Universiti Kebangsaan Malaysia
The National University of Malaysia

PROSPEKTUS SISWAZAH
POSTGRADUATE PROSPECTUS

2018-2019

FAKULTI TEKNOLOGI DAN SAINS MAKLUMAT
Faculty of Information Science and Technology

www.ftsm.ukm.my

MENGILHAM HARAPAN,
MENCIPTA MASA DEPA

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PENDAULAT AMANAH NEGARA
Guardian of The Nation

PROSPEKTUS SISWAZAH
Fakulti Teknologi dan Sains Maklumat

POSTGRADUATE PROSPECTUS
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Pengenalan

Kursus berasaskan Sains Komputer telah ditawarkan oleh Universiti Kebangsaan Malaysia (UKM) sejak penubuhannya pada 1970. Sejajar dengan perkembangan bidang sains komputer, UKM telah menubuhkan Unit Statistik dan Sains Komputer pada 1977 di bawah Pusat Pengajian Kuantitatif. Unit Statistik dan Sains Komputer telah dinaik taraf kepada Jabatan Sains Komputer pada tahun 1982 manakala Pusat Pengajian Kuantitatif telah ditukar kepada Fakulti Sains Matematik dan Komputer pada tahun 1988. Program akademik peringkat Sarjanamuda, Sarjana dan Doktor Falsafah telah ditawar secara berperingkat. Jumlah kakitangan akademik dengan kelayakan Doktor Falsafah telah bertambah secara berperingkat sejajar dengan keperluan negara untuk meningkatkan mutu pengajaran dan penyelidikan nasional.

Era tahun 90an menyaksikan ekonomi dunia dipacu oleh sektor ekonomi berasaskan pengetahuan selaras dengan perkembangan teknologi maklumat dan komunikasi (ICT). Malaysia tidak ketinggalan dengan merangka pelbagai dasar seperti Koridor Raya Multimedia (MSC). Justeru, teknologi maklumat dan komunikasi telah menjadi satu daripada industri terpenting negara. Selaras dengan perubahan dunia dari era industri ke era maklumat, Jabatan Sains Komputer telah dinaik taraf pada 1 Oktober 1994 menjadi sebuah fakulti yang dikenali sebagai Fakulti Teknologi dan Sains Maklumat (FTSM) dengan kekuatan 40 tenaga akademik. FTSM telah berjaya memperoleh status syarikat MSC pada 24 November 2000.

Kini, tenaga akademik FTSM dianggotai oleh 100 pensyarah dengan 11 daripadanya bertaraf Profesor. Kampus FTSM yang terletak di lingkungan kedua kampus UKM Bangi kini terdiri daripada 8 blok

bangunan, 2 dewan kuliah dan 1 blok pusat pelajar siswazah. Ia juga mempunyai dua pusat penyelidikan yang digerakkan oleh pensyarah yang pakar dalam pelbagai bidang. Pada usia lebih 20 tahun, FTSM telah berkembang dengan pesat dari pelbagai aspek. Pelajar FTSM sentiasa aktif menyertai pelbagai program dan pertandingan peringkat kebangsaan dan antarabangsa seperti *FIRA RoboWorld Cup Tournament.*

Introduction

Courses related to Computer Science have been offered by Universiti Kebangsaan Malaysia (UKM) since the university was established in 1970. In line with the emergence of the computer science discipline, UKM set up the Statistics and Computer Science Unit in 1977 under the Quantitative School. The Statistics and Computer Science Unit was upgraded to become the Computer Science Department in 1982 while the Quantitative School became the Faculty of Mathematics and Computer Science in 1988. Academic programs at the Undergraduate, Master and Doctor of Philosophy (PhD) levels have been introduced incrementally. The number of academic staffs with PhDs increased in accordance with the national requirements related to enhancing the quality of teaching and research.

In the 1990s, the world economy was driven by knowledge-based economics which was in tandem with the emergence of Information and Communication Technology (ICT). Not to be left out of these exciting developments, Malaysia devised various policies and initiatives including the Multimedia Super Corridor(MSC). Subsequently, ICT has become one of the nation's most important industries. In line with the changes that has moved the world from the industrial to the information era, the Computer Science Department was upgraded in 1 October 1994 to become the Faculty of Information

Science and Technology (Fakulti Teknologi dan Sains Maklumat) (FTSM). Strengthened by 40 academic staffs, the faculty was awarded the 'MSC company' status on 24th November 2000.

Today, FTSM consists of 100 faculty members that include 11 professors. The new FTSM campus is located at the second link of UKM Bangi; it has 8 building blocks, 2 lecture halls, and 1 postgraduate centre block. It also houses two research centres which are driven by experts in various fields of research. Since its inception, more than 20 years ago, FTSM has progressed rapidly in various aspects. FTSM students too, are making their presence felt by being actively involved in numerous programs and competitions at the national and international levels such as the FIRA RoboWorld Cup Tournament.

Misi

Fakulti Teknologi dan Sains Maklumat bertekad menjadi pusat pembelajaran, pengajaran, penyelidikan, perundingan dan rujukan dalam bidang teknologi dan sains maklumat yang cemerlang berlandaskan falsafah, visi dan misi UKM.

Mission

The Faculty of Information Science and Technology pledges to be a center of excellence in learning, teaching, research, consultancy and as a reference in the field of information science and technology based on the philosophy, vision and mission of UKM.

Visi

Menjadi fakulti terpilih untuk menghasilkan tenaga mahir yang terpelajar bagi mengisi keperluan negara dalam bidang teknologi maklumat.

Vision

Be a selected faculty to produce educated talent to fill the needs of the country in the field of information technology.

Matlamat

Fakulti Teknologi dan Sains Maklumat mengendalikan pelbagai program pengajian dengan matlamat berikut:-

a. Melahirkan siswazah dalam bidang teknologi dan sains maklumat yang berwibawa.
b. Menjadi pusat penyelidikan dan pembangunan dalam bidang teknologi dan sains maklumat.
c. Memberi perkhidmatan perundingan dan rujukan dalam bidang teknologi dan sains maklumat.
d. Menyebar pengetahuan teknologi dan sains maklumat kepada masyarakat umum.
e. Menggalakkan interaksi dan jalinan ilmu di antara ahli sains dan teknologi.

Objectives

The Faculty of Information Science and Technology offers various study programmes with the following objectives:-

a. *To produce competent graduates in the field of information science and technology.*
b. *To be a centre for research and development in the field of information science and technology.*
c. *To provide consultancy and reference services*

in the field of information science and technology.

d. *To disseminate knowledge of information science and technology to society.*

e. *To promote interaction and cohesion of knowledge between members in information science and technology.*

Pentadbiran Fakulti
Faculty Management

Pentadbiran Fakulti
Faculty Management

Dekan
Dean
Prof. Dr. Abdullah Mohd Zin
BSc(Southampton), MSc(Wales), PhD(Nottingham)

Timbalan Dekan (Penyelidikan dan Inovasi)
Deputy Dean (Research dan Innovation)
Prof. Madya Dr. Rozilawati Razali
BSc(Sheffield Hallam), MSc(UiTM), PhD(Southampton)

Timbalan Dekan (Akademik)
Deputy Dean (Academic)
Prof. Madya Dr. Nazlia Omar
BSc(UMIST), MSc(Liverpool), PhD(Ulster)

Timbalan Dekan (Hal-ehwal Jaringan Industri dan Penjanaan)
Deputy Dean (Industry Community Partnerships and Income Generation)
Prof. Madya Dr. Nurhizam Safie Mohd Satar
STM(UKMalaysia), PhD (IIUM)

Penolong Dekan Hal-ehwal Siswa dan Alumi
Assistant Dean Students and Alumni Affairs
Dr. Amelia Natasya Abdul Wahab
SmTM(UKMalaysia), MSc(Loughborough),
PhD(UKMalaysia)

Penolong Dekan Kualiti dan Strategi
Assistant Dean Quality and Strategy
Dr. Zulkefli Mansor
BIS (East London), MSE (UMalaya), PhD (UiTM)

Penolong Dekan Keusahawanan dan Kreativiti
Assistant Dean Enterprenuership and Creativity
Dr. Saidah Saad
Dip. Sains Komputer(ITM), SmSn (UKMalaysia),
STM(UKMalaysia), PhD(UTMalaysia)

Penolong Dekan Pengajaran dan Pembelajaran
Assistant Dean Teaching and Learning
Dr. Dian Indrayani Jambari
SmSn(UPMalaysia), MSc(Edinburgh), PhD(Reading)

Ketua Hal-ehwal Jaringan Industri dan Masyarakat
Head of Industrial and Community Partnerships
Dr. Hazura Mohamed
SmSn, SSn(UKMalaysia), PhD(UTMalaysia)

Pengerusi Pusat Penyelidikan
Chairperson of Center for Artificial Intelligence and Technology* (*CAIT)
Prof. Madya Dr. Shahnorbanun Sahran
BSc(UKMalaysia), MSc(UKMalaysia), PhD(Cardiff)

Pengerusi Pusat Penyelidikan
***Chairperson of Center for Software Technology and Management (*SofTAM)**
Prof. Madya Dr. Noraidah Sahari @ Ashaari
BA(SUNY), MSc(WVirg), Dip.LP(UTMalaysia),
PhD(UPMalaysia)

Pengerusi Pusat Keselamatan Siber
Chairperson of Center for Cyber Security
Prof. Madya Dr. Siti Norul Huda Sheikh Abdullah
BSc(UMIST), STM(UKMalaysia), PhD(UTMalaysia)

Ketua Program Pengajian Kedoktoran
Head of Doctoral Programme
Prof. Madya Dr. Jamaiah Yahaya
BSc(Wisconsin), MSc(Leeds), PhD(UKMalaysia)

Ketua Program Pengajian Sarjana
Head of Master Programme
Dr. Syaimak Abdul Shukor
SmTM(UKMalaysia), MEng(UTMalaysia),
PhD(Nottingham)

Penyelaras Program Eksekutif (Sarjana)
Programme Coordinator (Master by Coursework)
Prof. Madya Dr. Kamsuriah Ahmad
BSc(Flinders),STM(UKMalaysia), PhD(UPMalaysia)

Penyelaras Program Sarjana (Khas)
Master Programme Coordinator (Master by Module)
Prof. Madya Dr. Masnizah Mohd
SmTM, STM(UKMalaysia), PhD(Strathclyde)

Ketua Program Teknologi Maklumat
Head of Information Technology Programme
Dr. Zainal Rasyid Mahayuddin
SmTM(UKMalaysia), SSn(UKMalaysia), PhD(Cranfield)

Ketua Program Sistem Multimedia
Head of Multimedia System Programme
Dr. Siti Fadzilah Mat Noor
SmSn(UTMalaysia), STM(UKMalaysia), PhD(UTMalaysia)

Ketua Program Sains Komputer
Head of Computer Science Programme
Dr. Suhaila Zainuddin
BSc(Manchester), STM(UKMalaysia), PhD(UTMalaysia)

Dr. Nur Fazidah Elias
Dip. Sains Komputer, SmSn, MEng(UTMalaysia),
PhD(QUT)

Penyelaras Program Eksekutif
Executive Programme Coordinator
Dr. Dahlila Putri Dahnil Sikumbang
B.Eng.(Sheffield), MSc (UTMalaysia), PhD
(MMUniversity, Malaysia)

Penyelaras Program Antarabangsa
International Programme Coordinator
Dr. Lailatul Qadri Zakaria
SmTM, STM(UKMalaysia), PhD(Southampton)

Eksekutif Kanan
Senior Executive
Puan Nurazlinda Nurul Asri

Eksekutif
Executive
Puan Mas Aliza Abu

Ketua Unit ICT
Head of ICT Unit
Encik Azmi Nasir

Ahli Akademik Fakulti
Faculty Academics

Profesor/*Professors*

NAMA/ *NAME*	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Abdullah Mohd Zin BSc(Southampton), MSc(Wales), PhD(Nottingham)	Programming Language Communication and Distributed System Architecture Formal Method
Azuraliza Abu Bakar SmSn, SSn(UKMalaysia), PhD(UPMalaysia)	Data Mining
Haslina Arshad BSc(Bridgeport),MSc(Conventry), PhD(UPMalaysia)	Mobile Augmented Reality Virtual Reality IT in Manufacturing Robotic & Automation
Khairuddin Omar SmSn, SSn(UKMalaysia), Ph.D(UPMalaysia)	Artificial Intelligence Computer and Machine Vision Image Processing
Masri Ayob BEng(UKMalaysia), MEng(UTMalaysia), PhD(Nottingham)	Heuristic Search Scheduling Combinatorial Optimization
Mohd. Juzaiddin Ab Aziz Dip S.Komp(UPMalaysia), SmSn, STM(UKMalaysia),	Natural Language Processing Programming Language Technology

NAMA/ *NAME*	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
PhD(UPMalaysia)	
Nor Azan Hj. Mat Zin BSc(Florida), Dip.Pen., Spen(UKMalaysia), PhD(UKMalaysia)	Advanced Learning Technology (adaptive web-based systems and Serious Games, affective user modeling) ICT/Multimedia Application Accessibility
Salwani Abdullah SmSn(UTMalaysia), SSn(UKMalaysia), PhD(Nottingham)	Operations Research Combinatorial Optimization Data Mining
Shahrul Azman Mohd Noah SmSn(UKMalaysia), MSc, PhD(Sheffield)	Information Retrieval & Search Engine Ontology Semantic
Zarina Shukur SmSn(UKMalaysia), PhD(Nottingham)	Formal Methods Software Engineering Computer System Security
Zawiyah Mohammad Yusof SmSa(UKMalaysia), Post Grad. Dip. Lib and Info. Sc.(ITM), MA(Ormaa, London), PhD(Aberystwyth,Wales)	Social Informatics Information Management Impact Study & Strategic Planning

Profesor Madya/*Associate Professors*

NAMA/ *NAME*	**BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION***
Azizi Abdullah SmSn(UKMalaysia), MSE(UMalaya), PhD(Utrecht)	Computer Vision Pattern Recognition Machine Learning
Dalbir Singh a/l Valbir Singh B.Comp.Sc, MSc(USM), PhD(UMalaya)	Human Computer Interaction Information Systems Interaction Design & Usability
Elankovan Sundararajan SmSn, SSn(UKMalaysia), PhD(Melb.)	High Performance Architecture & Technology Computational Science Cloud Computing
Jamaiah Yahya BSc(Wisconsin), MSc(Leeds), PhD(UKMalaysia)	Software Engineering Information Systems
Kamsuriah Ahmad BSc(Flinders),STM(UKMalaysia), PhD(UPMalaysia)	Database Information System Knowledge Management
Maryati Mohd. Yusof BSc(Southern Illinois), STM(UKMalaysia), PhD(Brunel, West London)	Information Systems Evaluation Information Systems Adoption and Diffusion Health Information System

NAMA/ *NAME*	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Masnizah Mohd SmTM, STM(UKMalaysia), PhD(Strathclyde)	Information Retrieval Natural Language Processing
Md. Jan Nordin BSc, MSc(Ohio), PhD(Sheffield-Hallam)	Computer and Machine Vision Artificial Intelligence Image Processing
Mohammad Khatim Hasan SmSn, SSn(UKMalaysia), PhD(UPMalaysia)	Computational Science Quality Models
Mohammad Faidzul Nasrudin BBA(Western Michigan), STM(UKMalaysia), PhD(UKMalaysia)	Optimization Pattern Recognition Image Processing
Mohamad Shanudin Zakaria BSc, MSc(Northrop), PhD(Reading)	Pattern Recognition Computer System Security Service Science
Mohd Zakree Ahmad Nazri SmTM(UKMalaysia), MSc(UTMalaysia), PhD(UTMalaysia)	Decision Support Systems Intelligent Systems Soft Computing
Muriati Mukhtar BSc(Manc.), SSn(UKMalaysia), PhD(UTMalaysia)	Service Science Simulation and Modeling E-supply chains

