

APUTERAN

Foculty of Computing

ACADEMIC GUIDELINES FACULTY OF COMPUTING POSTGRADUATE 2023/2024

Inspiring Digital Talents



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Faculty of Computing

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Inspiring Digital Talents

2023 / 2024

Postgraduate Handbook (Curriculum and Syllabus) 2023/2024



OUR VISION & MISSION



To be a recognised world-class faculty with academic and research excellence in computing technology MISSION To develop future-oriented and industryrelevant digital talents, innovative solutions, and effective services in computing technology that will contribute to the nation's wealth

creation.

OUR STRATEGIC OBJECTIVES



- **SO1** Produce excellence and future-oriented talents in computing research and education.
- STRATEGIC OBJECTIVES
- **SO2** Produce life ready graduates with premium employment and contribute professionally and ethically in society.
- SO3 Enhance and strengthen flexible inclusive computing education
- **SO4** Championing for excellence computing research.
- **SO5** Provide the best services and facilities to support the faculty's strategy and desired stakeholders' experience.

FOREWORD BY THE DEAN

Assalamu'alaikum and welcome to the Faculty of Computing, the pioneer in computing higher education in this country that has offered academic programs for nearly 40 years. In today's rapidly evolving world, computing is at the forefront of innovation, shaping how we live, work, and interact. Our goal is to develop cutting-edge digital talents, industry-relevant solutions, and efficient services in computing technology. We have been actively developing and revising our undergraduate and postgraduate curriculums to fulfill the requirements of program standards, industries, and other stakeholders.

In supporting the teaching-research nexus initiative, we have six research groups that cover the niche areas under the computing body of knowledge and state of practice. The faculty received a high number of research and consultancy grants to boost our research activities, translating into an increment in the number of research assistants and postgraduate students. The quality of research is manifested by the list of high-impact journals, patents, and copyrights.

Our faculty is not just a place to gain knowledge; it's a community that will support you throughout your academic journey. Our professors are not just educators but mentors and guides committed to helping you succeed. Our facilities are not just buildings but spaces for you to explore, innovate, and create.

In closing, remember that you are not just students; you are the future of computing. Your ideas, innovations, and passion will shape tomorrow's technological landscape. I look forward to seeing you flourish and leave your mark on the computing world. Thank you.





MANAGEMENT TEAM FACULTY OF COMPUTING



FACULTY'S ADMINISTRATOR



OUR DEAN

Prof. Ts. Dr. Wan Mohd Nasir bin Wan Kadir



DEPUTY DEAN

(ACADEMIC & STUDENT AFFAIRS)

Prof. Ts. Dr. Dayang Norhayati binti Abang Jawawi



DEPUTY DEAN

(RESEARCH, INNOVATION & DEVELOPMENT)

Assoc. Prof. Dr. Siti Zaiton binti Mohd Hashim



POST GRADUATE ACADEMIC MANAGER

Dr. Zalmiyah binti Zakaria



EXTERNAL PROGRAMME ACADEMIC MANAGER

Dr. Ismail Fauzi bin Isnin



RESEARCH MANAGER

Assoc. Prof. Dr. Mohd Murtadha bin Mohamad



DIRECTOR COMPUTER SCIENCE DEPARTMENT

Prof. Ts. Dr. Md Asri bin Ngadi

Postgraduate Handbook (Curriculum and Syllabus) 2023/2024



DIRECTOR SOFTWARE ENGINEERING DEPARTMENT

Assoc. Prof. Dr. Radziah binti Mohamad



DIRECTOR APPLIED COMPUTING AND ARTIFICIAL INTELLIGENCE

Dr. Sharin Hazlin binti Huspi



DIRECTOR EMERGENT COMPUTING DEPARTMENT

Ts. Dr. Farhan bin Mohamed



DEPUTY REGISTRAR

Mr. Masnawi bin Miskam



ASSISTANT REGISTRAR (ADMIN, HR & FINANCE)

Mdm. Tan Hooi Luang



KNOWLEDGE MANAGEMENT/ RESEARCH CONSULTANT OFFICER

Mdm. Haslinda binti Sabari



FACILITY MANAGER

Ts. Mohd. Hazri bin Ishak



IT MANAGER

Mr. Mohamad Nazri bin Samin

FACULTY PROFILE

The history of Faculty of Computing (FC) began in 1981 when it was known as Department of Computer Science, under the wings of Faculty of Science. This department began its operation at UTM Gurney Road Kuala Lumpur where it received its first intake of Computer Science Integration Programme students. This programme integrated the programme of Diploma with Bachelor of Science (BSc) of Computer Science. In 1984, the department was established as Institute of Computer Science that consisted of Academic Unit and Administrative Computing Unit.



In 1991, the Institute was separated from the Administrative Computing Unit and be elevated to a faculty status knows as Faculty of Computer Science and Information Systems. The year also marked the first intake of Master of Science (MSc) and Doctor of Philosophy (PhD) of Computer Science students. The establishment of new faculty, increasing student and staff populations, and demands for facilities have resulted in a move to the UTM main campus in Skudai, Johor in 1995. As the years go by, the faculty has seen a significant increasing number of students due to the popularity of its high quality postgraduate academic programmes. The number of postgraduate students and staff, and demands for more sophisticated facilities has resulted in additional 5-storey building in 2012 to provide a conducive environment for teaching, learning and research.

In January 2013, once again the faculty made a significant stride by rebranding the faculties name from Faculty of Computer and Information System to Faculty of Computing. Branding the organisational restructuring and strengthening the academic programmes as well the faculty researches will hopefully make it in line with the university vision to be recognized as a world class centre of academia and technological excellence.





