



BACHELOR OF COMPUTER SCIENCE (NETWORKING)



BACHELOR OF COMPUTER SCIENCE (COMPUTER NETWORKS & SECURITY ENGINEERING) PROGRAMME SPECIFICATIONS

The Bachelor of Computer Science (Computer Networks & Security) is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru and is based on a 2-Semester per academic session.

The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Bachelor of Computer Science (Computer Networks & Security)
4. Final Award	Bachelor of Computer Science (Computer Networks & Security)
5. Programme Code	TC27 (SCSR)
6. Professional or Statutory Body of Accreditation	Ministry of Higher Education
7. Language(s) of Instruction	English
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise, self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time

11. Study Duration		Minimum: 4 years (8 semesters) Maximum : 6 years (12 Semesters)		
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short		-		-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Co-Curriculum d. IT Entrepreneurship	10 8 3 2	17.6%
ii.	Core Courses	74	56.5%
iii.	Elective Courses	34	25.9%
	Total	131	100%
Total Credit Hours to Graduate		131 credit hours	

Award Requirements

To graduate, students must:

- Achieve a total of 131 credit hours with minimum CPA of 2.0
- Pass industrial training (equivalent to 12 credit hours), which 4 credits will be graded and 8 credits as HW (Compulsory Attendance) status.
- Complete Computer Networks & Security Final Year Projects.
- Pass 5 Professional Skills Certificate (PSC).

Entry Requirements

Applicants must fulfill the general requirements set by the university as well as specific requirements of the programme. The minimum qualifications for candidates who intend to do a Bachelor of Computer Science (Computer Networks & Security) are as follows:

University General Requirements

- i. Passed and obtained good results in the Malaysian Certificate Examination (SPM) or its equivalent.
- ii. Passed Bahasa Melayu/Bahasa Malaysia with credit in the SPM/equivalent; AND
- iii. Passed the Malaysian University English Test (MUET) with minimum result of Band 1.

AND

Passed the Malaysian High School Certificate (STPM) or its equivalent and obtained the following:

- a) Grade C (CGPA 2.00) General paper, and
- b) Grade C (CGPA 2.00) in TWO (2) other subjects

OR

Passed Matriculation/Asasi Sains UM/Asasi UiTM/IPTS Foundation with minimum CGPA of 2.00.

OR

Obtained a Diploma in Computer Science from UTM/equivalent.

Special Requirements for the Programme

1) Minimum results based on **the Malaysian High School Certificate (STPM)**

- iii. Passed STPM with minimum CGPA of 2.80; AND
- iv. Passed with a minimum Grade B- (CGPA 2.67) in TWO (2) of

the following subjects:

- a) Mathematics T / Further Mathematics / Information and Communications Technology; AND
- b) Any TWO (2) of the following subjects: Physics/ Chemistry/ Biology; AND
- v. Passed Mathematics with credits in the SPM / equivalent examination; AND
- vi. Passed the Malaysian University English Test (MUET) with minimum result of Band 2.

2) Minimum requirements for **Matriculation Certificates (KPM) / Asasi Sains UM / Asasi UiTM / IPTS foundation**

- i. Passed Matriculation/Foundation with minimum CGPA of 2.80; AND
- ii. Passed with a Grade B- (2.67) in the following subjects:
 - a) Mathematics AND
 - b) Any TWO (2): Physics / Engineering Physics / Biology / Engineering Chemistry / Chemistry / Computer Science; AND
- iii. Passed with credits (minimum C) in Mathematics and/or Biology in the SPM examination; AND
- iv. Passed the Malaysian University English Test (MUET) with minimum result of Band 2.