NAMA/ *NAME*	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Nazlia Omar BSc(UMIST), MSC(Liverpool), PhD(Ulster)	Natural Language Processing Computational Linguistics
Noraidah Sahari @ Ashaari BA(SUNY), MSc(WVirg), Dip.LP(UTMalaysia), PhD(UPMalaysia)	Interaction Design and Usability E-Learning Multimedia Application
Nurhizam Safie Mohd Satar STM(UKMalaysia), PhD (IIUM)	Information System Project Management Software Project Management Health Information Technology
Ravie Chandren a/l Muniyandi SmSn, SSn(UKMalaysia), PhD(UKMalaysia)	Programming Language Technology Formal Method Natural/Bio-inspired computing
Rosilah Hassan BSc(Hanyang), MEE(UKMalaysia),PhD(Strathclyde)	Computer Systems & Network Technology Communication and Distributed System Architecture
Rozilawati Razali BSc(Sheffield Hallam), MSc(UiTM), PhD(Southampton)	Software Engineering Information Systems
Shahnorbanun Sahran BSc(UKMalaysia), MSc(UKMalaysia),	Pattern Recognition Image Processing

NAMA/ *NAME*	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
PhD(Cardiff)	Simulation and Modeling
Siti Norul Huda Sheikh Abdullah BSc(UMIST), STM(UKMalaysia), PhD(UTMalaysia)	Pattern Recognition Computer Vision Artificial intelligence
Zalinda Othman BTech(USMalaysia), MSc(Newcastle), PhD(USMalaysia)	Combinatorial Optimization IT in Manufacturing
Zulaiha Ali Othman SmSn(UKMalaysia), MSc(Sheffield), PhD(Sheffield Hallam)	Combinatorial Optimization Agent Technology Data Mining

Pensyarah / *Lecturers*

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Abdul Hadi Abd Rahman B.E.(UTM), M.Sc.(UPM), Ph.D(MJIIT-UTM)	Robotics & Automation
Afzan Adam SmSn(UKMalaysia), STM(UKMalaysia), PhD(Leeds)	Image processing Machine learning
Amelia Natasya Abdul Wahab SmTM(UKMalaysia), MSc(Loughborough), PhD(UKMalaysia)	IT For Manufacturing

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Amirah Ismail SmSn Lib.(ITM), STM(UKMalaysia), PhD(Warwick)	Multimedia Information Retrieval Knowledge Based System
Azrulhizam Shapi'i SmSn, SSN(UTMalaysia), PhD(UKMalaysia)	Game Technology CAD/CAM
Bahari Idrus SmSn, SSn(UKMalaysia), PhD(Bradford)	Quantum Computation Simulation & Modeling Formal Method
Dahlila Putri Dahnil Sikumbang B.Eng.(Sheffield), MSc (UTMalaysia), PhD (MMUniversity, Malaysia)	Wireless Sensor Networks RFID
Dian Indrayani Jambari SmSn(UPMalaysia), MSc(Edinburgh), PhD(Reading)	Service Science Information Systems Business-IT Alignment
Fadhilah Rosdi B.IT(UTHM), MSE(UMalaya), PhD(UMalaya)	Speech Processing Knowledge Based System
Hafiz Mohd Sarim BBA(CWRU), MSc(UMalaya)	Database Data Warehouse
Hairulliza Mohamed SmSn, SSn(UKMalaysia)	Quality Models Simulation and Modeling
Hazilah Mohd Amin BSc(Adelaide), MBA(Ohio)	Impact Study & Strategic Planning Quality Models Social Informatics

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Hazura Mohamed SmSn, SSn(UKMalaysia), PhD(UTMalaysia)	Quality Models
Ibrahim Mohamed BA(Liverpool John Moores), STM(UKMalaysia), PhD(IIUM)	Business Process Modeling Accounting Information Systems IT Audit & Control
Khairul Akram Zainol Ariffin MEng (Warwick Uni), Ph.D (UTP)	Cyber Security Digital Forensics
Khairul Azmi Abu Bakar B.Sc (Iowa State), M.Eng (UKMalaysia), Ph.D (Strathclyde)	Mobile Networks Computer System Security
Kok Ven Jyn Ph.D (UMalaya)	Computer and Machine Vision Pattern Recognition
Lailatul Qadri Zakaria SmTM, STM(UKMalaysia), PhD(Southampton)	Natural Language Processing Ontology Semantic
Lam Meng Chun BIT(UKMalaysia), PhD(UKMalaysia)	Virtual & Augmented Reality Human Computer Interaction Robotic
Marini Abu Bakar SmSn, SSn(UKMalaysia)	Programming Language Technology Computation & Graphics Programming
Mohd Ridzwan Yaakub SmTM(UKMalaysia), MSc(UPMalaysia), PhD(Queensland)	Opinion Mining Text Mining Ontology

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Mohd Rosmadi Mokhtar SmSn(UiTM), MSc(London), PhD(Manchester)	Computer System Security High Performance Architecture & Technologies
Mohd Zamri Murah BS, MS(Iowa)	Pattern Recognition Malay Manuscript Natural Language Processing (Jawi)
Nazatul Aini Abd Majid SmTM(UKMalaysia), SSn(UKMalaysia), PhD(Auckland)	IT in Manufacturing Quality Models
Norleyza Jailani SmSn(UKMalaysia), MSc(Dublin)	Agent Technology Computer Systems & Network Technology Mobile Computing
Noorazean Mohd Ali BIT(UUMalaysia), PhD(Lancaster)	Programming Language Technology Software Technology
Nor Samsiah Hj. Sani BIT(Universiti Tenaga Nasional), PhD(Sheffield)	Programming
Nur Fazidah Elias Dip. Sains Komputer, SmSn, MEng(UTMalaysia), PhD(QUT)	IT in Manufacturing IS Success & Evaluation
Rodziah Latih SmSn(UKMalaysia), MSc(Sheffield)	Programming Language Technology
Rossilawati Sulaiman SmSn(UKMalaysia), MSc(Essex), PhD(Canberra)	Computer System Security Mobile Computing Agent Technology

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Ruzzakiah Jenal SmTM (UKMalaysia), MSc(Loughborough), PhD(UKMalaysia)	Mathematical Modelling Schedulling
Sabrina Tiun BSc(Bradley), Msc(USMalaysia), PhD(USMalaysia)	Speech Processing Natural Language Processing Computational Linguistics
Saidah Saad Dip. Sains Komputer(ITM), SmSn (UKMalaysia), STM(UKMalaysia), PhD(UTMalaysia)	Knowledge Based System Semantic Web Information Retrieval
Siti Aishah Hanawi SmSn, SSn(UKMalaysia)	Quality Models
Siti Fadzilah Mat Noor SmSn(UTMalaysia), STM(UKMalaysia), PhD(UTMalaysia)	E-Learning Technology Multimedia Applications
Suhaila Zainuddin BSc(Manchester), STM(UKMalaysia), PhD(UTMalaysia)	E-learning Biology Data Mining Data Mining
Syahanim Mohd Salleh Dip S. Komp(ITM), SmSn, STM(UKMalaysia)	Programming Language Technology
Syaimak Abdul Shukor SmTM(UKMalaysia), MEng(UTMalaysia), PhD(Nottingham)	IT in Manufacturing Produt Development CAD/CAM

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Tengku Siti Meriam Tengku Wook SmSn, STM(UKMalaysia), PhD(UMalaya)	Interaction Design & Usability Multimedia Application Virtual & Augmented Reality
Umi Asma Mokhtar DCS(UiTM), BSc(UiTM), MSc(UKMalaysia), PhD(UKMalaysia)	Record Management
Wan Fariza Paizi@Fauzi B.Eng. (Southampton), M.Eng. (UTM), PhD (Monash)	Information Processing & Management Natural Language Processing Semantics Technology
Yuzita Yaacob BSc, MSc(Sam Houston), PhD(IIUM)	Computer Algebra Computational Science Multimedia Applications
Zainal Rasyid Mahayuddin SmTM(UKMalaysia), SSn(UKMalaysia), PhD(Cranfield)	Simulation & Modeling Robotics & Automation Virtual & Augmented Reality
Zurina Muda SmSn, STM(UKMalaysia), PhD(Southampton)	Multimedia Interactive & Intelligent Applications Spatial Image Annotation & Retrieval Semantic Image Processing
Noor Hasrina Bakar BSc IT (Marquette University, USA), MSc(University of Malaya), PhD (UMalaya)	Requirements Engineering Software Reuse Empirical Software Engineering
Zulkarnain Md. Ali Sm S. Komp Pend.(UTMalaysia), MSc(Loughborough), PhD(UPMalaysia)	Computer System Security Computer System & Network Technology

NAMA/NAME	BIDANG KEPAKARAN/ *AREA OF SPECIALIZATION*
Zulkefli Mansor DCS (UiTM), BIS (East London), MSE (Malaya), PhD (UiTM)	Software Engineering Information System Agile Methodology
Akmal Aris SmSnKomputer(UTMalaysia), STM(UKMalaysia)	Information Retrieval Web Programming
Ahmad Tarmizi bin Abdul Ghani SmSn(UKMalaysia), MNeBCC(Uor, AuTh, UC3M)	Service Science IT Governance
Junaidah Mohamed Kassim SmTM(UKMalaysia), MSc(UTMalaysia)	Database Web programming
Zaihosnita Hood SmSn(UKMalaysia), STM(UKMalaysia)	Information Systems

Guru Teknologi Maklumat
Information Technology Instructor

NAMA/*NAME*
Azura Ishak SmSn Pen(UPMalaysia), SSn(UPMalaysia)
Masura Rahmat SmSn, SSnTM(UTMalaysia)
Noor Faridatul Ainun Zainal SmTM, STM(UKMalaysia)

NAMA/*NAME*
Rohizah Abdul Rahman SmSk(USMalaysia), STM(UKMalaysia) Shahrina Shahrani SmTM (UKMalaysia)

Unit Akademik
Academic Unit

Prof. Madya Dr.
Nazlia Omar
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Timbalan Dekan (Akademik)
Deputy Dean (Academic)

Prof. Madya Dr.
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Ketua Program Kedoktoran
Head of Doctoral Programme

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Ketua Program Sarjana
Head of Master Programme

Prof. Madya Dr.
Kamsuriah Ahmad
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Executive Programme Coordinator

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Eksekutif Kanan
Senior Executive

Prof. Madya Dr. Masnizah Mohd.
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Penyelaras Program Sarjana Bermodul
Masters By Module Coordinator

Noor Azura Roslan
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Administrative Assistant

Yuraini Mohd. Yusoff
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Secretary to Deputy Dean

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Administrative Assistant

Juliana Jasin
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Penolong Pegawai Teknologi Maklumat
Assistant Information Technology Officer

Struktur Program

Program Siswazah diwujudkan bertujuan untuk melahirkan graduan yang berpengetahuan tinggi dalam bidang Teknologi Maklumat, meningkatkan kegiatan penyelidikan dalam bidang Teknologi Maklumat dan berusaha merapatkan kerjasama penyelidikan antara sektor awam/swasta dengan universiti. Fakulti Teknologi dan Sains Maklumat menawarkan 2 program pengajian iaitu program Ijazah Sarjana dan Ijazah Kedoktoran secara sepenuh masa dan *separuh masa. Mod pengajian bagi program pengajian siswazah adalah seperti berikut:

A. **Sarjana Secara Kerja Kursus**
B. **Sarjana Secara Kerja Kursus dan Penyelidikan**
C. **Sarjana Secara Penyelidikan**
D. **Sarjana Secara Modul**
E. **Doktor Falsafah**

*Nota: Pengajian separuh masa hanya ditawarkan untuk warganegara Malaysia sahaja.

Programme Structure

*The postgraduate programme is created to produce graduates with in-depth knowledge in the field of information technology, increase research activities in the field of information technology and to heighten the research collaboration between public/private sectors and the university. The faculty of Information Science and Technology offers 2 programmes, Master Programme and Doctor of Philosophy Programme (full time and *part time). The modes of postgraduate programmes are as follows:*

*A. **Masters Programme by Course Work***
*B. **Masters Programme by Course Work and Research***
*C. **Masters Programme by Research***
*D. **Masters Programme by Module***
*E. **Doctor of Philosophy Programme***

**Note: Part time study is offered to Malaysian citizens only.*

Syarat Kemasukan

1. Program Ijazah Sarjana (mod Kerja Kursus):

a. Ijazah Sarjanamuda Teknologi Maklumat/ Sains Komputer daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) ≥ 2.80; atau

b. Kelulusan lain yang setaraf dengan ijazah Sarjana muda dan mempunyai kelayakan lain atau pengalaman, yang diluluskan oleh Senat.

2. Program Ijazah Sarjana (bermodul)

i. Program Sarjana Keselamatan Siber

a. Ijazah Sarjanamuda dalam bidang Komputeran daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) ≥ 2.75; atau

b. Kelulusan lain yang setaraf dengan ijazah Sarjana muda dan mempunyai kelayakan lain atau pengalaman, yang diluluskan oleh Senat.

ii. **Sarjana Informatik Kesihatan:**

a. Ijazah Sarjanamuda dalam bidang Perubatan/ Sains Kesihatan daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) ≥2.75; atau

b. Kelulusan lain yang setaraf dengan ijazah Sarjana muda dan mempunyai kelayakan lain atau pengalaman, yang diluluskan oleh Senat.

iii. **Sarjana Sains Data:**

a. Ijazah Sarjanamuda dalam bidang Sains, Teknologi dan Perubatan daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) ≥2.75; atau

b. Ijazah Sarjanamuda dalam bidang Sains, Teknologi dan Perubatan atau Ijazah Sarjanamuda dalam bidang Sains Sosial dengan mendapat PNGK ≥2.50, boleh diterima masuk tertakluk kepada penilaian secara temubual; atau

c. Ijazah Sarjanamuda dalam bidang Sains, Teknologi dan Perubatan atau Ijazah Sarjanamuda dalam bidang Sains Sosial tetapi tidak mencapai PNGK 2.50, boleh diterima masuk tertakluk kepada minimum 5 tahun pengalaman bekerja dalam bidang yang relevan

d. Calon dengan Ijazah Sarjanamuda dalam bidang Sains Sosial hendaklah lulus dengan baik dalam mata pelajaran Matematik dan/atau Statistik atau kepujian dalam mata pelajaran Matematik atau lulus mata pelajaran Matematik Tambahan di peringkat SPM.

e. Kelulusan lain yang setaraf dengan ijazah Sarjana muda dan mempunyai kelayakan lain atau pengalaman, yang diluluskan oleh Senat.

3. Program Ijazah Sarjana (mod Kerja Kursus dan Penyelidikan):

a. Ijazah Sarjanamuda Teknologi Maklumat/ Sains Komputer daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) ≥3.00; atau

b. Kelulusan lain yang setaraf dengan ijazah Sarjana muda dan mempunyai kelayakan lain atau pengalaman, yang diluluskan oleh Senat.

4. Program Ijazah Sarjana (mod Penyelidikan):

a. Ijazah Sarjanamuda Teknologi Maklumat/ Sains Komputer daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) ≥3.50; atau

b. Kelulusan lain yang setaraf dengan ijazah Sarjana muda dan mempunyai kelayakan lain atau pengalaman, yang diluluskan oleh Senat.

5. Program Ijazah Kedoktoran:

a. Ijazah Sarjana Teknologi Maklumat/Sains Komputer daripada Universiti Kebangsaan Malaysia atau mana-mana institut pengajian tinggi dengan memperoleh Purata Nilai Gred dan Kumulatif (PNGK) yang baik; atau

b. Kelayakan lain yang berkaitan atau pengalaman, yang diluluskan oleh Senat; atau

c. Sedang mengikuti Program Sarjana secara penyelidikan di FTSM dan disokong oleh Jawatankuasa Siswazah fakulti untuk menukar program pengajian kepada Program Doktor Falsafah.