Faculty of Computing's Journey



FACTS AND FIGURES



FACULTY MEMBERS





PROGRAM OF STUDY AND CURRICULUM FACULTY OF COMPUTING 2023/2024

PROGRAMMES OFFERED

- Doctor of Philosophy, Field: Computer Science / Informatics Engineering / Software Engineering
- Master of Philosophy, Field: Computer Science / Software Engineering
- Master of Computer Science
- Master of Science (Data Science)
- Master in Innovative Computing

DOCTOR OF PHILOSOPHY FIELD: COMPUTER SCIENCE / INFOMATICS ENGINEERING / SOFTWARE ENGINEERING

PROGRAMME SPECIFICATIONS

The Doctor of Philosophy, Field: Computer Science (PECS) / Infomatics Engineering (PECI) / Software Engineering (PECQ) is offered on a full-time basis. The programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the programme is subjected to the student's entry qualifications and lasts between three (3) years to a maximum of eight (8) years.

The programme is offered full-time only and is based on a 2-Semester per academic session. This is a full research programme. The candidate is supervised by a qualified academic staff. The directed research work introduces candidates to the process by which new knowledge is developed and applied accordingly. Assessment is done by examining first assessment reports (research proposal), each semester's progress reports, and thesis examination (viva-voce).

1. Awarding Institution University			Universiti Teknologi Ma	laysia
2. Teaching Institution		Universiti Teknologi Malaysia		
3. Program	nme Name		Doctor of Philosophy	
4. Final Aw	/ard		Doctor of Philosophy	
5. Program	nme Code		PECSA3AJA / PECIA3/	AJA / PECQA3AJA
6. Professional or Statutory Body of Accreditation		Ministry of Higher Education		
7. Language(s) of Instruction		English		
8. Mode of Study (Conventional, distance learning, etc)		Conventional		
9. Mode of operation (Franchise, self- govern, etc)		Self-governing		
10. Study S	cheme		Full Time	
11. Study Duration		Minimum: 6 semesters Maximum:16 semesters		
Type of Minimum No. of Semester		Maximum No of Semester		
Semester	Full Time	Part Time	Full Time	Part Time
Normal	6	-	16	-
Short	-	-	-	-

General Information

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses	3	100%
ii.	Core Courses	0	0%
iii.	Research	0	0%
	Total	3	100%
Total Credit Hours to Graduate		3 credit hours	

COURSE MENU

Doctor of Philosophy students are required to register and pass the following courses before their first assessment (proposal defense).

- i. Research Methodology Course (course code UECP6013).
- ii. One University Elective Course (course code U*** ***3).

YEAR 1: SEMESTER 1					
Code	Course	Credit	Pre-requisite		
UECS6013	IT Project Management				
	Seminar on Development, Economics and				
011AF0013	Global	3			
UICW6023	Philosophy Science and Civilization				
UHAZ6123	Malaysian Society and Culture				
UECP6013	Research Methodology	0			
PECS1100 /					
PECI1100 /	* Research	0			
PECQ1100					
	TOTAL CREDIT	3			
	CUMULATIVE CREDITS	3			

YEAR 1: SEMESTER 2					
Code	Course	Credit	Pre-requisite		
PECS1200 /					
PECI1200 /	* Research	0			
PECQ1200					
	TOTAL CREDIT	0			
	CUMULATIVE CREDITS	3			

* Research (course code PEC***00), to be taken every semester until the submission of a thesis. The progress of a candidate in any semester is assessed through research progress reports submitted at the end of each semester. It is important for the students to know that the submission of the progress report needs to be done by the student themselves via GSMS website http://spsapp3.utm.my:8080/gsmsv4/.

RESEARCH CODE

Semester	Research Course Code
1	PECS1100 / PECI1100 / PECQ1100
2	PECS1200 / PECI1200 / PECQ1200
3	PECS2100 / PECI2100 / PECQ2100
4	PECS2200 / PECI2200 / PECQ2200
5	PECS3100 / PECI3100 / PECQ3100
6	PECS3200 / PECI3200 / PECQ3200
7	PECS4100 / PECI4100 / PECQ4100
8	PECS4200 / PECI4200 / PECQ4200
9	PECS5100 / PECI5100 / PECQ5100
10	PECS5200 / PECI5200 / PECQ5200
11	PECS6100 / PECI6100 / PECQ6100
12	PECS6200 / PECI6200 / PECQ6200
13	PECS7100 / PECI7100 / PECQ7100
14	PECS7200 / PECI7200 / PECQ7200
15	PECS8100 / PECI8100 / PECQ8100
16	PECS8200 / PECI8200 / PECQ8200

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Computing.
PEO2	Professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Synthesize, critique, apply, and extend in-depth relevant knowledge independently using innovative techniques, tools, and skills in the field of Computing as a basis for research to produce new ideas and solution.
PLO2	Create new concept/theories/solutions/practice through independent researchandoriginalitythatsatisfiesinternationalstandardswithinthefield of Computing using the latest techniques, tools, and skills.
PLO3	Integrate highly advanced and specialized research methodologies based on the forefront knowledge and latest development in the field of Computing to solve complex research problems with reasonable degree of originality.
PLO4	Demonstrate decent collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.
PLO5	Communicate effectively the knowledge, skills, ideas and research findings using appropriate methods to peers, scholarly communities, and societies through various medium.

PLO6	Use, improve existing or develop new appropriate tools or methodologies using a broad range of digital technology, media and software to support and enhance research activities.
PLO7	Demonstrate skills in designing, critical evaluation, and analysing numerical and graphical data using quantitative or qualitative tools to support and enhance research activities.
PLO8	Demonstrate leadership, professionalism and management skills, and take full responsibility for own work, and significantly for others in the research organization.
PLO9	Demonstrate the ability to manage and enhance own self- and if necessary, can be accountable for overall management of one's research organization and professional development.
PLO10	Develop potential commercialisation research output.
PLO11	Demonstrate adherence to legal, professional and contribute to the development of ethical sound codes of practice.