3) Minimum qualifications for students with **Certificates/Diplomas**

- i. Obtained a Diploma in Computer Science from UTM/equivalent with a minimum CPA of 3.00; or for candidates with a CPA below 3.00 but have a minimum of two or more years of working experience in the related area of study will be eligible to apply for a place to study at the university.
- ii. Obtained a credit pass in Mathematics in their SPM/equivalent examination or a minimum grade B- in any of the Mathematics Courses taken at the diploma level.
- iii. Candidates are required to submit the results transcript of all their examinations taken during their Diploma study (semester one until the final semester) to UTM. A copy of the diploma or a letter of completion of study will also have to be

- submitted together with their applications.
- iv. Passed the Malaysian University English Test (MUET) with minimum result of Band 2.

Note :-

Year of entry and duration of study will be based on the credit exemptions and credit transfer awarded by the university.

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	Obtain employment in local and global industries and organization, where they are competent in applying the fundamental knowledge computational principles and skills in computer network and security areas.
PEO2	Demonstrate the ability to learn and grow throughout their career and further contribute to the advancement of the computer network and security discipline.
PEO3	Develop software of increasing size and complexity, proficiently applying computer network and security theoretical knowledge across different application.
PEO4	Become leaders or technopreneurs in computer science discipline.
PEO5	Demonstrate professional ethics awareness as well as social responsibility as a computer scientist specializing in networking and computer security.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Intended Learning Outcomes
PLO1	Ability to acquire theory and principles of Computer Science and equip with social science and personal development knowledge.
PLO2	Ability to exhibit technical competencies in configuring, analysing, designing and developing computer network and security system using standard approaches.
PLO3	Ability to creatively solve real world computer network and security problems through Computer Science principles using current tools and techniques.
PLO4	Ability to present technical solutions to a range of audience.
PLO5	Ability to think critically and creatively in order to solve problems.
PLO6	Ability to continuously integrate computer science knowledge and skills through lifelong learning process.
PLO7	Ability to lead and work effectively in a team to achieve common goals.
PLO8	Ability to adapt and work effectively in varying cultures of communities, professional fields and environments.
PLO9	Ability to behave ethically, responsibly, and professionally with integrity in carrying out responsibilities and making decisions.
PLO10	Ability to identify business opportunities and develop entrepreneurship mind-set and skills.

UTM PROFESSIONAL SKILLS CERTIFICATE (PSC)

Students are required to enrol and pass all certificate programmes offered by the Centres of Excellence in the University and the School of Professional and Continuing Education (SPACE) during semester breaks

1. How to Get Yourself Employed (HTGYE)
2. ISO 9001: 2008 Quality Management System Requirement (ISO)

3. Occupational Safety and Health Awareness (OSHA)
4. How to Manage Your Personal Finance (HTMYPF)
5. Test of English Communication Skills for Graduating Students (TECS):
 - (i) TECS 1001 (Paper I – Oral Interaction)
 - (ii) TECS 1002 (Paper II - Writing)

COURSE MENU

YEAR 1: SEMESTER 1			
Code	Course	Credit	Pre-requisite
SCSI1013	Discrete Structure	3	
SCSJ1013	Programming Technique I	3	
SCSR1013	Digital Logic	3	
SCSP1513	Technology & Information System	3	
UHAK1012	Graduate Success Attributes	2	
UHAS1172	*Malaysia Dynamic	2	
UHAK1022	**Malaysian Studies 3		
UICI1012	*Islamic and Asian Civilization (TITAS)	2	
ULAM1012	**Malaysia Language for Communication		
	TOTAL CREDIT	18	
	CUMULATIVE CREDITS	18	

* For Malaysian students

** For International students

YEAR 1: SEMESTER 2			
Code	Course	Credit	Pre-requisite
SCSI1113	Computational Mathematics	3	
SCSI1143	Probability & Statistical Data Analysis	3	
SCSJ1023	Programming Technique II	3	SCSJ1013
SCSR1033	Computer Organisation and Architecture	3	SCSR1013
UICL2302	The Thought of Sciences and Technology	2	
ULAB1122	Academic English Skills	2	
UKQXxxx2	Co-curriculum	2	
	TOTAL CREDIT	18	
	CUMULATIVE CREDITS	36	