Entry Requirements

1. Master's programmes (by Course Work):

a. A Bachelor Degree in Information Technology/Computer Science from Universiti Kebangsaan Malaysia or other universities approved by the Senate with a Cummulative Grade Point Average (CGPA) ≥2.80*; or*

b. Other relevant qualifications or experience approved by the Senate

2. Master's programmes (by Module)

i. Master of Cyber Security

a. A Degree in Computing from Universiti Kebangsaan Malaysia or other universities

approved by the Senate with a Cummulative Grade Point Average (CGPA) ≥2.75; or

b. *Other relevant qualifications or experience approved by the Senate*

ii. Master of Health Informatic

a. *A Degree in Medical or Health Sciences from Universiti Kebangsaan Malaysia or other universities approved by the Senate with a Cummulative Grade Point Average (CGPA) ≥2.75; or*

b. *Other relevant qualifications or experience approved by the Senate*

iii. Master of Data Science:

a. *A Degree in Medicine, Technology and Science or Social Science Science from Universiti Kebangsaan Malaysia or other universities approved by the Senate with a Cummulative Grade Point Average (CGPA) ≥2.75; or*

b. *A Degree in Medicine, Technology and Science or Social Science with an CGPA 2.50, with conditional and interviews; or*

c. *A Degree in Medicine, Technology and Science or Social Science with CGPA less than 2.50, must has 5 years experience in relevant area; or*

d. *Candidate with bachelor degree in social science must passed mathematic/or statistic or credit in mathematic or passed add math in SPM level*

e. *Other relevant qualifications or experience approved by the Senate*

3. Master's programmes (by Course Work and Research):

a. A Bachelor Degree in Information Technology/Computer Science from Universiti Kebangsaan Malaysia or other universities approved by the Senate with a Cummulative Grade Point Average (CGPA) ≥3.00; or

b. Other relevant qualifications or experience approved by the Senate

4. Master's programmes (by Research):

a. A Bachelor Degree in Information Technology/Computer Science from Universiti Kebangsaan Malaysia or other universities approved by the Senate with a Cummulative Grade Point Average (CGPA) ≥3.50; or

b. Other relevant qualifications or experience approved by the Senate

5. Doctor of Philosophy programmes:

a. A Master Degree in Information Technology/Computer Science from Universiti Kebangsaan Malaysia or other universities approved by the Senate with a good Cummulative Grade Point Average (CGPA); or

b. Other relevant qualifications or experience approved by the Senate

c. Currently enrolled in Master by research in FTSM and supported by Faculty's Postgraduate Committee to convert to Doctor of Philosophy programme.

Syarat Keperluan Bahasa Inggeris

1. Calon luar negara diwajibkan memenuhi syarat keperluan Bahasa Inggeris seperti berikut:
   a. Mendapat keputusan **TOEFL** dengan skor tidak kurang daripada 550; atau
   b. **IELTS** dengan aras tidak kurang daripada 5.5 bagi program tertentu.

2. Calon luar negara yang memiliki kelayakan akademik yang diperoleh dari mana-mana universiti tempatan yang diiktiraf oleh Senat boleh dikecualikan syarat (1)(a) tetapi diwajibkan mengambil Ujian Kecekapan Bahasa Inggeris (UKBI) dan jika tidak melepasi tahap yang ditetapkan oleh program, calon dikehendaki mengikuti dan lulus Modul Kemahiran Bahasa Inggeris (MKBI).

3. Fakulti/Institut boleh memberi pengecualian syarat keperluan Bahasa Inggeris kepada calon luar negara yang berasal dari negara yang Bahasa Inggeris adalah bahasa rasminya atau yang memiliki kelayakan akademik yang diperolehi dari mana-mana institusi pengajian tinggi yang menggunakan Bahasa Inggeris sebagai bahasa pengantar.

English Language Requirements

1. *International students are required to fulfill the English language requirement as follows:*
   a. *Score not less than 550 in **TOEFL;** or*
   b. *not less than 5.5 in **IELTS** for particular programme.*

2. *International students who have the academic qualifications obtained from any local university approved by the Senate will be exempted from requirement (1)(a) but are required to take Ujian Kecekapan Bahasa Inggeris (UKBI) and if they do not acquire the level set by the program, the candidates are required to take and pass Modul Kemahiran Bahasa Inggeris (MKBI).*

3. *Faculty/Institute may grant exceptions to the English requirement for international students from countries with English as the official language or have academic qualifications obtained from institutions that use English as a medium of instruction.*

Keperluan Bahasa Melayu

Kursus Bahasa Melayu (4 unit)
Semua pelajar antarabangsa dikehendaki mengikuti dua (2) kursus Bahasa Melayu setara dengan 4 unit, yang ditawarkan oleh Pusat Citra. Pengecualian boleh diberikan kepada calon yang telah mengambil dan lulus kursus ini yang dikendalikan oleh badan-badan lain yang diiktiraf oleh Senat UKM.

Malay Language Requirement

Malay Language Courses (4 units)
All international students are required to follow two (2) Malay language courses equivalent to 4 units offered by the Citra Centre. Exemptions can be given to candidates who have taken and passed Malay language courses organized by other bodies recognized by the UKM Senate.

PROGRAM IJAZAH SARJANA
MASTERS PROGRAMME

A. Program Sarjana Secara Kerja Kursus (KK)

Fakulti menawarkan 8 program sarjana secara kerja kursus:

i. Sarjana Teknologi Maklumat (Sains Maklumat)
ii. Sarjana Teknologi Maklumat (Sistem Multimedia)
iii. Sarjana Teknologi Maklumat (Informatik Industri)
iv. Sarjana Sistem Maklumat
v. Sarjana Sains Komputer (Komputeran Prestasi Tinggi)
vi. Sarjana Sains Komputer (Teknologi Perisian)
vii. Sarjana Sains Komputer (Teknologi Rangkaian)
viii. Sarjana Sains Komputer (Kecerdasan Buatan)

Calon dikehendaki lulus sekurang-kurangnya 40 unit yang terdiri daripada 28 unit kursus dan menulis laporan projek (setara 12 unit). Di sepanjang pengajian, calon dikehendaki memenuhi syarat-syarat berikut:

1. Kursus Wajib Program (16 unit)
Semua pelajar yang mendaftar program ini dan mengkhusus kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

2. Kursus Elektif Program (12 Unit)
Semua pelajar yang mendaftar program ini dan mengkhususkan kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

3. Tempoh Pengajian
Sepenuh Masa : 2 - 4 semester
Separuh Masa : 4 - 8 semester

A. Masters Programme by Course Work (KK)

The Faculty offers 8 Masters programme by course work:

i. *Master of Information Technology (Information Science)*
ii. *Master of Information Technology (Multimedia System)*
iii. *Master of Information Technology (Industrial Informatics)*
iv. *Master of Information System*
v. *Master of Computer Science (High Performance Computing)*
vi. *Master of Computer Science (Software Technology)*
vii. *Master of Computer Science (Network Technology)*
viii. *Master of Computer Science (Artificial Intelligence)*

Candidates are required to pass at least 40 units which include 28 units of courses and write a project report (equivalent to 12 units). Throughout the program, candidates are required to fulfill the following conditions:

1. ***Core Courses (16 Unit)***
   All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

2. ***Elective Courses (12 Unit)***
   All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

3. ***Duration of Study***
   Full Time : 2 - 4 semesters
   Part Time : 4 - 8 semesters

B. Program Sarjana (bermodul)

1. Sarjana Keselamatan Siber

Calon dikehendaki lulus sekurang-kurangnya 40 unit yang terdiri daripada 28 unit kursus dan projek (setara 12 unit). Di sepanjang pengajian, calon dikehendaki memenuhi syarat-syarat berikut:

i. **Kursus Teras (16 unit)**
Semua pelajar yang mendaftar program ini dan mengkhusus kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

ii. **Kursus Elektif (12 Unit)**
Semua pelajar yang mendaftar program ini dan mengkhususkan kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

iii. **Projek (12 unit)**

2. Sarjana Informatik Kesihatan

Calon dikehendaki lulus sekurang-kurangnya 40 unit yang terdiri daripada 28 unit kursus dan projek (setara 12 unit). Di sepanjang pengajian, calon dikehendaki memenuhi syarat-syarat berikut:

i. **Kursus Teras (28 unit)**
Semua pelajar yang mendaftar program ini dan mengkhusus kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

ii. **Projek (12 unit)**

3. Sarjana Sains Data

Calon dikehendaki lulus sekurang-kurangnya 40 unit yang terdiri daripada 28 unit kursus dan projek (setara 12 unit). Di sepanjang pengajian, calon dikehendaki memenuhi syarat-syarat berikut:

i. **Kursus Teras (20 unit)**
Semua pelajar yang mendaftar program ini dan mengkhusus kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

ii. **Kursus Elektif (8 Unit)**
Semua pelajar yang mendaftar program ini dan mengkhususkan kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

iii. **Projek (12 unit)**

4. Tempoh Pengajian

Sepenuh Masa : 2 - 4 semester
Separuh Masa : 4 - 8 semester

B. Master Programme (by module)

1. Master of Cyber Security

Candidates are required to pass at least 40 units which include 28 units of courses and project (equivalent to 12 units). Throughout the program, candidates are required to fulfill the following conditions:

i. ***Core Courses (16 Unit)***
All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

ii. ***Elective Courses (12 Unit)***
All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

iii. ***Project (12 Unit)***

2. *Master of Health Informatic*

Candidates are required to pass at least 40 units which include 28 units of courses and project (equivalent to 12 units). Throughout the program, candidates are required to fulfill the following conditions:

i. ***Core Courses (28 Unit)***
All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

ii. ***Project (12 Unit)***

3. *Master of Data Science*

Candidates are required to pass at least 40 units which include 28 units of courses and project (equivalent to 12 units). Throughout the program, candidates are required to fulfill the following conditions:

i. ***Core Courses (20 Unit)***
All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

ii. ***Elective Courses (8 Unit)***
All candidates who register for this programme and specialize towards a related field are required to take and pass this course.

iii. ***Project (12 Unit)***

4. Duration of Study
Full Time : 2 - 4 semesters
Part Time : 4 - 8 semesters

C. Program Sarjana Secara Kerja Kursus dan Penyelidikan (KKP)

Fakulti menawarkan 8 program sarjana secara kerja kursus dan penyelidikan:

i. Sarjana Teknologi Maklumat (Sains Maklumat)
ii. Sarjana Teknologi Maklumat (Sistem Multimedia)
iii. Sarjana Teknologi Maklumat (Informatik Industri)
iv. Sarjana Sistem Maklumat
v. Sarjana Sains Komputer (Komputeran Prestasi Tinggi)
vi. Sarjana Sains Komputer (Teknologi Perisian)
vii. Sarjana Sains Komputer (Teknologi Rangkaian)
viii. Sarjana Sains Komputer (Kecerdasan Buatan)

Calon dikehendaki lulus sekurang-kurangnya 40 unit yang terdiri daripada 12 unit kursus dan menulis disertasi (setara 28 unit). Di sepanjang pengajian, calon

dikehendaki memenuhi syarat berikut:

1. **Kursus Elektif (12 Unit)**
   Semua pelajar yang mendaftar program ini dan mengkhusus kepada bidang yang berkaitan dikehendaki mengambil dan lulus kursus ini.

2. **Disertasi (28 unit)**
   Semua pelajar yang telah lulus semua kursus Lengkap Program di atas dikehendaki menjalankan suatu penyelidikan berkaitan dengan bidang dan mengemukakan sebuah disertasi. Disertasi ini mesti dipertahankan dalam peperiksaan lisan di hadapan panel pemeriksa yang dilantik oleh fakulti.

3. **Keperluan Penerbitan**
   Calon dikehendaki menghasilkan sekurang-kurangnya SATU penerbitan iaitu 1 jurnal (ISI/Scopus) sepanjang pengajiannya.

4. **Tempoh Pengajian**
   Sepenuh masa : 2-4 semester
   Separuh masa : 4-8 semester

C. Masters Programme by Course Work and Research

The Faculty offers 8 Masters programme by course work and research:

i. *Master of Information Technology (Information Science)*
ii. *Master of Information Technology (Multimedia System)*
iii. *Master of Information Technology (Industrial Informatics)*

iv. *Master of Information System*
v. *Master of Computer Science (High Performance Computing)*
vi. *Master of Computer Science (Software Technology)*
vii. *Master of Computer Science (Network Technology)*
viii. *Master of Computer Science (Artificial Intelligence)*

Candidates are required to pass at least 40 units which include 12 units of courses and write a dissertation (equivalent to 28 units). Throughout the program, candidates are required to fulfill the following conditions:

1. ***Elective Courses (12 Units)***
   All candidates who register for this programme and specialized towards a related field are required to take and pass these courses.

2. ***Dissertation (28 units)***
   All candidates who have passed all elective courses are required to undertake a research related to their field and submit a dissertation. This dissertation must be defended in an oral examination before the examiners, appointed by the faculty.

3. ***Duration of Study***
   Full Time : 2 - 4 semesters
   Part Time : 4 - 8 semesters

4. ***Publication Requirement***
   Candidates are required to produce at least ONE publications comprised of 1 journal article (ISI/Scopus) throughout the duration of their study.

D. Program Sarjana Secara Penyelidikan

Program Sarjana secara penyelidikan iaitu **Sarjana Komputeran** memerlukan pelajar mendaftar secara penyelidikan dalam bidang-bidang yang berkaitan serta mengambil dan lulus kursus Kaedah Penyelidikan. Pada akhir progam pengajian, pelajar dikehendaki menyiapkan satu tesis yang akan diperiksa oleh panel pemeriksa yang dilantik oleh fakulti. Di sepanjang pengajian calon dikehendaki memenuhi syarat berikut :

1. **Kursus Fakulti (4 unit)**
   Semua pelajar yang mendaftar program ini dikehendaki mengambil dan lulus kursus Kaedah Penyelidikan.

2. **Mempertahankan Usulan dan Perkembangan Penyelidikan**
   Semua pelajar dikehendaki menyerahkan usulan penyelidikan serta perkembangan penyelidikan mereka kepada ahli jawatankuasa yang dilantik mengikut bidang penyelidikan selewat-lewatnya pada semester kedua pengajian untuk membolehkan mereka meneruskan pengajian sarjana mereka. Kegagalan menghantar perkembangan penyelidikan boleh menyebabkan pengajiannya ditamatkan.

3. **Tesis (36 unit)**
   Hasil penyelidikan dikehendaki dikemukakan di dalam bentuk tesis. Tesis ini mesti dipertahankan dalam satu peperiksaan lisan di hadapan panel pemeriksa yang dilantik oleh fakulti.

4. **Keperluan Penerbitan**
   Calon dikehendaki menghasilkan sekurang-kurangnya DUA penerbitan iaitu 1 jurnal

(ISI/Scopus).

5. Tempoh Pengajian

Sepenuh Masa : 2 - 6 semester
Separuh Masa : 4 - 8 semester

D. Master Programme by Research

Master of Computing *(masters programme by research) candidates are required to conduct a full-time research in the selected field and take and pass the Research Methodology Course. At the end of the programme, the candidates must submit a thesis to be examined by the panel of examiners appointed by the Faculty. Throughout the course of study, candidates are required to adhere to the following requirements:*

1. ***Faculty Course (4 Units)***
   All candidates must take and pass Research Methodology.

2. ***Proposal Defense and Research Progress***
   All candidates are required to submit and defend their research proposal and their research progress to the appointed committee members the latest by the second semester of their study to entitle them to continue their study at Master level. Failure to submit their research proposal and progress may cause their studies to be terminated.

3. ***Thesis*** **(36 units)**
   All research findings must be written in the form of a thesis report. A candidate must then defend his/her thesis before a panel of examiners appointed by the faculty.

4. ***Publication Requirement***

Candidates are required to produce at least ONE publication comprised of 1 journal article (ISI/Scopus).