GRADUATION CHECKLIST

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

NO	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF
					FASSED
COR	E COURSES (0	CREDITS)	1	1	1
1	UECP6013	Research Methodology	0	0	
TOTA	L CREDIT OF	CORE COURSES (a)	0	0	
UNIV		TIVE COURSES			
	1		1	1	1
	UECS6013	IT Project Management			
1	UHAP6013	Seminar on Development, Economics and Global			
	UICW 6023	Philosophy Science and Civilization	3	3	
	UHAZ 6123	Malaysian Society and Culture			
TOTA	L CREDIT of L	INIVERSITY GENERAL COURSES (b)	3	3	
тот	AL CREDIT TO	GRADUATE (a + b)	3	3	
RESE	EARCH				
1	1 Hard-Bound Thesis endorsed by supervisor – 3 copies				
2	Copy of CD for Each Thesis – Extra 1 unit				
3	3 Copy of All Semester Results (Pre-Transcript)				
4 Copy of Registration Slip (current semester)					
5 Abstract and Title Page Approval Form (original copy)					
6 Course Checklist (endorsed by coordinator)					
7 Copy of IC (local student) / first page of Passport (international student)					

8	Fee Release Letter (UTM Bendahari)	
9	Exit Survey	
10	Submission of Thesis Form – 3 copies	
11	Verification of Graduate Information Form – 1 copy	

COURSE SYNOPSIS

CORE COURSES

UECP6013 - Research Methodology

This course covers the general principles of Research Methodology that are applicable to any discipline. It discusses the fundamental process in conducting academic research. The theoretical and practical aspects of preparing a research proposal presented. Amongst topics that will be covered are introduction to research and its philosophy, problem formulation and research objective, literature review, research methodology and design, data collection procedures, data analysis, research proposal and thesis preparation and research management.

UNIVERSITY ELECTIVE COURSES

UECS6013 - IT Project Management

This course presents a hands-on perspective to Information Technology project management. This course will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, that covers I) Basic concepts, life cycle and framework of project management II) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications, and III) Real Project Initiation, Planning, Executing, Monitoring and Closing. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risks and procurement management. Students are expected to perform real projects with teams and achieve agreed Key performance Indicators (KPI)

UHAP6013 - Seminar on Development, Economics and Global

Discussion on this subject includes issues related to globalization and development, economic and social crisis that has become a global concern. It aims at developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in detail.

UICW6023 - Philosophy Science and Civilization

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

research; Communication and information technology; Ethics and morals; Crime and violence; and Family education.

UHAZ6123 - Malaysian Society and Culture

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

MASTER OF PHILOSOPHY FIELD: COMPUTER SCIENCE / SOFTWARE ENGINEERING

PROGRAMME SPECIFICATIONS

The Master of Philosophy, Field: Computer Science (MECS) / Software Engineering (MECQ) is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between two (2) years to a maximum of four (4) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. This is a full research programme. The candidate is supervised by a lecturer. The directed research work introduces candidates to the process by which new knowledge is developed and applied accordingly. Assessment is done by examining first assessment reports (research proposal), each semester's progress reports, and thesis examination (viva-voce).

1. Awarding Institution		Universiti Teknologi Malaysia		
2. Teaching Institution		Universiti Teknologi Malaysia		
3. Programm	e Name		Master of Philosophy	
4. Final Award		Master of Philosophy		
5. Programm	ie Code		MECSA3AJA / MECO	QA3AJA
6. Professional or Statutory Body of Accreditation		Ministry of Higher Education		
7. Language(s) of Instruction		English		
8. Mode of Study (Conventional, distance learning, etc)		Conventional		
9. Mode of operation (Franchise, self- govern, etc)		Self-governing		
10. Study Scheme (Full Time/Part Time)		(Part Time)	Full Time	
11. Study Duration		Minimum: 2 yrs (4 semesters) Maximum: 4 yrs (8 semesters)		
No. of Semesters		ers	No of Weeks/Semester	
Semester	Full Time	Part Time	Full Time	Part Time
Normal	4	-	8	-
Short	-	-	-	-

General Information

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses	3	33%
ii.	Core Courses	6	67%
iii.	Research	0	0%
	Total	9	100%
Total Credit Hours to Graduate		9 credit hours	

COURSE MENU

Master of Philosophy students are required to register and pass the following courses before their first assessment (proposal defense)

- i. One University Elective Course (course code U*** ***3).
- ii. Research Methodology
- iii. Advanced Computer Science / Advanced Software Engineering

YEAR 1: SEMESTER 1				
Code	Course	Credit	Pre-requisite	
UECS6013	IT Project Management			
	Seminar on Global Development, Economic and			
0110150015	Social Issues	3		
UHIS6013	UHIS6013 Philosophy of Science and Civilization			
UHMZ6023	Malaysian Society and Culture			
UECP6013	Research Methodology	3		
MECS1203 /	Advanced Computer Science /	2		
MECQ1203	Advanced Software Engineering	5		
MECS1100 /	* Posoarch	0		
MECQ1100	Research	0		
	TOTAL CREDIT	9		
	CUMULATIVE CREDITS	9		

YEAR 1: SEMESTER 2						
Code Course Credit Pre-requisite						
MECS1200 /	* Posoarch	0				
MECQ1200	Research					
	TOTAL CREDIT	0				
	CUMULATIVE CREDITS	9				

* Research (course code MEC***00), to be taken every semester until the submission of thesis. The progress of a candidate in any particular semester is assessed through research progress reports submitted at the end of each semester. It is important for the students to know that the submission of the progress report needs to be done by the student themselves via GSMS website http://spsapp3.utm.my:8080/gsmsv4/.