YEAR 2: SEMESTER 1			
Code	Course	Credit	Pre-requisite
SCSR1213	Network Communications (CCNA1)	3	
SCSD2523	Database	3	
SCSD2613	System Analysis and Design	3	
SCSJ2013	Data Structure and Algorithm	3	SCSJ1023
SCSV2113	Human Computer Interaction	3	
SCSR3413	Computer Security	3	
	TOTAL CREDIT	18	
	CUMULATIVE CREDITS	54	

YEAR 2: SEMESTER 2			
Code	Course	Credit	Pre-requisite
SCSV1223	Web Programming	3	SCSD2523
SCSJ2033	Software Engineering	3	
SCSJ2154	Object Oriented Programming	4	SCSJ1023
SCSR2043	Operating Systems	3	SCSR2033
SCSR2242	Computer Networks	2	SCSR1213
SCSR2942	Computer Networks Lab (CCNA2)	1	
ULAB2122	Advanced Academic English Skills	2	ULAB1122
	TOTAL CREDIT	18	
	CUMULATIVE CREDITS	72	

YEAR 3: SEMESTER 1			
Code	Course	Credit	Pre-requisite
SCSJ3553	Artificial Intelligence	3	SCSJ2013
SCSR3104	Applications Development (CAPSTONE PROJECT)	4	SCSV1223, SCSD2613, SCSJ2033
SCSR3242	Inter-Networking Technology (CCNA 3&4)	2	SCSR2242
SCSR3941	Inter-Networking Technology Lab	1	SCSR2941
SCSR3443	Introduction to Cryptography	3	SCSR2043
ULAB3162	English for Professional Purpose	2	ULAB2122
ULAx1122	Foreign Language Elective	2	
UKQE3001	Extracurricular Experiential Learning	1	
	TOTAL CREDIT	18	
	CUMULATIVE CREDITS	90	

YEAR 3: SEMESTER 2			
Code	Course	Credit	Pre-requisite
SCSJ3203	Theory of Computer Science	3	SCSI1013, SCSJ2013
SCSR3032	Computer Networks & Security Project I	2	SCSR3104
SCSD3761	Technopreneurship Seminar	1	
UHAK1032	Introduction to Entrepreneurship	2	
	<i>Programme Elective Courses - Choose 3</i>	3	
		3	
		3	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	107	

YEAR 4: SEMESTER 1			
Code	Course	Credit	Pre-requisite
SCSJ4118	Industrial Training (HW)	8	92 credits
SCSJ4114	Industrial Training Report	4	CGPA >= 2.0
	TOTAL CREDIT	12	
	CUMULATIVE CREDITS	119	

YEAR 4: SEMESTER 2			
Code	Course	Credit	Pre-requisite
SCSR4134	Computer Networks & Security Project II	4	SCSR3032
UICL 2xx2	Enrichment of Knowledge Elective	2	
	<i>Programme Elective Courses - Choose 2</i>	3 3	SCSJ2203
	TOTAL CREDIT	12	
	CUMULATIVE CREDITS	131	

SCSR Elective Courses

SCSR 3223 High Performance & Parallel Programming
 SCSR 3253 Network Programming
 SCSR 3263 Wireless Sensor Network
 SCSR 4283 Network Analysis & Design Simulation
 SCSR 4433 Penetration Testing
 SCSR 4453 Network Security
 SCSR 4473 Security Management
 SCSR 4483 Security Programming
 SCSR 4493 Computer Forensic
 SCSR 4973 Special Topics on Network & Security

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in the course menu including the 5 compulsory Professional Skills Courses. 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.

COURSE SYNOPSIS

CORE COURSES

SCSI1013 Discrete Structure

This course introduces students to the principles and applications of discrete structure in the field of computer science. The topics that are covered in this course are set theory, proof techniques, relations, functions, recurrence relations, counting methods, graph theory, trees and finite automata. At the end of the course, the students should be able to use set theory, relations and functions to solve computer science problems, analyze and solve problems using recurrence relations and counting methods, apply graph theory and trees in real world problems and use deterministic finite automata finite state machines to model electronic devices and problems.