5. ***Duration of Study***

Full Time : 2 - 6 semesters
Part Time : 4 - 8 semesters

Sarjana Teknologi Maklumat (Sistem Multimedia)
Master of Information Technology (Multimedia System)

Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TH6084 Advanced Digital Multimedia • TH6204 Advanced Interface Design • TH6244 Advanced Modeling And Animation • TH6344 Interactive Games • TH607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TE6504 Software Management • TP6134 Multimedia Information Retrieval • TC6544 Advanced Artificial Intelligence
COURSEWORK & RESEARCH	• TH6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TH6084 Advanced Digital Multimedia • TH6204 Advanced Interface Design • TH6244 Advanced Modeling And Animation • TH6344 Interactive Games • TE6504 Software Management • TP6134 Multimedia Information Retrieval • TC6544 Advanced Artificial Intelligence

Sarjana Teknologi Maklumat (Informatik Industri)
Master of Information Technology (Industrial Informatics)

Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TR6584 Industrial Modeling and Simulation • TR6364 Statistical Process Control • TR6344 Supply Chain Management • TR6534 Computer Integrated Manufacturing • TR607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TR6324 Real Time Systems • TC6414 Knowledge Discovery and Data Mining • TC6544 Advanced Artificial Intelligence
COURSEWORK & RESEARCH	• TR6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TR6584 Industrial Modeling and Simulation • TR6364 Statistical Process Control • TR6344 Supply Chain Management • TR6534 Computer Integrated Manufacturing • TR6324 Real Time Systems • TC6414 Knowledge Discovery and Data Mining • TC6544 Advanced Artificial Intelligence

Sarjana Teknologi Maklumat (Sains Maklumat)
Master of Information Technology (Information Science)

Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TP6084 Information Retrieval • TP6024 Knowledge Management • TP6534 Natural Language Processing • TP6524 Ontology and Knowledge Representation • TP607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TP6014 Information Ethics and Policy • TP6134 Multimedia Information Retrieval • TC6244 Machine Learning
COURSEWORK & RESEARCH	• TP6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TP6084 Information Retrieval • TP6024 Knowledge Management • TP6534 Natural Language Processing • TP6524 Ontology and Knowledge Representation • TP6014 Information Ethics and Policy • TP6134 Multimedia Information Retrieval • TC6244 Machine Learning

Sarjana Sistem Maklumat / *Master of Information System*
Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TU6214 Decision Support and Executive Information Systems • TU6414 Management of Information Technology • TU6124 Business Process Modelling • TU6294 Project and Change Management • TU607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TE6504 Software Management • TP6084 Information Retrieval • TP6014 Information Ethics and Policy • TP6024 Knowledge Management • TU6234 Data Warehousing
COURSEWORK & RESEARCH	• TU6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TU6214 Decision Support and Executive Information Systems • TU6414 Management of Information Technology • TU6124 Business Process Modelling • TU6294 Project and Change Management • TE6504 Software Management • TP6084 Information Retrieval • TP6014 Information Ethics and Policy • TP6024 Knowledge Management • TU6234 Data Warehousing

Sarjana Sains Komputer (Komputeran Prestasi Tinggi)
Master of Computer Science (High Performance Computing)
Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TA6434 Algorithm and Data Structure • TA6604 HPC Architecture and Technology • TA6054 Advanced Numerical Analysis • TA6124 Parallel and Distributed System • TA607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TN6334 Mobile and Web Programming • TC6404 Image Processing and Computer Vision • TC6544 Advanced Artificial Intelligence • TR6324 Real Time Systems
COURSEWORK & RESEARCH	• TA6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TA6434 Algorithm and Data Structure • TA6604 HPC Architecture and Technology • TA6054 Advanced Numerical Analysis • TA6124 Parallel and Distributed Systems • TN6334 Mobile and Web Programming • TC6404 Image Processing and Computer Vision • TC6544 Advanced Artificial Intelligence • TR6324 Real Time Systems

Sarjana Sains Komputer (Teknologi Rangkaian)
Master of Computer Science (Network Technology)
Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TA6434 Algorithm and Data Structure • TN6014 Network Modeling and Simulation • TN6224 Computer Security and Defence • TN6384 Computer Network • TN607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TA6014 Theory of Automata & Programming • TA6604 HPC Architecture and Technology • TN6334 Mobile and Web Programming • TA6124 Parallel and Distributed Systems
COURSEWORK & RESEARCH	• TN6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TA6434 Algorithm and Data Structure • TN6014 Network Modeling and Simulation • TN6224 Computer Security and Defence • TN6384 Computer Network • TA6014 Theory of Automata & Programming • TA6604 HPC Architecture and Technology • TN6334 Mobile and Web Programming • TA6124 Parallel and Distributed Systems

Sarjana Sains Komputer (Software Technology)
Master of Computer Science (Teknologi Perisian)
Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TA6014 Theory of Automata & Programming • TA6434 Algorithm and Data Structure • TE6504 Software Management • TN6384 Computer Network • TE607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TA6604 HPC Architecture and Technology • TN6334 Mobile and Web Programming • TP6534 Natural Language Processing • TA6054 Advanced Numerical Analysis • TA6124 Parallel and Distributed Systems • TC6544 Advanced Artificial Intelligence
COURSEWORK & RESEARCH	• TE6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TA6014 Theory of Automata & Programming • TA6434 Algorithm and Data Structure • TE6504 Software Management • TN6384 Computer Network • TA6604 HPC Architecture and Technology • TN6334 Mobile and Web Programming • TP6534 Natural Language Processing • TA6054 Advanced Numerical Analysis • TA6124 Parallel and Distributed Systems • TC6544 Advanced Artificial Intelligence

Sarjana Sains Komputer (Kecerdasan Buatan)
Master of Computer Science (Artificial Intelligence)
Programme Structure

Mode	Core (28 Unit)	Elective (12 Unit)
COURSEWORK ONLY	• TA6434 Algorithm and Data Structure • TC6244 Machine Learning • TP6084 Information Retrieval • TC6544 Advanced Artificial Intelligence • TC607C Project • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TC6414 Knowledge Discovery and Data Mining • TP6524 Ontology and Knowledge Representation • TP6534 Natural Language Processing • TC6404 Image Processing and Computer Vision • TC6634 Multi-Agent Systems
COURSEWORK & RESEARCH	• TC6090 Dissertation • TM6112 Research Method in Computing	**Choose 3** courses below or any masters level courses offered and advised by Head of Programme • TA6434 Algorithm and Data Structure • TC6244 Machine Learning • TP6084 Information Retrieval • TC6544 Advanced Artificial Intelligence • TC6414 Knowledge Discovery and Data Mining • TP6524 Ontology and Knowledge Representation • TP6534 Natural Language Processing • TC6404 Image Processing and Computer Vision • TC6634 Multi-Agent Systems

Sarjana Keselamatan Siber
Master of Cyber Security

Programme Structure

<table>
<tr><th>Core (16 Unit)</th><th>Elective (12 Unit)</th></tr>
<tr><td>• TX6114 Computer Security
• TX6124 Network Security
• TX6134 Cyber Law and Ethics
• TX6144 Information Security Management
• TM6112 Research Method in Computing</td><td rowspan="3">Choose 3 courses below or any masters level courses offered and advised by Head of Programme
• TX6234 Software Security
• TX6224 Intrusion Detection and Prevention
• TX6244 Ethical Hacking and Penetration Testing
• TX6254 Security Audit and Assessment
• TD6004 Digital Forensic Safety Measures
• TD6104 Fundamental of Digital Forensics
• TD6114 File System and Operating System
• TD6214 Data Recovery and Analysis
• TD6314 Digital Media Forensic Analysis</td></tr>
<tr><th>Project (12 Unit)</th></tr>
<tr><td>• TX609C Project</td></tr>
</table>

Sarjana Informatik Kesihatan
Master of Health Informatic

Programme Structure

<table>
<tr><th>Core (20 Unit)</th><th>Elective (8 Unit)</th></tr>
<tr><td>• TS6024 Information Modeling and Databases
• TY6024 Health Informatics
• TY6034 Health Information System Analysis And Design
• TY6044 Enterprise Architecture for Health Information Systems
• TY6054 Information Technology Management
• TM6112 Research Method in Computing</td><td rowspan="3">Choose 2 courses below or any masters level courses offered and advised by Head of Programme
• TY6064 Law and Ethics in Healthcare
• FK6313 Principles Of Healthcare Management
• TC6424 Fundamental of Data Science
• TU6314 Business Analytics and Intelligence
• TC6404 Image Processing
• TA6434 Algorithm and Data Structure
• TC64444 Machine Learning for Data Science</td></tr>
<tr><th>Project (12 Unit)</th></tr>
<tr><td>• TY607C Project</td></tr>
</table>

Sarjana Sains Data
Master of Data Science

Programme Structure

Core (24 Unit)	Elective (4 Unit)
• TC6424 Fundamental of Data Science • TR6124 Statistical Methods for Data Analytics • TP6234 Unstructured Data Analytics • TS6024 Information Modelling and Databases • TU6434 Big Data Analytics and Management • TC6444 Machine Learning for Data Science • TM6112 Research Method in Computing	**Choose 1** courses below or any masters level courses offered and advised by Head of Programme • TP6084 Information Retrieval • TP6014 Information Ethics and Policy • TU6214 Decision Support and Business Intelligence • TP6134 Multimedia Information Retrieval • TP6524 Ontology and Knowledge Representation • TC6404 Image Processing • TA6434 Algorithm and Data Structure
Project (12 Unit)	
• TU607C Project	

PROGRAM IJAZAH KEDOKTORAN

DOCTOR OF PHILOSOPHY PROGRAMME

E. Program Ijazah Kedoktoran

Program Doktor Falsafah memerlukan pelajar mendaftar secara penyelidikan dalam bidang terpilih dan mengambil kursus Kaedah Penyelidikan. Di akhir program, calon dikehendaki menyediakan sebuah tesis. Tesis ini perlu dipertahankan di dalam peperiksaan lisan di hadapan panel pemeriksa yang dilantik oleh fakulti. Di sepanjang pengajian calon dikehendaki memenuhi syarat-syarat berikut :

1. **Kursus Fakulti (4 unit)**
   Semua pelajar diwajibkan mendaftar dan lulus kursus Kaedah Penyelidikan.

2. **Mempertahankan Usulan dan Perkembangan Penyelidikan**
   Semua pelajar dikehendaki menyerahkan usulan penyelidikan serta perkembangan penyelidikan mereka kepada ahli jawatan kuasa yang dilantik mengikut bidang penyelidikan pada enam bulan hingga dua tahun pengajian untuk membolehkan mereka meneruskan pengajian mereka. Kegagalan menghantar perkembangan penyelidikan boleh menyebabkan pengajiannya ditamatkan.

3. **Keperluan Penerbitan**
   Semua pelajar dikehendaki menerbitkan sekurang-kurangnya DUA penerbitan iaitu 2 jurnal (ISI/Scopus).

4. **Tempoh Pengajian**
   Sepenuh Masa : 6 - 12 semester
   Separuh Masa : 8 - 14 semester

5. Walau bagaimanapun calon Ijazah Kedoktoran boleh memohon kepada Dekan Fakulti/Pengarah Pusat Pengurusan Siswazah secara bertulis untuk

dikecualikan daripada syarat tempoh minimum pengajian, tertakluk kepada kelulusan Senat, calon hendaklah:

a. Mendapat perakuan Fakulti/Pusat Pengurusan Akademik

b. Menerbitkan sekurang-kurangnya dua makalah dalam jurnal berimpak tinggi yang berkaitan dengan penyelidikannya atau lain-lain jurnal yang diiktiraf Senat

6. Calon yang telah mendapat kelulusan di bawah subperaturan 5 hendaklah menjelaskan segala yuran untuk tempoh minimum pengajiannya.

E. Doctor of Philosophy Programme

Doctor of Philosophy programme requires a candidate to do a research in the selected field and take the Research Methodology course. At the end of the programme, the candidate is required to prepare a thesis. The thesis has to be presented and defended in an oral examination which will be examined by examiners appointed by the faculty. Throughout the course of study, candidates are required to adhere to the following requirements :

1. Faculty Course (4 units)

Student must take and pass the Research Methodology course.

2. Proposal Defense and Research Progress

Student is required to submit research proposal and progress to the committee members between 6 months to 2 years of their study in order to continue their study at PhD level. Failure to submit their research proposal and progress may cause

their studies to be terminated.

3. Publication Requirements

Students are required to produce at least TWO publications with a minimum of 2 journal articles (ISI/Scopus).

4. Duration of Study

Full Time : 6 - 12 semesters
Part Time : 8 - 14 semesters

5. *However, the PhD student can write to the Dean of FTSM/Director of UKM Postgraduate Office to apply for exemption from the minimum duration of study requirement, subject to approval from the Senate, having met the following conditions:*

a. *Has received approval from the Faculty/Centre for Academic Management*

b. *Has published at least two articles in high impact journals in the relevant research field, or in other journals endorsed by the Senate.*

6. *The PhD student who is exempted under subregulation 5, has to pay the tuition fees for the duration of minimum study requirement.*

Sinopsis Kursus
Course Synopsis

1. TA6014 Teori Automata dan Pengaturcaraan / Theory of Automata and Programming

Tujuan kursus ini adalah untuk menjawab persoalan berikut: Apakah keupayaan asas dan limitasi sebuah komputer? Untuk menjawab persoalan ini, kursus ini membincangkan tiga topik utama: model komputeran, teori kebolehkiraan dan teori kekompleksan. Tiga model komputeran yang dibincangkan: automata, mesin dan aturcara dan fungsi rekursif. Teori automata menyediakan model asas komputeran. Mesin dan aturcara merupakan model komputeran yang hampir ke aturcara berstuktur manakala fungsi rekursif adalah asas kepada aturcara fungsian. Teori kebolehkiraan membincangkan pengkelasan masalah yang dapat diselesaikan atau tidak dapat diselesaikan. Teori kekompleksan membincangkan isu masalah NP.

The purpose of this course is to answer the following question: What are the fundamental capabilities and limitation of a computer? In order to answer this question, this course will cover three important topics: models of computation, computability theory and complexity theory. Three models of computation will be covered: automata, program and machine and recursive functions. Automata theory provides the most basic model of computation. Programs and Machines is a model of computation which is closer to structured programming, while recursive functions is the basis for functional programming. Computability theory discusses the classification of problems that can be solved and those that are not. In complexity theory, issues like NP-hard problems will be discussed.

2. TA6054 Analisis Berangka Lanjutan / Advanced Numerical Analysis

Matlamat utama kursus ini adalah untuk mempertingkatkan kemahiran pelajar dalam menyelesaikan masalah saintifik yang berasaskan persamaan terbitan dengan menggunakan bahasa pengaturcaraan komputer. Pelajar harus mempunyai kebolehan untuk menggunakan teknik yang diperkenalkan dengan menggunakan komputer. Untuk masalah berangka mudah, pelajar perlu menulis aturcara komputer untuk mencari penyelesaian. Kandungan kursus ini termasuk, penyelesaian persamaan terbitan biasa (PTB) dan persamaan terbitan separa (PTS). Kaedah beza terhingga akan digunakan dengan meluas untuk mencari penyelesaian persamaan terbitan. Penyelidikan terkini dalam kaedah berangka juga dibincangkan. Masalah dunia sebenar akan digunakan sebagai kajian kes untuk meningkatkan pemahaman pelajar dalam menyelesaikan masalah sebenar dengan menggunakan kaedah yang diperkenalkan. Pelajar juga seharusnya mampu untuk menilai prestasi algoritma berangka.

The main objective of this course is to develop student skills in solving scientific problems that are based on differential equations with the use of computer programming language. Students should have the abilities to use the introduced techniques computationally. For a simple numerical problem, students are required to develop a computer program to find a solution. Contents include solution of Ordinary Differential Equations (ODEs) and Partial Differential Equation (PDEs). Finite Difference Method will be used extensively in solving both differential equations. Current research in numerical analysis also discussed. Real world problems are used as case studies to provide better

understanding on the application of the introduced techniques. Students should be able to analyze the performance of numerical algorithm.