RESEARCH CODE

Semester	Research Course Code
1	MECS1100 / MECQ1100
2	MECS1200 / MECQ1200
3	MECS2100 / MECQ2100
4	MECS2200 / MECQ2200
5	MECS3100 / MECQ3100
6	MECS3200 / MECQ3200
7	MECS4100 / MECQ4100
8	MECS4200 / MECQ4200

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Knowledgeable and competent in research on advanced areas of Computing.
PEO2	Practice professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Integrate and generate in-depth relevant knowledge independently using
	a complex problem in the field of Computing as a basis for research.
PLO2	Construct a critical and innovative solution for complex problems or issues in the field of Computing through research using the latest techniques and skills.
PLO3	Devise standard research methodology that are based on the forefront knowledge and latest development in the field of Computing to solve research problems with reasonable degree of originality.
PLO4	Demonstrate effective collaboration with peers, scholarly communities and society at large in the relevant field of expertise and research.
PLO5	Communicate the knowledge, skills, ideas clearly using appropriate methods to peers, experts, and non-experts through various medium.
PLO6	Use a broad range of suitable digital technologies, media, and software to design,
	manage, analyse and report research studies.
PLO7	Demonstrate skills in designing, planning evaluation activities, and analysing
	numerical and graphical data using quantitative or qualitative tools in solving
	problems.
PLO8	Demonstrate leadership, autonomy and responsibility in conducting and managing
	own research and resources.
PLO9	Demonstrate the ability to manage and enhance own self-advancement for
	academic development, professional development and research skills using lifelong
	learning strategies.
PLO10	Develop potential commercialisation research output.
PLO11	Demonstrate adherence to legal, ethical and professional codes of practice in the field of Computing and research activities.

GRADUATION CHECKLIST

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

NO.	CODE	COURSE	CREDIT EARNE D (JKD)	CREDIT COUNT- ED (JKK)	TICK (√) IF PASSED
CORE	COURSES (6 C	REDITS)		1	·
1	UECP6013	Research Methodology	3	3	
2	MECS1203 /	Advanced Computer Science /	3	3	
2	MECQ1203	Advanced Software Engineering	5	5	
ΤΟΤΑ	L CREDIT OF CO	ORE COURSES (a)	6	6	
UNIVERSITY ELECTIVE COURSES (Choose 1 only)					
	UECS6013	IT Project Management			
	UHIS6013	Philosophy of Science and			
		Civilization			
	UHLM6013	Malay Language for Post			
		Graduates			
	UHMS6013	Seminar on Global Development,		3	
1		Economic and Social Issues	3		
· ·	UHMZ6023	Malaysian Society and Culture	0	0	
	UBSS6013	Organization Behavior and			
		Development	_		
	UBSS6023	Business Ethics, Responsibility and			
		Sustainability			
	UHPS6013	Dynamics of Leadership	_		
	URTS6013	Environmental Ethics	_		
	UECS6023	Introduction to Technopreneurship			
	UMJJ6013	Basic Japanese Language and			
		Culture			
ΤΟΤΑ	L CREDIT of UN	IVERSITY GENERAL COURSES (b)	3	3	
ΤΟΤΑ	L CREDIT TO GI	RADUATE (a + b)	9	9	
RESE	ARCH				
1	Hard-Bound The	esis endorsed by supervisor – 3 copies	i		
2	Copy of CD for	Each Thesis – Extra 1 unit			
3	Copy of All Sem	nester Results (Pre-Transcript)			
4	Copy of Registr	ation Slip (current semester)			
5	Abstract and Tit	le Page Approval Form (original copy)			
6	Course Checklis	st (endorsed by coordinator)			
7	Copy of IC (loca	al student) / first page of Passport (inter	national stu	dent)	
8	Fee Release Le	tter (UTM Bendahari)			
9	Exit Survey				
10	Submission of T	hesis Form – 3 copies			
11	Verification of Graduate Information Form – 1 copy				

COURSE SYNOPSIS

CORE COURSES

UECP6013 - Research Methodology

This course covers the general principles of Research Methodology that are applicable to both disciplines computer science and software engineering. it discusses the fundamental process in conducting academic research. The theoretical and practical aspects of preparing a research proposal presented. Amongst topics that will be covered are introduction to research and its philosophy, problem formulation and research objective, literature review, research methodology and design, data collection procedures, data analysis, research proposal and thesis preparation and research management.

MECS1203 - Advanced Computer Science / MECQ1203 - Advanced Software Engineering

This course will expose students to the concepts, principles and state-of-the-art methods and approaches in the main knowledge areas across a broad range of Computer Science and Software Engineering. It also provides opportunities for the students to explore and systematically evaluate the currently available approaches.

UNIVERSITY ELECTIVE COURSES

UECS6013 - IT Project Management

This course presents a hands-on perspective to Information Technology project management. This course will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, that covers I) Basic concepts, life cycle and framework of project management II) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications, and III) Real Project Initiation, Planning, Executing, Monitoring and Closing. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risks and procurement management. Students are expected to perform real projects with teams and achieve agreed Key performance Indicators (KPI)

UHMS6013 - Seminar on Global Development, Economic and Social Issues

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

UHIS6013 - Philosophy Science and Civilization

This course is offered to international students in advanced scholar and doctoral programs from Malay societies such as Indonesia, Brunei, South Thailand and Malay-Singapore. This course contains two sections. This subject discusses the world view of its role and importance in shaping the culture of life and civilization; The concepts of revelation, science, humanity, nature and happiness; and Comparative Studies in the Philosophy of Science: Epistemology, Ontology and Axiology in Education. Discussions on current issues and challenges, among others; the challenge of civilization between the West and the East; Development and the

environment; Economy and trade; National administration and management; Scientific research; Communication and information technology; Ethics and morals; Crime and violence; and Family education.