SCSJ1013 Programming Technique I

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types.

SCSR1013 Digital Logic

Digital electronics is the foundation of all microprocessor-based systems found in computers, robots, automobiles, and industrial control systems. This course introduces the students to digital electronics and provides a broad overview of many important concepts, components, and tools. Students will get up-to-date coverage of digital fundamentals-from basic concepts to programmable logic devices. Laboratory experiments provide hands-on experience with the simulator software, actual devices and circuits studied in the classroom.

SCSP1513 Technology & Information System

As a primer subject, this course will introduce students to information systems and technology (IS/IT), as well as its uses in daily life both at home and at work. Various aspects of IS/IT encompassing hardware, software, network, communications, internet, multimedia, graphics and systems applications will be introduced. Students will be equipped with basic skills in handling PC installation and productivity tools via practical work in the labs, which shall comprise a major part of the study. At the end of the course, student should be able to distinguish basic IS/IT component and applications.

SCSI1113 Computational Mathematics

This course is a combination of linear algebra and numerical methods as preparation for computer science student to apply mathematics knowledge in core knowledge of computer science. The first part of this course is an introduction to linear algebra. The topics that are covered in linear algebra are linear equations, linear combinations, linear independence, linear transformation, and vector spaces. The second part of this course covers numerical methods that can be used to solve non-linear equation, linear systems, eigenvalue problems, interpolation, differentiation and integration. At the end of the course, students should be able to apply mathematics knowledge to solve mathematical problems. Implementation of engineering tools such as MATLAB, would enhance student to use simple programming technique for solving mathematical problems.

SCSI1143 Probability & Statistical Data Analysis

This course is designed to introduce some statistical techniques as tools to analyse the data. In the beginning the students will be exposed with various forms of data. The data represented by the different types of variables are derived from different sources; daily and industrial activities. The analysis begins with the data representation visually. The course will also explore some methods of parameter estimation from different distributions. Further data analysis is conducted by introducing the hypothesis testing. Some models are employed to fit groups of data. At the end of course the students should be able to apply some statistical models in analysing data using available software.

SCSJ1023 Programming Technique II

Pre-requisite : SCSJ1013 Programming Technique I

This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.

SCSR1033 Computer Organisation and Architecture

Pre-requisite : SCSR1013 Digital Logic

This course was designed to give the understanding of basic concept of computer organization and architecture. Topics covered in this subject will be on computer performance, types of data and the representative, arithmetic manipulation, instruction execution, micro programmable control memory, pipelining, memory, input/output and instruction format. At the end of this course, the student should be able to understand the concept of overall computer component and realize the current technology in computer hardware.

SCSD2523 Database

This course introduces students to the concept of database system and how it is used in daily human life and profession. The focus of the course is to equip students with the knowledge and skills on important steps and techniques used in developing a database, especially in the conceptual and logical database design phase. Among topics covered are database environment, database design, entity relationship diagram, normalization, and structured query language (SQL). Students will be taught to use a database management system (DBMS). Students are required to design and develop the database component of an information system using the learned techniques, DBMS and a development tool. At the end of the course, students should be able to apply the knowledge of designing and

developing a good database system.

SCSD2613 System Analysis and Design

The main focus of this course is to provide a practical approach of systems analysis and designing skills for the students using structured methodology. Hence the course enables students to study information system requirements for any system application within an organizational context. The contents are sequentially organized directly from planning, analysis, designing and implementation phases. From the resulting output of the planning and analysis phase shall enable students to form input, output and interface design. Hence a prototype design can be demonstrated.