3. TA6124 Sistem Selari dan Teragih / Parallel and Distributed Systems

Sistem pengkomputeran moden dan kebenaran untuk pembentukan rangkaian komputer dalam sistem teragih dilaksanakan dalam pelbagai cara dan kaedah: daripada kaedah sebaran tunggal kepada sebaran pelbagai (multicasting), dan seterusnya kepada pelaksanaan selari di dalam perkakasan dan perisian. Merekabentuk sistem pengkomputeran teragih adalah satu proses yang kompleks yang memerlukan pemahaman yang kukuh tentang masalah rekabentuk dan aspek-aspek teori dan praktikal untuk menyelesaikannya. Kursus ini merangkumkan prinsip-prinsip asas sistem teragih berlandaskan tujuan umum dan juga aplikasi spesifik seni bina komputer dan kaedah, teknik dan paradigma pengaturcaraan yang membolehkan ianya dilaksanakan dalam perisian. Lebih khusus lagi, ia meliputi model-model asas teori, algoritma dan aspek-aspek sistem pengkomputeran teragih. Kursus ini juga menyelidik memori yang dikongsi dan paradigma penghantaran mesej dalam perkakasan dan juga perisian; keserentakan, 'multithreading' dan 'Synchronicity'; model superkomputer yang berlandaskan kepada pemprosesan selari, berkelompok dan teragih. Keluasan dan liputan terperinci teori diimbangi dengan sistem yang berkaitan dengan isu-isu praktikal seperti pengecualian bersama, pengesanan kebuntuan, pengesahan, privasi, audit dan pemulihan kegagalan. Aplikasi sebenar adalah dirujuk, untuk menggambarkan penggunaan praktikal teknik dan

algoritma. Kursus ini juga meliputi topik baru seperti rangkaian sensor, pengkomputeran 'peer-to-peer', rangkaian 'peer-to-peer', pengkomputeran mudah alih dan forensik digital. Pengedaran mesej menggunakan MPI, pengaturcaraan berasaskan 'threads' menggunakan POSIX, pengaturcaraan berasaskan arahan-menggunakan OpenMP, dan pengaturcaraan GPU di CUDA juga dibincangkan.

Modern computer systems and computer networking permit formation of distributed systems that execute in a variety of ways and means: ranging from single to multicast to parallel execution in both hardware and software. Designing distributed computing systems is a complex process requiring a solid understanding of the design problems and the theoretical and practical aspects of their solutions. This unit covers the fundamental principles of distributed systems in both general purpose and application specific computer architectures and the methods, techniques and programming paradigms that allow it to be performed in software. More specifically, it covers the models underlying the theory, algorithms and systems aspects of distributed computing systems. The unit examines both shared memory and message passing paradigms in both hardware and software; concurrency, multithreading and synchronicity; parallel, clustered and distributed supercomputing models. Broad and detailed coverage of the theory is balanced with practical systems-related issues such as mutual exclusion, deadlock detection, authentication, privacy, audit and failure recovery. Real-world applications are referred to, to illustrate the practical use of techniques and algorithms. This unit also covers emerging topics such as sensor networks, peer-to-peer computing, peer-to-peer networks, mobile computing and digital forensics. Message passing

using MPI, thread-based programming using POSIX threads, directive-based programming using OpenMP, and GPU programming in CUDA are discussed.

4. **TA6434 Algortima dan Struktur Data / Algorithm and Data Structure**

Algoritma dan struktur data adalah asas kepada pengaturcaraan. Dalam kursus ini pelajar akan didedahkan pelbagai konsep algoritma dan struktur data melalui pendekatan yang lebih formal. Tajuk termasuk: Konsep asas teknik rekabentuk algoritma; analisis algoritma; struktur data; model data; data dalam pengaturcaraan; perwakilan data; kebetulan perwakilan; kegunaan ruang; hubungan kawalan data; algoritma bagi graf dan kajian kes. Beberapa perbincangan mengenai algoritma; spesifikasi formal dan pembuktian, menentukan keberkesanan komputeran juga dimasukkan dalam kursus ini.

Data structure and algorithm is the basis to programming. In this course, students will be exposed to various data structures and algorithm concepts through a formal approach. Topics include: Basic concept on algorithm design techniques; algorithm analysis; data structure; data model; data in programming; data representation; the correctness of the representation; space used; data control relationship; graph algorithms and case study. Several discussions on algorithm, formal specification and proof, determine the effectiveness of the computing are also included in this course.

5. TA6604 Senibina dan Teknologi Komputeran Prestasi Tinggi / HPC Architectures and Technologies

Kursus ini memberi gambaran mengenai teknologi terkini untuk pengaturcaraan dan penggunaan sistem pengkomputeran berprestasi tinggi (HPC) yang selari dan teragih. Penekanan akan diberikan kepada pengkomputeran berbilang teras, pengkomputeran selari, dan pengkomputeran grid / awan. Pengaturcaraan berbilang teras meliputi metodologi pengaturcaraan benang (thread), menganalisis prestasi, menyemak benang, membentuk profil benang dan penskalaan aplikasi berasaskan benang. Dalam pengkomputeran selari, tumpuan akan diberikan kepada seni bina selari, model pengkomputeran selari, algoritma selari dan teknologi pengaturcaraan selari. Pelajar akan diberi pendedahan kepada asas algoritma dan teknik selari. Tugasan praktikal dalam pengaturcaraan selari di dalam persekitaran kluster akan diberikan. Aplikasi sebenar akan dirujuk bagi menggambarkan penggunaan secara praktikal teknik dan algoritma yang berkaitan. Contoh aplikasi adalah seperti sains pengkomputeran, perlombongan data dan carian web, dan pengkomputeran grid / awan pula meliputi pengenalan kepada perisian tengah dan perkhidmatan web.

This course gives an overview of current technologies for programming and using parallel and distributed high-performance computing (HPC) systems. Emphasis will be given on multi-core computing, parallel computing, and grid/cloud computing. Multi-core programming covers thread programming methodology, performance analyzer, thread checker, thread profiler and scalability of threaded application. In parallel computing, the focus will be on parallel architectures, parallel

computing models, parallel algorithms and parallel programming technologies. Students will be given exposure to fundamental parallel algorithms and techniques. Practical assignments in parallel programming on cluster environment will be given. Real-world applications are referred to, to illustrate the practical use of techniques and algorithms. Examples of driving applications such as computational science, data mining and web search, introduction to grid/cloud computing middleware and web services are covered in grid/cloud computing.

6. TC6244 Pembelajaran Mesin / Machine Learning

Pembelajaran Mesin adalah sains buatan. Objektif utama bidang ini adalah pengaturcaraan komputer atau penghasilan algoritma untuk mengoptimumkan sesuatu prestasi kriteria menggunakan sampel data atau pengalaman. Melihat kepada objektif ini, kursus ini memperkenalkan prinsip dan kaedah yang digunakan untuk pembelajaran mesin. Dalam kursus ini, elemen prinsip pembelajaran mesin ini merangkumi statistik, pengecaman pola, rangkaian neural, dan kecerdasan buatan, pemprosesan signal, kawalan kualiti dan perlombongan data. Beberapa aplikasi pembelajaran mesin di dalam bidang yang dinyatakan di atas adalah Regresi, *Learning Associations,* Pengkelasan, *Unsupervised and Supervised Learning and Reinforcement Learning* akan dibincangkan.

Machine Learning is a science of the artificial. The field's main objective of study is specifically programming computers or algorithms to optimize a performance criterion using example data or past

experience. Referring to this objective, this course is to introduce the principles and methods for machine learning. Principles elements of Machine Learning are taught in detail covering different fields that have their bases in statistics, pattern recognition, neural networks, and artificial intelligence, signal processing, quality control and data mining. Some of the Machine Learning applications in those fields is Regression, Learning Associations, Classification, Unsupervised and Supervised Learning and Reinforcement Learning will be discussed.

7. TC6404 Pemprosesan Imej dan Penglihatan Komputer / Image Processing & Computer Vision

Visi mungkin adalah deria yang paling penting bagi manusia untuk menghadapi dunia nyata. Saat ini, dengan kemajuan ilmu pengetahuan dan teknologi, banyak aplikasi imej telah diadaptasi di dunia nyata, dari yang sederhana hingga yang kompleks, mulai dari bisnis ke aplikasi saintifik seperti sistem pengintipan dan perubatan. TC6404 adalah kursus untuk pemprosesan dan visi komputeral. Kursus ini menekankan kepad prinsip-prinsip umum pemprosesan imej dan visi komputer selain daripada aplikasi khusus. Dalam hal ini, tiga perspektif berbeza akan diperkenalkan iaitu bentuk matematik, pseudo-code dan aturcara lengkap. Kursus ini merangkumi topik-topik berikut: imej digital, penapis, pinggir dan kontur, mengenalpasti titik menarik, mengesan lengkuk mudah, kawasan imej binary, model penampilan, perbandingan imej dan pengecaman objek.

Vision is probably the most important sense for human beings for coping with the real world. Nowadays, with the advance of science and

technology, many imaging applications have been adapted in the real world, from simple to complex, ranging from business to scientific applications such as medical and surveillance systems. TC6404 is a course to the fundamentals of digital image processing and computer vision. It emphasizes general principles of image processing and analysis, rather than specific applications. In this respect, three different perspectives will be introduced i.e. mathematical form, abstract pseudo-code algorithms, and complete programs. We expect to cover the following topics: digital images, filters, edges and contours, finding points of interest, detecting simple curves, regions in binary images. local appearance model, image comparison and object recognition.

8. TC6414 Knowledge Discovery and Data Mining/ Penerokaan Pengetahuan dan Perlombonga Data

Kursus ini mengandungi dua bahagian. Pertama membincangkan konsep dan proses penemuan pengetahuan dalam pangkalan data. Ia menekankan penyediaan dan pemprosesan awal data termasuk pembersihan data, integrasi, transformasi, pemilihan data, reduksi dan pendiskretan data. Beberapa algoritma pemilihan fitur yang penting dibincang. Perlombongan data merupakan satu bahagian utama di dalam proses penemuan pengetahuan. Bahagian kedua membincang konsep dan teknik perlombongan data yang melibatkan penemuan corak-corak yang mewakili pengetahuan yang disimpan didalam pangkalan data yang besar, gudang data atau sebarang storan penyimpanan maklumat. Ia termasuk tugas/fungsi perlombongan data seperti pengkelasan dan peramalan, perlombongan petua sekutuan, pengelompokan, dan algoritma perlombongan data seperti K-

kejiranan terdekat, induksi petua, algoritma pohon keputusan, rangkaian neural, algoritma genetik; contoh-contoh perlombongan data. Aplikasi saintifik dan industri juga dibincangkan.

This course consists of two parts. The first part will discuss the concepts and knowledge discovery processes in database. The focus is on data preparation and preprocessing including data cleaning, integration, transformation, data selection, and data reduction and discretization. Several feature selection algorithms are discussed. Data mining is the main part of knowledge discovery process. The second part will discuss the concepts and techniques of data mining that will involve patterns discovery that represents knowledge stored in a large database, data warehouse or any information repository storage. It includes the principles of data mining task such as classification and prediction, association rules mining, clustering, data mining algorithms including K-nearest neighbour, induction rules, decision tree algorithm, neural network, genetic algorithm; data mining examples. The scientific and industrial applications also discussed.

9. TC6634 Sistem Multi-Agen*/ Multi-Agent Systems*

Tujuan utama kursus ini adalah untuk melahirkan pelajar yang memahami teori dan konsep perisian berasaskan agen dan multi-agen. Ia termasuklah teori reasoning, colaborative, cooperative, belief, desire and intention. Teori ini difahami lagi dengan cara mendedahkan pelajar kepada pelbagai jenis agent system yang mempunyai sebahagian daripada ciri agen seperti Agent Technology Applications in Internet and Ecommerce, Multi-Agent Clinical Diagnosis etc. Pelajar juga diberi

kemahiran untuk membangunkan sistem berasaskan multi-agen menggunakan platform agen teknologi terkini. Di akhir kursus pelajar diberi peluang mengaplikasikan kemahiran dalam bidang ini dengan menjalankan projek pembangunan sistem berasaskan agen secara berkumpulan bagi menyelesaikan masalah bisnes.

Main objective of this course is to produce students that understand the concept and theory of software agent and multi-agent system. It includes reasoning, reasoning, colaborative, cooperative, belief, desire and intention. The agent theory will be more understand by showing various kind of agent application such as agent in internet, in ecommerce,clinical diagonsis and etc. Students also provide with skill to develop agent system using latest agent tecnology platform. The end of this course, students have chances to applied their skill by developing agent system in group to solve particular bussiness problem.

10. TC6544 Kecerdasan Buatan Lanjutan / Advanced Artificial Intelligence

Kursus ini bertujuan untuk memberi kefahaman dan meneroka bidang penyelidikan dalam bidang Kepintaran Buatan dan melaporkan kemajuan terkini dalam topik-topik yang dipilih. Ini termasuklah penyelesaian masalah dan carian: strategi carian asas dan lanjutan, pembelajaran mesin: rangkaian neural dan logik kabur, dan metodologi carian terkini seperti algoritma berasakan alam dan hiper-heuristik.

The course aims to give an understanding and explore various research areas in the field of Artificial Intelligence and to report the recent

advancement in the selected topics. These include problem solving and search: basic and advanced search strategies, machine learning: neural network and fuzzy logic, and recent search methodologies such as nature inspired algorithms and hyper-heuristics.

11. TE6504 Pengurusan Perisian / Software Management

Kursus ini memperkenalkan pelajar kepada lima fungsi utama pengurus perisian: rancang, atur, urus pasukan, tunjuk-arah dan kawal. Pelajar akan membina kemahiran, pengetahuan dan keupayaan dalam fungsi-fungsi ini untuk memastikan perisian dapat dihasilkan pada masa dan belanjawan yang telah ditetapkan. Kursus ini dimulakan dengan perancangan di mana pelajar akan belajar bagaimana untuk merangka halatuju projek dan juga menggabungkan unit kerja dan sumber supaya jadual dan kos projek dapat ditepati. Mereka juga akan mempelajari cara mengurus risiko, menetapkan kawalan dan memantau projek. Memandangkan projek melibatkan sumber manusia, pelajar juga akan mempelajari cara untuk menyusun dan menggabungkan bakat dan keupayaan tenaga kerja yang bersesuaian, membina semangat kerja berpasukan, merangsang dan menunjuk-arah ahli pasukan. Di samping pengurusan projek, kursus ini juga mendedahkan pelajar kepada beberapa aspek pengurusan perisian yang lain seperti kualiti, perubahan dan penambahbaikan proses. Pengurus mengawal melalui ukuran, maka pelajar juga akan diajar mengenai konsep pengukuran dan metrik dalam penilaian perisian.

This course introduces students the five primary functions of software manager: planning, organizing, staffing, directing and controlling. The students will develop skill, knowledge and abilities in these functions to successfully deliver an acceptable product on schedule and within budget. The course starts with planning where the students will learn how to create a project roadmap as well as integrate work items and resources together in such a manner that they can achieve aggressive budgets and schedule. They also will learn how to manage risks, put into place controls and monitor projects. As software projects involve people, the students will learn how to organize and get the right mix of talent and capability, develop teams and teamwork, motivate and direct team members. In addition to project management, this course also exposes students to other software management aspects such as quality, configuration and process improvement. Managers control things through measures, thus the students will also be taught on measurement concepts and metrics in software assessment.

12. TH6084 Multimedia Digital Lanjutan / Advanced Digital Multimedia

Kursus ini membincangkan multimedia digital yang meliputi teknologi dan reka bentuk multimedia digital serta teori berkaitan reka bentuk sistem atau aplikasi multimedia. Topik-topik ialah konsep asas multimedia digital; multimedia dan web; multimedia dan rangkaian dan reka bentuk dan pembangunan sistem

multimedia digital. Teori-teori berkaitan seperti teori reka bentuk visual, kebolehcapaian, kebolehgunaan dan penyelidikan berkaitan dalam bidang multimedia turut dibincang.

This course discusses the digital multimedia which includes technologies, design and related theories for multimedia system or application design and development. Topics are the fundamentals of digital multimedia; multimedia and the web; multimedia and networking and design and development of digital multimedia system. Related theories such as visual design, accessibility, usability and the current researches in the field of multimedia are also discussed.