UHMZ6023 - Malaysian Society and Culture

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

MASTER OF COMPUTER SCIENCE

PROGRAMME SPECIFICATIONS

The Master of Science, Field: Computer Science is offered on a full-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts to a maximum of four (4) years.

The programme is offered on full-time and is based on a 2-Semester per academic session. This is a mixed-mode master programme. Academic load for each semester depends on total number of credits. Students can take a minimum of one course (equivalent to 3-4 credits) up to a maximum of twenty (20 credits) for full-time. Students are required to finish all course works before starting Dissertation III. Students with a minimum CGPA of 3.5 can register one (1) elective course together with Dissertation III. Students who register courses with UM status can also register Dissertation III. Assessment method for academic achievement is the combination of two (2) parts, that is based on GPA/CGPA and research progress report. The research progress report needs to be submitted by week 12 of the semester through GSMS. Dissertation is graded based on three categories i.e. satisfactory (MM), Unsatisfactory (TM) and Fail (GG).

General Information

1. Awarding	Institution		Universiti Teknologi Malaysia		
2. Teaching	Institution		Universiti Teknologi Malaysia		
3. Programm	ne Name		Master of Compute	r Science	
4. Final Awa	rd		Master of Compute	r Science	
5. Programm	ne Code		MECSA2AJA		
6. Professional or Statutory Body of Accreditation Ministry of Higher Education		ducation			
7. Language	7. Language(s) of Instruction English				
8. Mode of St	tudy (Convent	tional, distance	Conventional		
learning, e	tc)		Open Distance Learning (ODL)		
9. Mode of operation (Franchise, self-govern, etc)		Self-governing			
10 Study Sch	omo (Eull Tim	o/Part Tima)	Full Time		
		ie/Fait Time)	Part Time (ODL)		
			Full Time / Part Tim	ie:	
11. Study Dur	ation		Minimum - 3 semesters		
	I		Maximum - 8 seme	sters	
Type of Min. No. of Semesters		Max. No. o	f Semesters		
Semester	Full Time	Part Time (ODL)	Full Time	Part Time (ODL)	
Normal	3	3	8	8	
Short	-	-	-	-	

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses	3	6.7%
ii.	Programme Core Courses	12	26.7%
iii.	Programme Electives	6	13.3%
iii.	Research	24	53.3%
	Total	45	100%
Total	Credit Hours to Graduate	45 credit hours	

COURSE MENU

Master of Computer Science students are required to register and pass the following courses before registration of Dissertation III.

- i. FOUR Core Courses
- ii. **TWO** Elective Courses
- iii. **ONE** University Elective Course (course code M*** ***3).
- iv. Dissertation II (course code MECS xx80)

COURSE MENU 1

YEAR 1: SEMESTER 1					
Code	Course	Credit	Pre-requisite		
MECS1023	Advanced Data Structure and Algorithm		MECS0023		
MECS1033	Advanced Artificial Intelligence	2	MECS0033		
	Research Methodology in Computer Science	5			
WEC31043	(Dissertation I)				
Mxxx xxx3	Elective I	3			
Uxxx xxx3	University Common Elective	3			
	TOTAL CREDIT	15			
	CUMULATIVE CREDITS	15			

YEAR 1: SEMESTER 2					
Code	Course	Credit	Pre-requisite		
MECS1013	Advanced Theory of Computer Science	3	MECS0013		
Uxxx xxx3	Elective II	3			
MECSxx80	Dissertation II	9			
	TOTAL CREDIT	15			
	CUMULATIVE CREDITS	30			

YEAR 2: SEMESTER 1					
Code	Course	Credit	Pre-requisite		
MECSxx80	Dissertation III	15			
	TOTAL CREDIT	15			
	CUMULATIVE CREDITS	45			

COURSE MENU 2

YEAR 1: SEMESTER 1					
Code	Course	Credit	Pre-requisite		
MECS1023	Advanced Data Structure and Algorithm				
MECS1033	Advanced Artificial Intelligence	3			
MECS1043	Research Methodology in Computer Science	5			
	(Dissertation I)				
	TOTAL CREDIT	9			
	CUMULATIVE CREDITS	9			

YEAR 1: SEMESTER 2					
Code	Course	Credit	Pre-requisite		
MECS1013	Advanced Theory of Computer Science	3			
Mxxx xxx3	Elective I	3			
Uxxx xxx3	University Common Elective	3			
	TOTAL CREDIT	9			
	CUMULATIVE CREDITS	18			

YEAR 2: SEMESTER 1					
Code	Course	Credit	Pre-requisite		
Mxxx xxx3	Elective II	3			
MECSxx80	Dissertation II	9			
	TOTAL CREDIT	12			
	CUMULATIVE CREDITS	30			

YEAR 2: SEMESTER 2					
Code	Course	Credit	Pre-requisite		
MECSxx80	Dissertation III	15			
	TOTAL CREDIT	15			
	CUMULATIVE CREDITS	45			

* Research (course code MECS **80), to be taken every semester until the submission of a thesis. The progress of a candidate in any semester is assessed through research progress reports submitted at the end of each semester. It is important for the students to know that the submission of the progress report needs to be done by the student themselves via GSMS website http://spsapp3.utm.my:8080/gsmsv4/.