SCSJ2013 Data Structure and Algorithm

Pre-requisite : SCSJ1023 Programming Technique II

This course emphasis on data structure concepts theoretically and practically with detail algorithms for each of data structure. Students will learn abstract data type concepts using class and apply the concept in the implementation of data structures. Apart from it, student will learn recursive concept as a programming style and algorithm efficiency analysis with Big O notation. Various sorting and searching techniques will be discussed as data structure operations. Analysis of each algorithm will also be explained. Further, students will be exposed to linear data structures such as linked lists, stack and queue. Non-linear data structures such as tree and binary search tree will be discussed. Along the course, students should be able to implement and apply the theory and concepts of data structure in the assignments and mini project which are conducted in group.

SCSR1213 Network Communications

This course will discuss the basic topics of computer network and data communications. Based on TCP/IP Internet protocol stack, the course will apply top down approach. Starts with the important and usage of computer network in commonly applications, the approach will go further detail in the technical aspect in data communication. At the end of this course, students will have an understanding and appreciation of how the network works.

SCSV2113 Human Computer Interaction

This course will introduce students to human-computer interaction theories and design processes. The emphasis will be on applied user experience (UX) design. The course will present an iterative evaluation-centered UX lifecycle and will introduce a broader notion of user experience, including usability, usefulness, and emotional impact. The lifecycle should be viewed as template intended to be instantiated in

many different ways to match the constraints of a particular development project. The UX lifecycle activities we will cover include contextual inquiry and analysis, requirements extraction, design-informing models, design thinking, ideation, sketching, conceptual design, and formative evaluation.

SCSJ2203 Software Engineering

This course is designed to give students an introduction to an engineering approach in the development of high quality software systems. It will discuss the important software engineering concepts in the various types of the common software process models. The students will also learn the concepts and techniques used in each software development phase including requirements engineering, software design and software testing. This course will also expose the students to utilizing object-oriented method (e.g. UML) and tools in analyzing and designing the software. At the end of this course, students are expected to be able to appreciate most of the common software engineering concepts and techniques as well as producing various software artifacts, documentations, and deliverables.

SCSV1223 Web Programming

This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard HTML for content creation, CSS for content presentation, JavaScript for client-side logics, PHP for server-side logics and MySQL for database processing. At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.

SCSR2043 Operating Systems

Pre-requisite : SCSR2033 Computer Organization and Architecture

This course covers introduction to operating systems, which serve as an interface between computer hardware and the user. The operating system is responsible for the management and coordination of processes, sharing of limited resources of the computer. Students will be exposed to the techniques and algorithms that may be applied in designing an operating system. Topics covered include process management, concurrency and synchronization, deadlock, memory management, file management, secondary storage management and I/O management. At the end of the course, the student shall have a clear understanding on the general concepts that underlie of an operating system.

SCSJ2154 Object Oriented Programming

Pre-requisite : SCSJ1023 Programming Technique II

This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this

course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

SCSR3032 Computer Networks & Security Project I

Pre-requisite : SCSR3104 Application Development

This is the initial part of a 2-part Final Year Project that every student must fulfil successfully. Students are introduced to the methodologies of research and application development through a series of lectures. Students are guided through a step-by-step practice to complete the initial stages of proposal, planning and design of a project. Students must also meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their initial work.

SCSJ3203 Theory of Computer Science

Pre-requisite : SCSJ1013 Discrete Structure

SCSJ2013 Data Structure and Algorithm

The goal of this course is to provide students with an understanding of basic concepts in the theory of computation. This course introduces students to formal languages and automata theory. It will emphasize on languages, grammars and abstract machines i.e. Regular Language, Context Free Language, Regular Grammar, Context Free Grammar, Finite Automata, Push Down Automata and Turing Machine. The course will also provide practice on the acceptability of input string by these machines. At the end of the course, students should be able to apply the theory in constructing these abstract machines and testing them with the right input strings.