13. TH6204 Reka Bentuk Antara Muka Lanjutan / Advanced Interface Design

Kursus ini merangkumi prinsip asas reka bentuk dan kebolehgunaan antara muka produk digital dalam konteks multi-platform. Pelajar dapat memahami dan mengenal pasti paradigma atau gaya interaksi melalui evolusi teknologi. Selain itu, perbincangan berkenaan kaedah interaksi yang berpusatkan pengguna menjadi topik utama bagi mengupas kaedah reka bentuk dan penilaian spesifik kepada pengguna pakar dan biasa. Seterusnya pelajar diberi pendedahan menjalankan kaedah penilaian dan mengkritik reka bentuk antara muka. Akhirnya pelajar akan dapat mengenal pasti dan menganalisis secara kritikal isu yang berkaitan bidang reka bentuk antara muka.

This course covers the basic principles of user interface design and usability of digital products. Students will be introduced to various interaction paradigms or styles developed throughout the evolution of technology. It also discusses the design and evaluation methods used in User-Centered Design approach involving both experts and end users. Students will then be asked to perform critical

evaluation on the user interface design of chosen products. Finally, students will be asked to critically discuss and analyze relevant user interface design issues.

14. TH6244 Pemodelan dan Animasi Lanjutan / Advanced Modeling and Animation

Kursus ini memperkenalkan prinsip dan teknik pemodelan tiga dimensi (3D) untuk menghasilkan rigging dan animasi. Fokus kursus ialah kepada pemodelan karakter dan animasi. Penteksturan dan pencahayaan juga dibincangkan. Pelajar akan mempelajari kaedah untuk melengkapkan (rig) model 3D dan menganimasi model tersebut menggunakan kinematik songsang dan kedepan (inverse). Pelajar juga akan mempelajari kaedah menentukan kualiti animasi, mengendali pergerakan model, mengguna rakaman rujukan (footage), dan mengaplikasi konsep utama daripada animasi klasik ke dalam persekitaran 3D.

The course aim to introduce the principle and technique of three dimensional (3D) modelling to produce a character model rigging and animation. Other important elements such as mapping/texturing, camera position and lighting are also discussed. Student will learn how to model 3D, rigging and animate the model either using inverse or reverse kinematic, control the movement, light the scenario and apply the principles of animation in the 3D environment.

15. TH6344 Permainan Interaktif / Interactive Games

Kursus ini akan membincangkan aspek-aspek seperti teori reka bentuk permainan, teori motivasi,

sejarah main permainan, 'genres' permainan, proses reka bentuk permainan dan produksi permainan. Topik seperti pembangunan cerita, pembangunan watak (peranan pemain, konsep dan reka bentuk permainan) dan konsep persekitaran akan menyediakan pelajar peluang mencipta cerita permainan berasaskan realisme dan 'abstraction'. Topik-topik lain yang turut dibincangkan ialah struktur permainan: berjujukan, kotak pasir; proses reka bentuk pemain solo dan pemain multi; permainan yang bermakna, sistem dan interaktiviti; peraturan permainan digital; permainan sebagai skema ketidakpastian; permainan sebagai sistem maklumat dan permainan sebagai sistem sibernetik.

The course will discuss aspects such as game design theory, motivation theory, history of games play, game genres, game design process and game production. Topics such as story development, character development (players' roles, character concepts and design) and environment concept shall provide students with opportunity to create gaming stories based on realism and abstraction. Other topics such as games structure: linear, sand box; single player and multi player design process; meaningful play; system and interactivity; rules for digital games; games as schemas of uncertainty; games as information systems and games as cybernetics system shall also be discussed.

16. TM6014 Kaedah Penyelidikan dalam Teknologi Maklumat / Research Methodology in Information Technology

Kursus ini bertujuan untuk mendedahkan calon pascasiswazah dengan kaedah penyelidikan dalam bidang teknologi maklumat. Antara tajuk yang akan dibincangkan ialah: kepentingan penyelidikan

dalam bidang teknologi maklumat, kaedah melakukan tinjauan susastera, beberapa kaedah penyelidikan dalam bidang teknologi maklumat seperti kaedah formal, pembangunan prototaip, tinjauan dan uji kaji. Pelajar juga didedah tentang perbezaan antara pendekatan kajian kuantitatif dan kualitatif. Kemudian, kursus ini membincang tentang kaedah penulisan hasil kajian, sama ada penulisan laporan, penulisan kertas kerja dan juga penulisan tesis. Bahagian akhir kursus ini membincang tentang pengurusan penyelidikan. Dalam bahagian ini perbincangan menjurus kepada penulisan usulan. penyelidikan, pemantauan aktiviti penyelidikan dan pengurusan output penyelidikan.

The objective of this course is to introduce research methodology in information technology for postgraduate candidates. The topics of this course includes: the importance of Information Technology research, literature review, some research methodologies in Information Technology studies such as formal method, survey, prototype development, and experimental approach. The students will be introduced to the differences between quantitative and qualitative studies. Then, the course will discuss the technique of result writing, such as report writing, paper writing, and thesis writing. At the end of the course will discuss the management of the research, which focuses on research proposal writing, supervising research activities, and management of research results.

17. TM6112 Kaedah Penyelidikan Dalam Komputeran / Research Method in Computing

Kursus praktikal ini akan membantu pelajar Ijazah Sarjana dalam aspek etika dan teknik

mengendalikan penyelidikan yang baik. Pelajar akan didedahkan kepada pelbagai jenis pendekatan dan metodologi penyelidikan: penyelidikan berbentuk pembangunan, algoritmik, empirik dan *formal*. Pelajar juga diperkenalkan dengan teknik mengendalikan ulasan literatur yang baik. Latihan akan diberikan untuk merangsang pemikiran kritis dalam mengulas literatur dan menulis penyelidikan akademik. Selain daripada memahami keadah penyelidikan, pelajar juga diperkenalkan kepada kaedah analisis data. Pelajar akan mengintegrasikan kemahiran yang dipelajari dalam penulisan satu proposal penyelidikan. Akhir sekali, pelajar akan diajar bagaimana membuat pembentangan yang baik sebagai persediaan untuk viva.

This practical course will guide masters students in the ethics and techniques in conducting a good research. Students will be exposed to the different types of research approaches and their methodologies; development, algorithmic, empirical and formal types of research. Students also will be introduced to the techniques of conducting a good literature review. Training will be given to stimulate critical thinking in literature reviewing and scholarly research writing. Apart from understanding the methods, students will also be introduced to data analysis methods. They will integrate skills learnt in a form of writing a research proposal. Lastly, students will learn to prepare good presentation as a preparation for viva.

18. TN6014 Simulasi dan Pemodelan Rangkaian / Network Modeling and Simulation

Satu langkah penting dalam reka bentuk dan kejuruteraan sistem komunikasi adalah anggaran

prestasi dan tingkah laku mereka; terutamanya untuk sistem matematik yang kompleks atau sangat dinamik, simulasi rangkaian amat berguna. Pemodelan dan simulasi rangkaian adalah panduan praktikal untuk menggunakan pemodelan dan simulasi bagi menyelesaikan masalah kehidupan sebenar. Kursus ini merangkumi konsep teras dalam pemodelan dan simulasi rangkaian, ia secara sistematik membincangkan banyak pertimbangan praktikal yang digunakan oleh pemaju dalam memodelkan sistem komunikasi berskala besar yang kompleks. Kursus ini menyediakan contoh-contoh daripada rangkaian komputer dan telekomunikasi dan menggunakannya untuk menggambarkan proses pemetaan konsep simulasi generik untuk masalah domain khusus dalam industri dan disiplin yang berbeza. Kursus ini memberi tumpuan kepada peralatan, prinsip pemodelan dan model-model terkini bagi simulasi rangkaian berasaskan peristiwa diskret dan juga kaedah piawai yang digunakan hari ini dalam bidang akademik dan industri untuk penilaian prestasi reka bentuk dan seni bina rangkaian yang baru. Bahagian peralatan memberi fokus kepada enjin-enjin simulasi OPNET/NS2 yang berbeza, ia juga melibatkan isu-isu seperti keselarian, integrasi perisian dan simulasi perkakasan. Bahagian-bahagian yang berkaitan dengan pemodelan dan model untuk simulasi rangkaian ialah: pemodelan rangkaian, teori giliran, pemodelan trafik rangkaian, pemodelan input dan analisis output, dan akhir sekali taburan statistik dan penjanaan nombor rawak.

A crucial step during the design and engineering of communication systems is the estimation of their performance and behavior; especially for mathematically complex or highly dynamic systems,

network simulation is particularly useful. Network modeling and simulation is a practical guide to using modeling and simulation to solve real-life problems. This course comprehensive exposition of the core concepts in network modeling and simulation, it systematically address the many practical considerations faced by developers in modeling complex large-scale communication systems. The course provides examples from computer and telecommunication networks and uses these to illustrate the process of mapping generic simulation concepts to domain-specific problems in different industries and disciplines. This course focuses on tools, modeling principles and state-of-the art models for discrete-event based network simulations, the standard method applied today in academia and industry for performance evaluation of new network designs and architectures. The focus of the tools part is on OPNET distinct simulation engines, while it also deals with issues like parallelization, software integration and hardware simulations. The parts dealing with modeling and models for network simulations are: Network modeling, Queuing theory, network traffic modeling, input modeling and output analysis, and lastly statistical distribution and random number generation.

19. **TN6224 Keselamatan dan Pertahanan Komputer / Computer Security and Defence**
    Kursus ini membentangkan paradigma asas dan prinsip-prinsip teknologi keselamatan komputer serta mekanisme di dalam sistem komputer moden. Pada akhir kursus ini, pelajar akan berupaya untuk menyelesaikan masalah keselamatan komputer dengan cara yang berstruktur. Kursus ini telah distruktur supaya pelajar memerlukan hanya pengetahuan minima di dalam bidang sains

komputer dan matematik. Ia dibangunkan untuk memberikan pengenalan umum kepada topik-topik berikut: asas-asas keselamatan komputer, keselamatan OS, model-model keselamatan, kriptografi dan isu-isu keselamatan yang berkaitan dengan keselamatan komputer.

This course presents the basic paradigms and principles of computer security technology and mechanism in modern computer systems. At the end of this course, students should be able to treat computer security problems in a structured way. The course has been structured so that the formal prerequisites only require a minimal knowledge in computer science and mathematics. It is designed to serve as a general introduction to the following topic: computer security fundamentals, OS security, security models, cryptography and security issues related to these topics.

20. TN6384 Computer Network / Rangkaian Komputer

Matlamat kursus ini adalah untuk memperkenalkan kepada pelajar mengenai konsep dan pratikal Komunikasi Data, Rangkaian Komputer dan Telekomunikasi. Ia mengandungi kuliah secara formal, makmal, tutorial, tugasan dan peperiksaan. Pelajar akan mengulangkaji konsep asas dan kemudian mengaplikasikan kepada siatuasi semasa yang berubah dengan pantas mengikut peredaran teknologi. Oleh kerana itu, pelajar perlu memahami reka bentuk protokol-protokol dan implemtasinya, pembangunan sistem perisian dan perkasasan rangkaian serta telekomunikasi dengan menekankan kepentingan pengukuran prestasi, memantau dan menganalisis serta

menggunakannya di dalam rangka kerja metodologi yang sesuai.

The aim of the course is to introduce students to the concepts, techniques and practices of Data Communications, Computer Networking and Telecommunications. It will consist of formal lectures, laboratory practical, tutorials, assignments, mid-term exam and final exam. The intention is to make the students learn the basic concepts, apply them and realize that in this fast moving complex subject area there is a need to understand design of protocols, implementation of protocols, development of networking and telecommunication software and hardware systems, and the importance of performance measures, monitoring and analysis and using it within the framework of suitable methodologies.

21. TP6014 Polisi dan Etika Maklumat / Information Ethics and Policy

Kursus ini membincang tentang governans maklumat, strategi pelaksanaan, komponen dan skop yang dicakupi selain daripada kemahiran yang diperlu bagi melaksana inisiatif governans maklumat. Pelajar turut dilengkapi dengan pengetahuan tentang hak capaian ke atas maklumat, menentu nilai maklumat bagi tujuan membuat keputusan dan berkeupayaan menderaf dasar governans maklumat. Kursus juga bertujuan membincang sama ada organisasi memberi keutamaan kepada hal ehwal maklumat terutamanya dari aspek pengurusan dan pentadbiran bagi menyerlah keandalan maklumat, ketelusan dan kebertanggungjawaban organisasi selain daripada etika penggunaan dan penyebaran maklumat.

This course discusses about information governance, the strategy of implementation, its component and scope, and the relevant skills for executing the initiative. Students will also be equipped with knowledge on the right to information access, determine the value of information with the aim for making decision and are also able to draft the information governance policy. This course also discusses whether organization gives priority to information matters especially the management and administration aspects with the hope to enhance the reliability, transparency and accountability of organisations. Also covered are ethics in using and dissemination

22. TP6024 Pengurusan Pengetahuan / Knowledge Management

Kursus ini bertujuan untuk mengemukakan terma-terma pengetahuan dan pengurusan pengetahuan serta pelbagai pendekatan yang boleh menyokong pengurusan pengetahuan. Pandangan koheren mengenai peranan pengetahuan dan pengurusan pengetahuan dalam organisasi dari perspektif pelbagai disiplin akan dibincangkan. Pelajar akan mendapat pengetahuan daripada sumber pengetahuan yang tidak berstruktur dan separa berstruktur serta mempelajari teknik-teknik semasa, peringkat dan proses yang menentukan amalan terbaik pengurusan pengetahuan. Teknik-teknik tersebut adalah: kepintaran buatan dalam mewakili dan memanipulasi pengetahuan; pengurusan dokumen untuk menilai pengetahuan prosedur dan mempersembahkannya dalam bentuk

kawalan aliran kerja. Pelajar akan diajar bagaimana meneroka, mengubah, berkongsi dan menguruskan pengetahuan melalui pendekatan berasaskan proses. Kursus ini mendedahkan pelajar kepada topik lain yang penting dan berkaitan seperti: konsep-konsep dari pengurusan rekod untuk menyokong pemilikan penilaian pengetahuan dan kesahihan proses pengetahuan. Sejauh mana teknologi moden boleh menyokong proses pengurusan pengetahuan; dan kemungkinan penyelesaian sosio-teknologi untuk memenuhi keperluan pengurusan pengetahuan dalam organisasi.

This course aims to present the terms knowledge and knowledge management and range of approaches that may support knowledge management. A coherent view on the role of knowledge and knowledge management in organizations from a multidisciplinary perspective will be discussed. Students will gain an appreciation of the sources of unstructured and semi-structured knowledge and learn current techniques, stages and processes that define good knowledge management practice. The techniques includes: artificial intelligent for representing and manipulating knowledge; document management for evaluating procedural knowledge and representing this in workflow controls. Students will be taught how to capture, to transfer, to share and to manage the knowledge in process-oriented approach. This course exposes students to other important and related topics such as: concepts from records management to support evaluating ownership of knowledge and validity of knowledge processes; The extent to which modern technology can support knowledge management processes; and possible socio-technological solution to satisfy the

knowledge management requirements of the organization.

23. TP6084 Capaian Maklumat / Information Retrieval

Kursus ini mendedahkan kepada pelajar takrif, masalah dan penyelesaian dalam capaian maklumat. Pelajar diperkenalkan dengan model capaian maklumat seperti model Boolean, model ruang vektor, model kebarangkalian dan model linguistik. Kaedah maklumbalas kerelevanan, pengelompokan dan pengembangan kueri dalam capaian maklumat juga dibincang. Konsep capaian maklumat yang diguna dalam teknologi enjin gelintar diteroka. Algoritma analisis pautan dalam enjin gelintar seperti algoritma PageRank dan HITS juga dibincang. Kaedah penilaian sistem capaian maklumat turut dibincang dengan terperinci.

The course introduces to students the definition, problems, and solutions of Information Retrieval (IR). Students will learn various IR models such as the Boolean model, the vector space model, the probability model and the linguistic model. The concepts of relevance feedback, clustering and query expansion will also be discussed. Techniques of IR used in search engine technology will be explored. Hyperlink analysis algorithm in search engines such as the PageRank algorithm and HITS will also be examined. Methods on IR evaluation will be discussed in detail.