RESEARCH CODE (MECSxx80)

Year	Semester	Research Course Code		
1	2	MECS1280		
2	1	MECS2180		
2	2	MECS2280		
3	1	MECS3180		

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives		
PEO1	Acquire mastery and competency in advanced computing knowledge		
PEO2	Become computer scientists who are effective communicators, professional and imbued with high standards of ethical conducts within their organization and society		
PEO3	Be analytical thinkers who are responsive to the changing environment and practice lifelong learning		

Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Apply advanced knowledge to solve critical issues in the field of Computer
	Science. (Knowledge and Understanding)
PLO2	Manage and solve complex problems efficiently using systematic and standard
	approaches. (Cognitive Skills)
PLO3	Adapt technical and scientific skills to solve real world problems. (Practical
	Skills)
PLO4	Perform effective collaboration with stakeholders professionally. (Interpersonal
	Skills)
PLO5	Use a broad range of information, media and technology to support study or
	research findings. (Communication Skills)
PLO6	Use digital technologies and software competently to support study or research
	works. (Digital Skills)
PLO7	Analyse numerical or graphical data using quantitative or qualitative methods
	for solving problems. (Numeracy Skills)
PLO8	Demonstrate leadership, autonomy and responsibility in a team by managing
	resources and tasks fairly. (Leadership, Autonomy and Responsibility)
PLO9	Perform independent studies for self-advancement through continuous
	academic or professional development. (Personal Skills)
PLO10	Propose entrepreneurial project based on relevant knowledge and expertise.
	(Entrepreneurial Skills)
PLO11	Conduct respectable, ethical and professional practices in organization and
	society. (Ethics and Professionalism Skills)

GRADUATION CHECKLIST

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

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNT- ED (JKK)	TICK (√) IF
(0)	COBE CO				PASSED
(a)		Advanced Theory of Computer			
	MECSIUIS	Science			
1	MECS1023	Advanced Data Structure and	3	з	
· ·	MECS1033	Advanced Artificial Intelligence		0	
	MECS1043	Research Methodology in	-		
	MEGG1040	Computer Science (Dissertation I)			
тот	L AL CREDIT OF	CORE COURSES (a)	12	12	
(b)		= COURSES (6 CREDITS) - CHOO	DSF 2 ONL	·- Y	
(~)	MCSD2213	Advanced Analytics for Data		•	
	WICODZZIO	Science			
	MCSD1233	Big Data Management	-		
	MCSD2123	Massive Data Mining and	-		
		Streaming			
	MECR1063	Cryptographic Engineering	-		
	MECR2213	Cyber Threat Intelligence	-		
	MECR1023	Information Security Governance	-		
		and Risk Management			
	MECS2423	Virtual and Augmented Reality			
		Environment			
2	MECS2433	Advanced Computer Graphics and	3	3	
	MECS2413	Advanced Human Computer	-		
		Interaction			
	MECS2323	Advanced Computer Network and Cloud Computing			
	MECS2313	Advanced Computer System &	-		
		Architecture			
	MECS2343	Blockchain Technology			
	MEEH1293	Intelligent Engineering Solution			
	MKET1423	Wireless Communication systems	1		
	MKET1523	Internet of Things Technology	1		
TOT	AL CREDIT OF	ELECTIVE COURSES (b)	6	6	
(C)	UNIVERS	TY GENERAL COURSES (3 CRE	DITS) – CH	OOSE 1 ON	NLY
	UBSS6013	Organization Behavior and			
		Development			
	UBSS6023	Business Ethics, Responsibility and			
1		Sustainability	3	3	
	UHMS6013	Seminar on Global Development,			
		Economic and Social Issues			
	UHMZ6023	Malaysian Society and Culture			

	UHIS6013	Philosophy of Science and			
		Civilization			
	UHPS6013	Dynamics of Leadership			
	UHLM6013	Malay Language for Postgraduates			
	URTS6013	Environmental Ethics			
	UECS6013	IT Project Management			
	UECS6023	Introduction to Technopreneurship			
	UMJJ6013	Basic Japanese Language and			
		Culture			
TOT	AL CREDIT OF	UNIVERSITY GENERIC	2	2	
COU	RSES (c)		3	S	
(d)	RESEARC	CH (24 CREDITS)			
1	MECS xx80	Dissertation II	9	9	
2	MECS xx80	Dissertation III	15	15	
TOTAL CREDIT OF CORE COURSES (d)		24	24		
TOTAL CREDIT TO GRADUATE (a + b + c + d)		45	45		
DISS	ERTATION				
1	Softcopy The	sis (Endorsed by Supervisor)			
2	Copy of Pre-transcript				
3	Copy of Registration Slip (Current Semester)				
4	Copy of Publication (Optional)				
5	Graduation Course Checklist (Endorsed by Coordinator)				
6	Copy of IC (Local Student) / first page of Passport (International Student)				
7	Fee Release Letter (UTM Bendahari)				
8	3 Program Exit Survey				
9	Graduation Form				

COURSE SYNOPSIS

CORE COURSES

MECS1013 - Advanced Theory of Computer Science

The course presents the most fundamental theories and concepts that provide a mathematical sense to answer some of the basic questions as can the given problems be solved by computation and how efficiently can a given problem be solved by computation. The course provides an in-depth study of the main models and concepts of the mathematical theory of computation, including automata and languages, computability and complexity. The emphasis of the course will be on the ability to move from a concrete problem to a mathematical model, and after proving things about the mathematical model to correctly interpret what we have learned about the concrete problem.

MECS1023 - Advanced Data Structure and Algorithm

This course provides a solid or advanced understanding of theory and practice of data structure and the study of algorithms analysis. Students will learn the most common data structures and the advanced concepts of the data structure such as B-trees, heaps and priority queues. Further, students will be exposed to the techniques used in the development and analysis of data structures and its algorithms. The analytical abilities of the students in this course are to analyze the performance of data structures and algorithms. At the end of the course, students should be able to implement and apply the theory and concepts of the advanced data structure in assignments.