SCSR4118 Industrial Training (HW)

Pre-requisite : 92 credits AND CGPA \geq 2.0

Industrial Training refers to the placement of a student at an organization for a minimum of 20 weeks to elevate students' knowledge and skills in a specific database profession and at the same time produce graduates who are credible, creative and proficient. This course aims to provide a platform for the students apply their knowledge learned in the university and boost

their skills which needed by a profession. It is also intend for the students to gain exposure in every aspect of real career life. The students will be evaluated based on two components; 1) student performance evaluation by organisation supervisor and 2) student performance evaluation by faculty supervisor. The organization supervisor is expected to assess the student performance based on work performance and students personality. The assessment by faculty supervisor more focusing on students' generic skills

SCSR4114 Industrial Training Report

Pre-requisite : 92 credits AND CGPA >= 2.0

Industrial Training Report refers to the placement of a student at an organization for a minimum of 20 weeks to experience and apply their theoretical knowledge in the industrial training. The students will be evaluated based on four components; 1) technical report, 2) oral presentation, 3) log book and 4) ethics. The aim of the technical report is to educate the students in producing related technical report and able to explain a specific detail on the tasks that have been done during the training. Students need to follow specified format in writing the technical report and submit it within the predetermined date. The students are required to present their training achievement to Industrial Training supervisors (organization and supervisor). Students need to fill in the online log book daily for the purpose of close monitoring between the students and supervisors. Student also needs to practice the good ethical values and work conduct throughout the training. The passing mark is 60%.

SCSR4134 Computer Networks & Security Project II

Pre-requisite : SCSR3032 Computer Networks & Security Project I

This is the second part of a 2-part Final Year Project that every student must fulfil successfully. In this installation, students are required to execute the next phases of their development plan from Part1. 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 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 and present their final work.

SCSD3761 Technopreneurship Seminar

This 1-credit course will provide module and training for students on how to generate digital income through crowdsourcing platforms and methods. Crowdsourcing is a method to generate online income which the work is offered and implemented digitally in global platforms.

COMPULSORY PROGRAMME COURSES

SCSR2242 Computer Networks & SCSR2941 Computer Networks Lab

Pre-requisite: SCSR1213 Network Communications

This course will discuss the routing and switching concepts in computer networking specifically in local area network (LAN). The course starts with the architecture, components and operation of routers and switches and furthermore discusses the operation of Virtual LAN (VLAN), Access control list (ACL) and Network Address Translation (NAT).

SCSR3242 Inter-Network Technology & SCSR3941 Inter-Network Technology Lab

Pre-requisite: SCSR2242 Computer Networks & SCSR2941 Computer Networks Lab

This course will discuss related to scaling and connecting networks in a wide area network (WAN). The course starts with enhancing LAN and discusses two most popular routing protocols i.e. EIGRP and OSPF. Furthermore, the course will cover on WAN interconnection, security issues and Quality of Service). At the end of this course, students will be able to design and configure enhanced VLAN, WAN connection and network troubleshooting

SCSR3413 Computer Security

This course helps to equip students with basic principles in computer security including its issues and requirements. It covers the topics of the threats to computer as well as other general security areas such as program and network, evaluating the relative risks of these threats and developing cost-effective and user-friendly countermeasures. At the end of this course, the student should gain some knowledge and experience with respect to the risks of secure computing.

SCSR3443 Cryptography

Pre-requisite: SCSR3413 Computer Security

This course will introduce the concepts of fundamental cryptography and its applications. The topics that will be covered are evolution of cryptography, number theory, information theory, symmetric and asymmetric cryptography and message authentication. Several cryptographic structures and the characteristics of the algorithms that provide the strength to the algorithms will also be discussed. At the end of the course, the student should be able to apply the knowledge in developing application with security features.

PROGRAMME ELECTIVE COURSES

SCSR3223 High Performance & Parallel Programming

Pre-requisite: SCSJ1023 Programming Technique II

High performance computing/parallel computing is widely used, nowadays, to execute complex systems and computations of complex problems that need to be solved with minimal time as possible. This course introduces the students to architectures of parallel computers, parallel algorithm design and parallel application programming using MPI and OpenMP packages in C/C++ programming language. Student will experience hands-on programming practices on cluster computer.