24. TP6134 Capaian Maklumat Multimedia / Multimedia Information Retrieval

Capaian multimedia adalah tentang carian dan penghantaran mesej multimedia: gambar, muzik,

video, 3D animasi, dan kombinasi tersebut. Kursus ini berkaitan dengan aspek teknikal capaian multimedia: teknik, algoritma, dan struktur data untuk perumusan permintaan carian, deskripsi media, deskripsi padanan, mengindeks, penilaian prestasi, maklum balas relevan, dan lain-lain. Siri kuliah di peringkat awal akan memberi pengetahuan yang kritikal tentang aspek teknikal capaian multimedia, penyelidikan terhadap infrastruktur untuk menyokong skala besar, perpustakaan digital multimedia termasuk pangkalan data multimedia, mengindeks secara efisyen, penghantaran, dan masalah rangkaian. Penggabungan sistem pangkalan data multimedia akan meningkat kuantiti dan kualiti maklumat untuk dimanipulasi oleh pengguna dan capaian maklumat. Pelbagai jenis ciri, algoritma pemadanan, dan statistik penilaian bagi tujuan pengujian capaian maklumat multimedia turut dibincang.

Multimedia retrieval is about the search and delivery of multimedia: images, music, video, 3D scenes, and the combination of these. This course deals with the technical aspect of multimedia retrieval: techniques, algorithms, and data structures for search query formulation, media description, matching of descriptions, indexing, performance evaluation, relevance feedback, etc. During a number of initial lectures, a critical amount of knowledge is provided about the technical aspect of multimedia retrieval, research in infrastructure for supporting large-scale, distributed multimedia libraries includes multimedia databases, efficient indexing, transmission, and networking issues. The incorporation of multimedia database systems will improve the quantity and quality of information manipulated by computer users and information retrieval. In order to

experimentally verify various techniques, in practical we will experiment with different types of features, matching algorithms, and evaluation statistics for multimedia information retrieval.

25. TP6524 Ontologi dan Perwakilan Pengetahuan / Ontology and Knowledge Representation

Kursus ini bermatlamat untuk menjelaskan kepada pelajar dasar formal perwakilan pengetahuan berasaskan logik yang merangkumi kaedah penaakulan dan teknik aplikasi dalam perwakilan pengetahuan kepada permasalahan pengurusan data konvensional. Penekanan seterusnya diberi kepada logik deskripsi dan bahasa ontologi. Kursus ini akan memperkenal kepada pelajar dasar teori dan prinsip dalam kejuruteraan ontologi dan seterusnya pengikhtisaran perisian dan teknik untuk membangun dan menggunakan ontologi. Metodologi dan metod untuk membangun ontologi akan dihurai dan dibincangkan dengan terperinci. Pelajar akan memperoleh pelbagai kegunaan dan aplikasi ontologi dalam persekitaran sebenar dan mempersiapkan mereka untuk menjalankan penyelidikan dalam bidang ini.

The course aims to provide students with an understanding of the formal foundations of classical logic-based knowledge representation languages, with an overview of the reasoning methods for them, and of the application techniques developed in knowledge representation to classical data management problems. Emphasis will then be given on description logics and ontology languages. It will introduce students the theoretical foundations and principles of ontology engineering and also provide overview of software tools and techniques for the development and use of ontologies. Methodologies

and methods for building ontologies will be covered in detail. Students will acquire various uses and applications of ontology in the real-world and prepare them for doing research in this area.

26. TP6534 Pemprosesan Bahasa Tabii / Natural Language Processing

Kursus ini bertujuan untuk memperkenalkan teknik asas pemprosesan bahasa tabii dan menghubungkannya dengan beberapa isu penyelidikan semasa, serta menilai beberapa aplikasi semasa yang berpotensi. Ia meliputi teori piawai, model dan algoritma serta membincangkan penyelesaian kepada masalah, contoh sistem dan aplikasi dan mengetengahkan isu bidang penyelidikan. Di antara topik yang disentuh adalah sintaksis, semantik, wacana, pragmatik dan pengetahuan dunia nyata. Ini adalah bagi menghadapi masalah seperti pengelasan kata, penghuraian sintaktik, penyahtaksaan makna kata, dan pemprosesan wacana. Algoritma dan kaedah yang digunakan ialah kaedah berasaskan korpus, teknik berasaskan pengetahuan dan kaedah statistik. Aplikasi yang terlibat dalam penggunaan bahasa tabii seperti pengekstrakan maklumat, capaian maklumat, penterjemahan mesin, sistem soal jawab, dan pemprosesan pertuturan juga akan dibincangkan.

This course aims to introduce the fundamental techniques of natural language processing and relating it to some current research issues, and to evaluate some current and potential applications. It covers standard theories, models and algorithms, discussing competing solutions to problems, describing example systems and applications, and highlighting areas of open research. Among the

topics discussed are syntax, semantic, discourse, pragmatic and real world knowledge. These are required to overcome problems of part-of-speech tagging, syntactic parsing, word sense disambiguation and discourse processing. Algorithms and methods used will be corpus-based processing, knowledge-based techniques and statistical methods. Applications involving NLP techniques such as information extraction, information retrieval, machine translation, question answering systems, and speech processing will also be discussed.

27. TR6344 Pengurusan Rantai Bekalan / Supply Chain Management

Pengenalan kepada pengurusan rantai bekalan: Konfigurasi Rangkaian Logistik; Pengurusan inventori khususnya 'variability'; Kepentingan maklumat (khususnya kesan bullwhip); Strategi Pengedaran; Pakatan strategik (contohnya 3PL); Koodinasi rekabentuk produk dan rantai bekalan; Nilai pengguna; Sukatan prestasi (metrik prestasi) sesebuah rantai bekalan. Isu antarabangsa dalam pengurusan rantai bekalan.

Introduction to supply chains and supply chain management; Logistic network configuration; Inventory management especially in the management of variability; The role of information sharing (the bullwhip effect); Distribution strategies; Strategic partnerships (for example 3PL); Supply chain coordination and product design; customer value; Performance measures (performance metrics); International issues in supply chain management

28. TR6364 Kawalan Proses Berstatistik / Statistical Process Control

Kursus ini membincangkan kawalan kualiti berstatistik merangkumi: pengenalan dan sejarah kualiti, pemodelan kualiti dalam industri, alat kawalan kualiti, carta kawalan pemboleh ubah, carta kawalan attribut dan analisis keupayaan. Pelajar akan mengkaji amalan kawalan kualiti dalam industri dan mencadang penyelesaian bagi masalah kualiti.

This course discusses statistical process control including introduction and history of quality, modelling process quality, quality control tools, variable control chart, attribute control chart and capability analysis. Students will examine quality control practice in industry and suggest solution for quality issue.

29. TR6534 Computer Integrated Manufacturing / Integrasi Komputer dalam Pembuatan

Kursus ini memberi penekanan kepada pengintegrasian di dalam sesuatu enterprise pembuatan berasaskan teknologi integrasi-komputer dalam pembuatan (CIM). Antara topik yang dibincangkan adalah penggunaan komputer dalam aktiviti pembuatan seperti reka bentuk-berbantukan komputer (CAD), pembuatan berbantukan komputer (CAM) dan juga sub-sistem yang lain dalam CIM. Selain itu ia melibatkan pengurusan pangkalan data, kemudahan, dokumentasi produk, dan operasi pembuatan, perancangan proses, kawalan dan perancangan pengeluaran, teknologi berkumpulan, dan pengurusan dan operasi pembuatan. Tujuan CIM adalah untuk memudahkan proses pengeluaran, membantu dalam mereka bentuk produk, dan

mengorganisasi kilang sebagai asas untuk automasi dan integrasi. Selain itu, CIM juga membolehkan proses pengeluaran dan fungsi perniagaan dilakukan secara automatik. Ini disokong oleh penggunaan komputer, mesin, dan robot. CIM akan mengintegrasi semua proses sokongan dan pengeluaran mengguna rangkaian komputer, perisian, dan teknologi informasi yang berkaitan.

This course emphasizes the integration of manufacturing enterprise using computer-integrated manufacturing (CIM) technologies. Some of the topics that will be discussed are CAD, CAM and other CIM sub-systems, database management, facility layout, product documentation, process planning, production planning and control, Group technology, and manufacturing operations and management. CIM objectives are to simplifying production processes, aid in designing products, and organised factory as a vital foundation to automation and integration. Furthermore, CIM can automate production processes and business functions that are supported with computers, machines, and robot. CIM will integrate all production and support processes using computer networks, cross-functional business software, and other information technologies.

30. TR6584 Pemodelan dan Simulasi Industri / Industrial Simulation and Modelling

Kursus ini berkaitan konsep sistem masa nyata, khususnya sistem kawalan masa nyata dan juga sistem terbenam. Pelajar akan didedahkan kepada komponen-komponen sistem masa nyata dan cara untuk membangunkan sistem tersebut. Selain daripada itu, kursus ini juga merangkumi beberapa tajuk penting di dalam sistem masa nyata seperti analisis jaring Petri dan penjadualan masa nyata.

Pelajar dikehendaki untuk melakukan aktiviti makmal bagi mengecam dan membangun sistem kawalan masa nyata menggunakan PLC (Programmable Logic Controller), sistem kawalan berasaskan komputer dan bola sepak robot.

This course is related to the concept of real-time systems, in particular real-time control systems and embedded systems. Students will be exposed to components of real-time systems and methods for developing a real-time system. Besides, the course will also cover some important topics in real-time systems such as Petri-net analysis and real-time scheduling. Students are required to participate in laboratory activities for developing real-time systems by using PLC (Programmable Logic Controller), computer based control system and robot soccer.

31. TU6124 Pemodelan Proses Bisnes / Business Process Modeling

Pengurusan Proses Bisnes (Business Process Management, BPM) ialah satu konsep, kaedah, dan alatan bagi membantu organisasi mendefinasi, melaksana, menilai, dan memperbaiki proses. BPM ialah gabungan beberapa konsep organisasi seperti business process reengineering, Six Sigma, dan pengurusan kualiti menyeluruh. Ia menggunakan alatan seperti pengurusan aliran kerja, analisis proses, perlombongan proses, dan SOA. BPM membantu organisasi menjadi lebih efisien dengan mengkoordinasi aktiviti dan mengintegrasi aplikasi kepada proses. Kursus ini melihat keperluan organisasi awam dan swasta dalam inisiatif BPM. Beberapa kajian kes perlu dilalui oleh pelajar bagi memberi kemahiran bagaimana mengaplikasi BPM.

Business Process Management (BPM) is a concept, method, and tool in supporting organisations to define, implement, evaluate, and improve their business process. Many BPM's business models introduced will allow selections of the best BPM process model for organisations to use; based on their conditions and identifications of business models' weaknesses and eventually to come up with new recommendation(s) to improve it. It uses tools such as Workflow Management, Analysis Process, Mining Process, and Service Oriented Architecture (SOA). The main objective of BPM is improving organisational efficiency through activities coordination and application integration into process. This course overlook the requirement of public and private organisations within the BPM's initiative. To improve students' skills in using the BPM, some case studies will be used throughout this course.

32. TU6214 Sistem Sokongan Kataputus dan Eksekutif / Decision Support and EIS

Pendekatan sistem dalam penyelesaian masalah akan diperkenalkan terutamanya dari segi penyelesaian masalah organisasi. Pelajar akan didedahkan kepada kepentingan maklumat dalam sesuatu organisasi untuk penyelesaian masalah dan juga pembuatan keputusan.Tajuk sistem sokongan keputusan, sistem pengurusan pangkalan data, gudang data, sistem pengurusan model, sistem pengurusan penjana dialog, sistem sokongan keputusan berkumpulan, sistem maklumat eksekutif dan pengurusan pengetahuan akan dibincangkan. Beberapa pendekatan pembangunan sistem sokongan keputusan dan sistem maklumat eksekutif juga akan dibincangkan dan pelajar akan

diminta membangunkan suatu sistem maklumat eksekutif di akhir kursus ini.

The System Approach in problem solving will be introduced especially in the context of organisastion problems. Students will be exposed to the importance of information in an organisation for its problem solving and also for its decision making. Topics such as decision support system, data base management system, data warehouse, model management system, dialot generators management system, group decision support system, executive information system, and knowledge management will be discussed. Some developmental approaches for decision support system and executive information system will also be discussed. Students will be required to develop an executive information system at the end of this course.

33. TU6234 Gudang Data / Data Warehousing

Kursus ini memperkenalkan prinsip lanjutan dalam reka bentuk dan pengurusan gudang data. Tujuan kursus ini adalah untuk memberi pendedahan kepada pelajar aspek gudang data dari segi teori dan juga praktikal. Antara kandungannya ialah: terminologi gudang data, permodelan dimensional menggunakan skema bintang dan skema snowflake, perbezaan di antara proses transaksi atas-talian (OLTP) dan proses analitik atas-talian (OLAP), reka bentuk dan implementasi gudang data yang efisyen, reka bentuk data mart, proses pengekstrakan, transformasi dan umpukan, dan pengurusan gudang data. Selain itu kursus ini turut menekankan aspek analisis gudang data menggunakan teknologi kepintaran bisnes.

This course introduces advanced principles and management of data warehouse. The aim of this course is to teach theoretical as well as practical aspects of data warehousing. The main topics covered include: general data warehousing terminology, dimensional modelling using star schema and snowflake schema, differences between online transaction processing (OLTP) and online analytical processing (OLAP), efficient data warehouse design and implementation, data extraction, transformation, and loading process (ETL), presentation of data, data mart design, and administration of data warehouses. The course also emphasizes data warehouse analysis using business intelligence technologies.

34. TU6294 Pengurusan Projek dan Perubahan / Project and Change Management

Pengurusan projek dan perubahan merupakan antara aktiviti-aktiviti penting dalam pembangunan sistem maklumat berkomputer. Pengurusan projek membabitkan pengurusan aktiviti yang terlibat dalam memenuhi keperluan projek melalui sembilan ilmu asas yang berhubungkait antara satu sama lain. Sembilan Ilmu asas yang terbabit ialah: pengurusan integrasi, pengurusan skop, pengurusan masa, pengurusan kos, pengurusan kualiti, pengurusan sumber manusia, pengurusan komunikasi, pengurusan risiko, dan pengurusan perolehan projek. Manakala, pengurusan perubahan membabitkan pengurusan individu-individu berkepentingan yang terkesan daripada perubahan yang berlaku di dalam projek. Faktor-faktor utama yang mempengaruhi pergurusan perubahan terdiri dari keadaan pasaran, permintaan pelanggan, kemajuan teknologi, kos input, jangkaan pemegang saham dan persaingan.

Kursus ini akan mendedahkan pelajar kepada konsep dan teknik yang merangkumi sembilan ilmu asas pengurusan projek dan perubahan.

Project and change management are part of the important activities in computerized information systems development. Project management involves managing the activities to meet the project requirements through nine fundamental areas of knowledge that are interconnected. The nine fundamentals are: project integration management, scope management, time management, cost management, quality management, human resource management, communications management, risk management and procurement management. Change management involves managing the staked individuals impacted by the changes in the project. Major factors that influenced the change management include the market conditions, customer demands, emerging technologies, input costs, shareholder expectations and competition. This course will expose the students to the concepts and techniques from the nine fundamentals of project management and change management.

35. TU6414 Pengurusan Teknologi Maklumat / Management of IT

Kursus ini membincangkan tentang isu berkaitan pengurusan sistem maklumat dalam organisasi termasuk polisi, strategi dan perancangan TM. Tajuk kursus merangkumi pengurusan fungsian jabatan TM, perolehan TM, pelaburan dan penilaian TM dan perancangan TM organisasi: hala tuju, keperluan maklumat dan pelaksanaan.

The course is intended to cultivate and exercise knowledge pertinent to various types of IT

management in organisation including policy, strategy, and IT planning. The following topics will be covered in the course: functional management of IT department; IT acquisition, IT investment and measurement, and organisational IT planning: direction, information requirement, and implementation.

36. TX6114 Computer Security

This course presents the basic paradigms and principles of computer security technology and mechanism in modern computer systems. At the end of this course, participants should be able to solve computer security problems in a structured manner.