MECS1033 - Advanced Artificial Intelligence

Increasing practical implementation of several Soft Computing approaches in real world problems has grounded this course to explore the intensity of SC techniques. As such, Neural Computing, Nature Inspired Computing and Granular Computing provide foundations for the conception, design and development of the intelligent systems. By hybridizing such paradigms, it has been possible to create a number of successful and sophisticated solutions to complex real-world problems. The aim of this course is to provide the student with knowledge of the principles, mechanisms and theory behind SC and their applications. The theory of each SC techniques is given in a conceptual and in a mathematical way; the practice is discussed with stress on the outcomes of successful applications and on the intricacies of the actual implementations.

MECS1043 - Research Methodology in Computer Science

This course covers the general principles of Research Methodology that are applicable to Computing and Digital Technology discipline. It discusses the fundamental process in conducting academic research. The theoretical and practical aspects of preparing a research proposal presented. Among topics that will be covered are introduction to research and its philosophy, problem formulation and research objectives, literature review, research methodology and design, data collection procedures, data analysis, research proposal and thesis preparation and research management.

ELECTIVE COURSES

MCSD2213 - Advanced Analytics for Data Science

This course provides a solid or advanced understanding on the use of analytics approach in the examination of data or content to discover deeper insights, make predictions or generate recommendations using sophisticated techniques and tools on real world problems. Students will learn descriptive analytics using advanced tools to gain insight into the past. Students will also acquire understanding of predictive analytics using statistical and machine learning techniques to understand future outcomes. The prescriptive analytics provides knowledge in simulation and optimization to quantify the effect of future decisions to advise possible outcomes before a decision is made. The analytical abilities to be acquired by students in this course are to reliably select analytic techniques or methods and specify steps involved in the analysis process and to interpret analytically the results obtained from data analytics techniques or tools. At the end of the course, students should be able to implement and apply the knowledge on analytical techniques or tools in real world problems and be able to make informed decisions or recommendations through analytical interpretations of results.

MCSD1233 - Big Data Management

This course provides basic fundamentals of big data architecture and management. Students will learn the big data processes and the current big data technologies that are available. Further, students will be exposed to the big data platform ecosystem for big data manipulation. The big data management will be explored for the best practice in managing and manipulating large amounts of data. At the end of the course, students should be able to understand the architecture and management of big data and also can develop simple applications of big data handling using a particular platform in assignment.

MCSD2123 - Massive Data Mining and Streaming

This course aims to introduce students to basic principles and methods of machine learning algorithms that are typically used for mining large data sets. This course also will provide students with the skill and knowledge to build systems capable of analysing huge amounts of data. It explains the principle of distributed file systems and shows Map reduce as a tool for creating parallel algorithms. Typically, it covers the algorithms used for analysing networks, fundamental principles of techniques such as decision trees and support vector machines and finally neural network architecture. The students will gain practical understanding through a coding exercise where they will implement and apply one machine learning algorithm on a particular large dataset.

MECR1063 - Cryptographic Engineering

This is a survey and seminar course that gives an overview on the concepts of advanced database topics such as databases to handle objects, unstructured data, semi-structured data; distributed databases and data warehouses. The course opens with a sequence of lectures by the instructor to provide background on post relational database systems. This sets the stage for student review papers on their topic of interest and a practical group project in databases to expose them to issues and research solutions regarding emerging database technologies.

MECR2213 - Cyber Threat Intelligence

With the rapid increase of cyber-attacks, accurate security information is becoming more difficult to obtain. This course exposes the students to a complete cycle of CTI which includes hunting, behavioral patterns extraction, clustering and correlation, threat actor attribution until taking it down. Besides, it also explains the Cyber Kill Chain process in launching an attack. Understanding CKC is important in detecting cyberthreat. CTI will be explained in 3 different levels; strategic, tactical and operational.

MECR1023 - Information Security Governance and Risk Management

The subject is aimed at imparting knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an information system. This subject covers issues related to administration, management, and governance of security of information systems. Topics include auditing and data management, risk management (risk identification, risk analysis, risk control), contingency planning, incident handling and risk governance. The subject will study in detail principles and tools related to these topics. The subject will also cover security standards, evaluation and certification process, security planning, ethical and legal issues in information and privacy.

MECS2423 - Virtual and Augmented Reality Environment

This course focuses on Virtual and Augmented Reality (AR) systems, algorithms, and applications. With the proliferation of powerful, always-on, Internet-connected mobile devices such as smartphones, tablets and newer head-worn displays, sophisticated applications that combine location-specific content with the current user view are becoming more possible. Application developers for these devices require a broad set of technical and design skills to create effective interactive AR experiences. Topics will include vision-based marker and feature tracking, model-to-view space transformations, mobile application development, and AR interaction techniques.

MECS2433 - Advanced Computer Graphics and Image Processing

The aim of the course is to give understanding of sound knowledge and theory of Computer Graphics & Image Processing. First part of the lecture will cover basic and advanced theory of Computer Graphics. Second part of the lecture will deal with Image Processing and Pattern Recognition.

MECS2413 - Advanced Human Computer Interaction

This course provides the students with advanced topics in Human Computer Interaction (HCI). The course gives students practice and theoretical knowledge of the use of HCI methodologies for both design and evaluation, different types of HCI experimentation, including both quantitative and qualitative methods. Students are expected to participate in group activities, student-led presentations, and discussion of several research papers in HCI.

MECS2323 - Advanced Computer Network and Cloud Computing

This course focuses on advanced topics in the computer network. Topics covered include the technical knowledge of IPv6, concept of SDN, and implementation of wireless, sensors, Adhoc and 5G network. The second part is Students will have an opportunity to perform research in these and other areas of computer network and cloud computing.

MECS2313 - Advanced Computer System & Architecture

This course focuses on advanced topics in the design and analysis of computer architectures. Topics covered include instruction set design, pipelining, instruction-level parallelism, highspeed memory systems, storage systems, interconnection networks, and multiprocessor architectures. Students will have an opportunity to perform research in these and other areas in the field of computer architecture.

