a significant or interesting role. Students completing this course will be familiar with the core computer science theory and practical skills necessary to perform elementary computer forensic investigations, understand the role of technology in investigating computer based crime, and be prepared to deal with investigative bodies at an elementary level.

MCSH 2443 – Network and Internet Security

This course will discuss issues pertaining to computer, network and internet system security. Emphasis is given on the fundamental knowledge as well as hands on practice. Topics covered include fundamental of security and attackers, authentication, cryptography, access control, network security and web security. Topic such as public key infrastructure, security management and computer forensics will be also introduced.

MCSH 2453 – Security Architecture and Model

This subject contains the concepts, principles, structures and standards used to design, monitor, and secure operating systems, equipment, networks, applications and those controls used to enforce various levels of availability, integrity, and confidentiality. This process starts with defining the proper security requirements (policy) which will be formalized by the security models. The main security features and mechanisms in operating systems, security issues of computer architecture as well as software protection and computer viruses will also be discussed.

MCSH 2493 – Secure Software Development

This course provides the principles of Secure Software Engineering and practical methods to secure requirements, Design, Implementation, Testing, Deployment and Maintenance your software development. The students will understand how to establish secure software development life cycle processes and how to assess security requirements for software development. The students will also be able to understand software vulnerability, and how to evaluate, and address security risks to software.

ELECTIVE COURSES

MCSH 2413 – Security Audit & Assessment

This course covers the technical concepts and management practices of information systems audit and assessment associated with information technology. It also covers different types of security management based on current standard and policy, the existing application controls, evidence collection and evaluation techniques used for information systems auditing.

MCSH 2423 - Advanced Cryptography

This course follows on from the introductory cryptography and provides the basic mathematical background to cryptography. The emphasis of the module is very much focused on the most widely used cryptographic processes, analysis and algorithms.

MCSH 2433 - Database Security

This course aims to put the role of security into perspective and demonstrate how it forms part of a security system within a database. The aim is to illustrate, usually by the use of system development, how a particular situation may make certain aspects of security important and how an entire system might fit together.

MCSH 2463 - Wireless Security

This course focuses on various aspects of wireless network security. It examines security mechanisms implemented in IEEE 802.11 wireless local area networks (WLANs), mobile ad hoc networks (MANETs), wireless sensor networks (WSNs), vehicular ad hoc networks (VANETs), Wireless personal area network (WPAN), wireless metropolitan area networks (WMANs), wireless mesh networks (WMNs), and 3G/B3G/4G. It applies relevant theoretical models and empirical study of wireless security status and deployment policies in organizations.

MCSH 2473 - Multi Media Security and Information Hiding

This course takes a detailed overview of Multimedia Security and its components which is multimedia authentication, copyright protection and theoretical information hiding capacity. Students completing this course will be familiar with the core multimedia security theory and practical skills necessary to perform applications such as authentication, copyright protection etc., understand the role of technology in information hiding which is steganography and watermarking.

MCSH 2483 - Business Continuity Planning

The course is aimed at imparting knowledge and skill sets required to prepare to respond to a disaster and restore normal operations afterward. This subject covers issues related to administration and management of disaster recovery program. The important plan for disaster recovery includes the contingency plans: i) the Incident Response Planning (IRP), ii) Disaster Recovery Planning (DRP), iii) Business Impact Analysis (BIA) and iv) Business Continuity

Planning (BCP). Topics include preparing to develop disaster recovery plan, assessing risk, prioritizing system and functions for recovery, developing plans and procedure and organizational relationships in disaster recovery. The subject will study in detail principles and tools related to these topics. The subject will also cover procedures to response to attacks on computer, implementing disaster recovery plans, testing and rehearsal, assessment of needs, threats and solutions and living through a disaster.

MCSH 2513 - Penetration Testing

This course will discuss issues pertaining to penetration testing, finding vulnerabilities in various computer systems and exploiting them in an ethical manner. Emphasis is given on the fundamental theory and as well as hands on practice. Topics covered include information reconnaissance, web application pentesting, wireless pentesting, network pentesting, and mobile application pentesting.

MCSH 2523 - OS Exploitation

This course will discuss issues pertaining to OS exploitation, finding vulnerabilities in various computer programs and exploiting them in an ethical manner. Emphasis is given on the fundamental theory and as well as hands on practice. Topics covered include vulnerability discovery, stack overflow exploitation, format string exploitation, head overflow exploitation, shellcoding, and intro to kernel exploitation.

MCSH 2533 - Malware Analysis

This course will discuss issues pertaining to analysis of malicious software code. Emphasis is given on the fundamental theory and as well as hands on practice. Topics covered include static analysis, dynamic analysis, defensive mechanism of malware, and some topics on malware research.

PROJECTS

MCSU 1015 - Project 1

This is the initial part of a 2-parts Master project that every student must fulfil successfully. Students are required to propose a suitable research topic under the supervision of a lecturer as a supervisor. Students must meet regularly with supervisor who will monitor their continuous progress. At the end of this course, students are required to prepare a report to be evaluated and present their proposal.

MCSU 2027 - Project 2

This is the second part of a 2-parts Master project that every student must fulfil successfully. Students are required to execute the next phases of their development plan in Project 1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated the project following software development and research testing practices. Students must meet

regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report to be evaluated and present their final work. The corrected report will be printed as a Master's thesis.

UNIVERSITY COMMON COURSES (CHOOSE 1 ONLY)

UHAP 6013 - Seminar on Global Development, Economic and Social Issues
Discussion on this subject includes issues related to globalization and development, economic and social crisis that has become a global concern. It aims in developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in details.

ULAM 6013 - Malay Language for Academic Writing
In this course students are exposed to the writing of scientific papers. They will also be taught about the method of scientific writers especially the procedure of writing paragraphs. There they will be exposed to scientific writing. In addition, writing formats such as quotes, bibliographies and edits are explained in accordance with UTM's scientific writing format.

UICW 6023 – Philosophy of Science and Civilization
This course is offered to international students in advanced scholar and doctoral programs from Malay societies such as Indonesia, Brunei, South Thailand and Malay-Singapore. This course contains two sections. This subject discusses the world view of its role and importance in shaping the culture of life and civilization; The concepts of revelation, science, humanity, nature and happiness; and Comparative Studies in the Philosophy of Science: Epistemology, Ontology and Axiology in Education. Discussions on current issues and challenges, among others; the challenge of civilization between the West and the East; Development and the environment; Economy and trade; National administration and management; Scientific research; Communication and information technology; Ethics and morals; Crime and violence; and Family education.

UHAZ 6123 - Malaysian Society and Culture
This course is designed for international postgraduates from countries of non-Malay origins. Students will be exposed to various aspects of the Malaysian culture such as belief system, religious festivals, customs and etiquettes of different ethnic groups in Malaysia. Emphasis will be given to the Malay culture as it makes the core for the *Dasar Kebudayaan Kebangsaan*. Students will also be briefly introduced to basics of Malay language as the national language of Malaysia.

UCSM 1263 - IT Project Management
This course presents a hands-on perspective to Information Technology project management in an organization. This subject will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into

three main sections, which covers 1) Basic concepts, life cycle and framework of project management; 2) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications and 3) other project management methodologies such as Prince II, Adaptive and Extreme Project Management. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risk and procurement management.