37. TX6124 Network Security

This course presents the concept and knowledge of network security protocols and its applications.

38. TX6134 Cyber Law and Ethics

This course analyses the phenomena of cyber crime, legal and investigation/evidential issues, to enable participants to associate the evolution of criminal behaviour and technology advancement.

39. TX6144 Information Security Management

This course includes a conceptual overview and practical approach to information security management. It focuses on risk management, business continuity management and incident management

40. **TX6224 Intrusion Detection and Prevention**
    The course covers methodology, technique, and tools for monitoring events in computer or network for preventing and detecting unwanted process activity, recognizing and recovering from malicious behaviour.

41. **TX6244 Ethical Hacking and Penetration Testing**
    This course concerns with assessing target networks and systems to identify security vulnerabilities from both internal and external threats. The assessment is performed through penetration testing and ethical hacking procedures.

42. **TX6254 Security Audit and Assessment**
    This course introduces techniques in internal audit, and security control in ICT environment, consisting of network, application and operating systems.

43. **TD6104 Fundamental of Digital Forensics**
    This course covers the introduction to investigation, the methodology of conducting forensics related cases and the standards, guideline and handling quality cases. This course also includes forensic laboratory and challenges in present and future digital forensics.

44. **TD6214 Data Recovery and Analysis**
    This course introduces the fundamental of data recovery, and analysis methods for different types of digital devices and scenarios. Participants will be exposed to advanced techniques and methods for

analyzing evidence on cyber world such as artificial intelligence tools.

45. TD6314 Digital Media Forensic Analysis

This course is about forensics analysis on various types of digital files; including documents, audio, video and images. This course also discusses about file structure and analysis method. At the end of the course, participants will be exposed to digital forensics case solution and writing forensic case report.

46. TS6024 Pemodelan Maklumat dan Pangkalan Data/ *Information Modeling and Databases*

Kursus ini memberikan pelajar asas yang kukuh dalam mereka bentuk dan implemetasi pangkalan data. Kursus ini tertumpu kepada aktiviti mereka bentuk pangkalan data, dan menunjukkan bahawa kejayaan implementasi pangkalan data adalah melalui reka bentuk yang baik dari sudut pandangan strategik persekitaran data. Contoh sebenar diberikan sebagai latihan perbincangan berkumpulan bagi membantu pelajar membina kemahiran mereka bentuk aplikasi pangkalan data yang bermakna dan bernilai di dunia sebenar.

This course provides students with a solid foundation in practical database design and implementation. The course provides in-depth coverage of database proper design of databases to fit within a larger strategic view of the data environment. With a strong hands-on component that includes real-world examples and exercises, this course will help students develop database design skills that have valuable and meaningful application in the real world.

47. TY6024 Informatik Kesihatan/ *Health Informatics*

Kursus ini direka bentuk untuk memperkenalkan pelajar kepada konsep asas, prinsip, aplikasi, dan proses berkaitan Informatik Kesihatan. Kursus ini menawarkan pengenalan asas tetapi menyeluruh kepada isu utama dan perkembangan di dalam bidang ini. Ia menyediakan rangka kerja untuk memahami jenis sistem maklumat yang terdapat di dalam organisasi penjagaan kesihatan. Pelajar akan didedahkan kepada konsep tertentu yang berkaitan dengan rekod perubatan elektronik (EMR), data kesihatan dan standard. Apabila tamat kursus ini, pelajar dapat menerangkan keperluan maklumat penting untuk pengurusan maklumat kesihatan yang efektif dan sokongan keputusan, dan melaksanakan kemahiran ini kepada masalah dunia sebenar.

This course is designed to introduce the student to fundamental concepts, principles, applications, and processes in Health Informatics. The course offers a basic but comprehensive introduction to major issues and developments in the field. It provides a framework to understand the types of information systems prevalent in healthcare organizations. Student will be exposed to specific concepts related to electronic medical records (EMR), health data and standards. Upon completion of the course, student should be able to explain the key information requirements for effective health information management and decision support, and apply these competencies to real-world problems.

48. TY6034 Analisis dan Rekabentuk Sistem Maklumat Kesihatan/ *Health Information System Analysis And Design*

Kursus ini disediakan untuk mendedahkan pelajar kepada persekitaran pembangunan sistem maklumat kesihatan menggunakan kitar hayat pembangunan sistem. Melalui pendedahan ini pelajar akan memperolehi pengetahuan yang mendalam tentang menganalisis dan merekabentuk sistem maklumat dalam menyokong keperluan operasi dan bisnes. Pelajar akan belajar membangunkan prototaip asas sistem maklumat kesihatan secara sistematik berdasarkan kepada analisis dan merekabentuk yang dikendalikan. Melalui kursus ini, pelajar berupaya menilai sistem maklumat kesihatan yang digunapakai berdasarkan kepada kaedah penilaian yang piawai.

This course is prepared to expose student to health information systems development environment based on system development life cycle. Through this exposure, student will obtain in depth knowledge on analyzing and designing health information systems in supporting operation and business requirement. Students will learn to develop simple prototype of health information systems systematically based on the conducted analysis and design. In this course, students will be able to learn how to evaluate the existing health information system based on a standard evaluation method.

49. TY6044 Senibina Enterpris bagi Sistem Maklumat Kesihatan/ *Enterprise Architecture for Health Information Systems*

Kursus ini bertujuan untuk memperkenalkan asas pengetahuan tentang Seni Bina Enterpris (EA) dan mata pelajaran yang berkaitan untuk pembangunan.

Ia bermula dengan pengenalan kepada pengkomputeran pelanggan-pelayan dan komponennya. Kemudian, ia merangkumi pemahaman EA sebagai bidang utama kejuruteraan enterpris yang menyediakan kesepaduan operasi institusi kesihatan untuk misi dan matlamat, keadaan semasa sebuah institusi, ketelusan proses, kawalan dan meningkatkan prestasi dengan menggunakan teknologi maklumat (IT). Kursus ini merangkumi asas pemodelan proses perniagaan dan penghasilan teknologi maklumat dan seni bina. Asas dalam kejuruteraan perusahaan seperti model utama dan metodologi pembangunan perusahaan juga dibincangkan. Kursus ini akan menyediakan para pelajar dengan kemahiran untuk analisis, pembangunan, pengujian, penyelesaian masalah dan pentauliahan projek HL7. Piawaian lain seperti DICOM, GS1, SNOMED, LOINC, IHE, NEHTA, dan XML juga diterokai. Kursus ini juga memperkenalkan Orientasi Perkhidmatan dalam pembangunan EA sebagai sumber kelebihan daya saing yang mampan (CA).

This course aims to introduce the basic level of knowledge about the Enterprise Architecture (EA) and it related subjects for Health Informatics System(HIS) development. It will begin with an introduction to enterprise client-server computing and its components. Then, it covers the understanding of EA as a key area of enterprise engineering that provides the coherence of health institution operations to its mission and goals, the actuality of current state of an institution, transparency of its processes, controlled transformation of its asserts, and increase performance using information technologies (IT). The course incorporates the basics of business-process modelling, and creating information and

technology architectures. The basics in enterprise engineering i.e. main models and methodologies of enterprise building are also discussed. This course will provide the participants with the skills for the analysis, development, testing, problem solving and commissioning of an HL7 project. Other standards such as DICOM, GS1, SNOMED, LOINC, IHE, NEHTA, and XML are explored. Last but not least the course embraces the Service Orientation during EA building as a source of sustainable competitive advantage (CA).

50. TY6054 Pengurusan Teknologi Maklumat/ *Management of Information Technology*

Kursus ini bertujuan untuk memupuk dan mempraktikkan pengetahuan berkaitan dengan pelbagai jenis pengurusan teknologi maklumat(TM) dalam organisasi termasuk dasar, strategi dan perancangan TM. Topik yang akan dibincangkan dalam kursus ini termasuk pengurusan fungsi jabatan TM; pemerolehan TM, pelaburan TM dan pengukuran serta perancangan organisasi TM: arahan, keperluan maklumat dan pelaksanaan.

The course is intended to cultivate and exercise knowledge pertinent to various types of IT management in organisation including policy, strategy, and IT planning. The following topics will be covered in the course: functional management of IT department; IT acquisition, IT investment and measurement, and organisational IT planning: direction, information requirement, and implementation.

51. TY6064 Undang-undang dan Etika Penjagaan Kesihatan/ *Law and Ethics in Healthcare*

Tujuan kursus ini adalah untuk melengkapkan pelajar dengan pengetahuan dan kemahiran yang diperlukan untuk memahami isu undang-undang dan etika yang timbul dalam amalan penjagaan kesihatan dan berupaya menilai keadaan yang mungkin mempunyai implikasi undang-undang atau etika. Di samping itu, pelajar dijangka dapat menentukan bila untuk mendapatkan nasihat undang-undang atau jawatankuasa etika dan mempunyai pemahaman tentang implikasi undang-undang penjagaan kesihatan di atas keputusan yang dibuat. Topik termasuk undang-undang penjagaan kesihatan, piawaian profesional, kecuaian dan penyelewengan, rekod perubatan dan badan yang mengawal selia aspek perkhidmatan kesihatan.

The aim of this course is to equip the student with the knowledge and skills necessary to recognize legal and ethical issues that arise in healthcare practice and to be able to evaluate the situations that may have legal or ethical implications. In addition, the students are expected to know when to seek legal or ethics committee counsel and to have an understanding of the implications of health care law on their own decision making. Topics include health care law, professional standards, negligence and malpractice, medical records and governing bodies that regulate aspects of health services delivery.

52. TR6124 Kaedah Statistik Bagi Analisis Data/ *Statistical Methods for Data Analytics*

Kursus ini membincangkan konsep penting dalam statistik bagi menjalankan analisis data. Pelajar akan menguasai teknik pensampelan data serta berupaya mengolah dan mempersembah data.

Konsep kebarangkalian akan diaplikasi dalam melaksanakan analisis pentaabiran. Pelajar dilatih untuk membuat generalisasi keputusan terhadap populasi kajian. Perisian statistik diguna dalam proses analisis data.

This course discusses important concepts in statistics for data analysis. Students are able to perform data sampling technique, process and present data. Probability concepts will be applied in carrying out inferential analysis. Students are trained to generalize the results towards the study population. Statistical software will be used in data analysis process.

53. TP6234 Analisis Data Tidak Berstruktur/ *Unstructured Data Analytics*

Kursus ini bertujuan untuk memperkenalkan teknik asas pemprosesan bahasa tabii dan kaedah analitikal teks serta menghubungkannya dengan beberapa isu penyelidikan semasa. Ia meliputi teori piawai, model dan algoritma serta membincangkan penyelesaian kepada masalah, contoh sistem dan aplikasi dan mengetengahkan isu bidang penyelidikan. Di antara topik yang disentuh adalah sintaksis, semantik, wacana, pragmatik dan pemilihan fitur. Ini adalah bagi menghadapi masalah seperti pengelasan kata, penghuraian sintaktik, penyahtaksaan makna kata, dan klasifikasi teks. Algoritma dan kaedah yang digunakan ialah kaedah berasaskan korpus, teknik berasaskan pengetahuan dan kaedah statistik. Aplikasi yang terlibat dalam penggunaan bahasa tabii seperti pengekstrakan maklumat, klasifikasi dokumen, penterjemahan mesin, sistem soal jawab dan analisis sentimen juga akan dibincangkan.

This course aims to introduce the fundamental techniques of natural language processing and text analytics and relating them to some current research issues. It covers standard theories, models and algorithms, discussing competing solutions to problems, describing example systems and applications, and highlighting areas of open research. Among the topics discussed are syntax, semantic, discourse, pragmatic and feature selection. These are required to overcome problems of part-of-speech tagging, syntactic parsing, word sense disambiguation and text classification. Algorithms and methods used will be corpus-based processing, knowledge-based techniques and statistical methods. Applications involving NLP techniques such as information extraction, information retrieval, machine translation, question answering systems, and sentiment analysis will also be discussed.

54. TS6024 Pemodelan Maklumat dan Pangkalan Data/ *Information Modelling and Databases*

Kursus ini memberikan pelajar asas yang kukuh dalam mereka bentuk dan implemetasi pangkalan data. Kursus ini tertumpu kepada aktiviti mereka bentuk pangkalan data, dan menunjukkan bahawa kejayaan implementasi pangkalan data adalah melalui reka bentuk yang baik dari sudut pandangan strategik persekitaran data. Contoh sebenar diberikan sebagai latihan perbincangan berkumpulan bagi membantu pelajar membina kemahiran mereka bentuk aplikasi pangkalan data yang bermakna dan bernilai di dunia sebenar.

This course provides students with a solid foundation in practical database design and implementation. The course provides in-depth coverage of database

design, demonstrating that the key to successful database implementation is in proper design of databases to fit within a larger strategic view of the data environment. With a strong hands-on component that includes real-world examples and exercises, this course will help students develop database design skills that have valuable and meaningful application in the real world.

55. TU6434 Pengurusan dan Analisis Data Raya/ Big Data Analytics and Management

Matlamat kursus ini adalah untuk pelajar mengenali dan memahami asas konsep pengurusan data gadang dan analisis supaya mereka akan menjadi kompeten dalam mengenalpasti cabaran yang dihadapi oleh aplikasi yang memproses jumlah data yang sangat besar serta berupaya mencadangkan penyelesaian boleh skala; dan memahami bagaimana kesan data gadang kepada risikan perniagaan, penemuan saintifik dan masyarakat. Kursus membincangkan beberapa teknologi maklumat penting yang digunakan dalam memanipulasi, menyimpan dan menganalisis data gadang. Kursus ini akan memberi tumpuan kepada bagaimana untuk mengendali, melombong dan menganalisis jumlah data yang sangat besar. Kursus ini juga bertujuan untuk melengkapkan pelajar dengan keupayaan teknikal untuk merangka penyelesaian boleh skala untuk pelbagai kelas masalah pemprosesan data gadang. Kursus ini memberi peluang kepada pelajar untuk bekerja dengan data dari masalah dunia sebenar dengan (I) melaksanakan penyelesaian pemprosesan data berskala besar menggunakan alat pengkomputeran bertumpuan-data pilihan mereka; (II) menggerakkan pelaksanaannya pada Cloud; (III) menanda aras penyelesaian mereka. MapReduce

dan NoSQL akan digunakan sebagai alat untuk mewujudkan algoritma selari yang boleh memproses jumlah data yang sangat besar. Penyelesaian berasaskan storan NoSQL akan dianalisis untuk ciri kritikal seperti kelajuan membaca dan menulis, konsistensi data dan keupayaan boleh skala untuk jumlah data yang besar. Hadoop dan rangka kerja sumber terbuka akan dikaji bagi membolehkan perlaksanaan MapReduce dengan murah dan efisyen pada masalah berskala Internet. Kursus ini juga meliputi alat berkaitan yang menyediakan SQL seperti akses kepada data yang tidak berstruktur seperti Pig dan Hive.

The goal of this course is to familiarize students with the fundamental concepts of Big Data management and analytics so that they will become competent in recognizing challenges faced by applications dealing with very large volumes of data as well as in proposing scalable solutions for them; and will be able to understand how Big Data impacts business intelligence, scientific discovery and society . This course brings together several key information technologies used in manipulating, storing, and analyzing big data. This course will focus on how to handle, data mine and analyze very large amounts of data or Big data. This course is also aimed to equip students with the technical capability to devise scalable solutions to various classes of big data processing problems. This course will allow the students with an opportunity to work on a real-world data problem by (I) implementing large-scale data processing solutions using data-centric computing tools of their choice; (II) deploying their implementations on a compute cloud service; (III) benchmarking their solutions. MapReduce and NoSQL will be used as tools/standards for creating

parallel algorithms that can process very large amounts of data. NoSQL storage solutions will be analyzed for their critical features: speed of reads and writes, data consistency, and ability to scale to extreme volumes. The course material will be drawn from textbooks as well as recent research literature. We review Hadoop, an open source framework that allow us to cheaply and efficiently implement MapReduce on Internet scale problems. This course also covers related tools that provide SQL-like access to unstructured data: Pig and Hive.

PROSPEKTUS SISWAZAH

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