SCSR3253 Network Programming

Pre-requisite: SCSR1213 Network Communications

This course covers various techniques and technologies to develop network applications. Topics cover from networking fundamentals, to remote procedure call, including TCP and UDP sockets, multicasting, multimedia network application, and peer-to-peer computing.

SCSR3263 Wireless Sensor Network

Pre-requisite: SCSR1213 Network Communications

This course will discuss on the topics of Wireless Sensor Networks (WSNs) technology, which collect information and pass the information via wireless networks to achieve a high level of desired monitoring and control in coordinated manners. In this course, the student will be exposed to various protocols proposed for WSNs based on top-down approach at each layer of OSI model. Furthermore, the analyses of advantages and disadvantages of those protocols and their applicability and performance in different application will be carried out. In this way the students will be exposed to the creation of technology as the evolution of different technologies before. At the end of this course the student will have an understanding in the area of Wireless Sensor Networks.

SCSR4283 Network Analysis & Design Simulation

Pre-requisite: SCSR2242 Computer Networks

This course presents the main ideas on how to study a LAN performance, to design a new computer network using latest technologies with basic security features, and how to forecast computer network performance using simulation technique with NS3 simulator.

SCSR4433 Penetration Testing

Pre-requisite: SCSR2043 Operating System & SCSR3413 Computer Security

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 pen testing, wireless pen testing, network pen testing, and mobile application pen testing.

SCSR4453 Network Security

Pre-requisite: SCSR2941 Computer Networks Lab & SCSR3413 Computer Security

This course educates students about the overall security process based on a security policy design, implementation and management. Emphasis is placed on security technologies, products and solutions; and on firewall and secure router design, installation, configuration, and maintenance. The course covers authentication, authorization, and accounting (AAA) implementation using routers and firewalls and security the network at both Layer 2 and 3 of the OSI model, intrusion prevention system (IPS) and virtual private network (VPN) implementations using routers and firewalls. Finally, managing a secure network is also discussed during the lecture.

SCSR4473 Security Management

Pre-requisite: SCSR3413 Computer Security

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. This course covers issues related to administration and management of security of enterprise information systems. Topics include auditing and data management, risk management, contingency planning, incident handling and responses. The course will study in detail principles and tools related to these topics. The course will also cover security standards, evaluation and certification process; security planning, ethical and legal issues in information and privacy.

SCSR4483 Secure Programming

Pre-requisite: SCSJ1023 Programming Technique II, SCSR2043 Operating System SCSR3413 Computer Security

This course covers various techniques and technologies to develop secure applications using Java Programming Language. Topics cover from Basic Security Concepts to Authentication and Authorization, including Cryptography Fundamental, Keys & Certificates, Key Management, Message Digests, Digital Signatures, Cipher-based Encryption and SSL & HTTPS. At the end of this course student should be able to design and develop secure application based on current security technologies.

SCSR4493 Computer Forensic**Pre-requisite: SCSR3413 Computer Security**

This course educates students on the overall computer forensic principles and practices. Emphasis is given on the fundamental knowledge of digital forensics investigations, such as types of crimes and evidences, basic computer investigation, evidence acquisition and legal and ethical issues. Hands on practice on selected tools are also added to give a more holistic view of an investigation process. Real case examples are studied and discussed to enhance critical and investigative thinking.

SCSR4973 Special Topics on Network & Security**Pre-requisite: Depends on the topic**

This course is aimed to expose students to specific topics in Computer networks and Security. Topics such as optical networks, wireless sensor networks and cloud computing will be discussed. Students will learn the concepts, application domain, trends and security challenges of these topics. Students will be given self-reading assignments to further enhance their understanding of the course. Student will learn how to write.