MECS2343 - Blockchain Technology

This course focuses on the introduction to blockchain technology and its applications. Block chain is a technology which will lead the majority of data storage and information sharing for upcoming many industries. In this course students will understand about fundamentals of blocks, blockchain protocol as well as the fundamentals of cryptographic primitives used in the Blockchain and smart contract. The protocol behind the chain formation of blocks with data stored will be understood with practical implementations. Consensus Protocol creation for blockchain formation will be created using python script to understand blockchain from the very core. As a hands on, students will be introduced with a development of blockchain application through Solidity Smart Contract platform.

MEEH1293 - Intelligent Engineering Solution

In an increasingly competitive world where more and more data is becoming available from web documents, digital media, financial markets, and wireless sensors, there is a great need for new intelligent systems that can analyse huge amounts of data and make the right decisions. These intelligent systems can analyse the stock markets and make robust predictions, control and optimize factory productions in an uncertain environment, improve transportation safety, improve the quality of life of the elderly or entertain the children. This course provides students a solid theoretical foundation, a set of practical tools and projects that allow the understanding and the design of intelligent systems and services that fulfils the needs for a dynamic and ever-changing industry and offer exciting opportunities for research.

MKET1423 - Wireless Communication Systems

This course introduces students to the introductory and advanced level of wireless communication technologies. In the beginning students will be presented with the concept of wireless communication systems and mobile radio propagation. Students will then be illuminated on MIMO technology in mobile communication. Next, the course will describe cellular concepts that will include small cell networks. This is followed by details on the overall evolution of the mobile communication system. Finally, this course will cover different multiple access techniques used in wireless communication systems.

MKET1523 - Internet of Things Technology

The course provides students with a technical background to the Internet of Things (IoT) which includes its concept, architecture and applications. It also gives the underlying communication protocols and technologies. The course has a significant practical element that will be delivered during lab sessions in which students are expected to complete exercises involving system design, device programming and cloud development.

UNIVERSITY GENERAL COURSES

UBSS6013 - Organization Behavior and Development

This course helps students integrate behavioural science theories, tools, concepts, and techniques learned in the lab to an OB application in a "real" organization. Students are expected to conceptualize and apply Organization Behaviour three-level of analysis and synthesize it with the theory and practice of Planned Change for individuals, groups and organizations. Throughout the course, participants are exposed to the important topics central to behaviours of organization and its holistic process for development and change. Some of the topics include multiple views of organizations that influence organizational change, the evolution of organizational development and its challenges. The course also covers the nature of planned change, theories and types of change, the role of values and ethics in organizational change, and the concept of emergent change to enable participants to have an overall view of how available approaches to planned change management can be applied in organizational settings.

UBSS6023 - Business Ethics, Responsibility and Sustainability

Business plays a significant role in societal and environmental well-being. Private and public organizations are no longer responsible to shareholders and those inside the organizations, but to external parties including consumers, politicians, regulators, communities and ordinary citizens. To fulfill the conflicting needs of these stakeholders, business leaders and managers often encounter complex situations that require them to make difficult decisions whereby the lines between right and wrong are blurry. This course aims to provide students with the fundamental knowledge about the role of organizations in a society and to develop their skills to sustainably manage organizations that integrate legal, ethical, economic, environmental, and social dimensions into their decision-making. The course intends to develop responsible managers who have high integrity, professionalism and interpersonal skills. The course will also teach strategies on how managers can promote responsible conduct in their companies. The course objectives will be achieved through various teaching and learning methods, specifically through critical examination of case studies involving ethical issues and dilemmas on complex and controversial business problems. This course is integrative in nature built upon the understanding and reflection of the main disciplines covered in the core courses in the MBA program.

UHMS6013 - Seminar on Global Development, Economic and Social Issues

This course focuses on different approaches to economic development with reference to economic growth. Discussion on this course also includes issues related to globalization, technology, and digital divides as well as the social crisis that has become a global concern. It aims in developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in detail.

UHMZ6023 - Malaysian Society and Culture

This course is designed for international postgraduates. This course discusses the various aspects of Malaysian culture and society. Topics on belief system, religious festivals, customs, and etiquettes of different ethnic groups in Malaysia will be introduced to the students. In addition, students will also be introduced to the Malay Language. At the end of the course

students should be able to understand the cultures practiced among Malaysians and adapt themselves to these new cultures.

UHIS6013 - Philosophy of Science and Civilization

This course discusses the meaning and nature of the philosophy of science and civilization. It seeks first to explore the different denotation, connotation, and cognitive substance of philosophy, science, and civilization, as independent concepts. It then seeks to understand these terminologies individually in their historical perspectives and their relationship to each other. Understanding the meaning and import of culture is necessary to our understanding of civilization. The study of the nature and meaning of religion is therefore significant in our appreciation of culture and civilization. Historically, Islam and the Muslims have always been intricately connected to the Western world. Thus, the discussion also includes comparative studies of Islamic and western philosophy and universal values. The final discussion is about the contribution of Islam to the world's civilization, education, culture and scientific development.

UHPS6013 - Dynamics of Leadership

This course is intended to encourage students to discover and develop their personal leadership qualities. Students will be exposed to leadership theories so that they could develop an insight that leadership itself is a dynamic relationship based on mutual influence and common purpose between leaders and followers. Topics covered include Introduction to Leadership, Leadership Traits & Ethics, Leadership Behaviour and Motivation, Influencing: Power, Politics, Networking and Negotiation, Contingency Leadership Theories, Communication, Coaching, and Conflict Skills, The LeaderFollower Relationship, Team Leadership, Leading Self-Managed Teams, Transformational and Level 5 Leadership. Students will be evaluated based on their class leadership role, short talk and personal learning portfolios.

UHLM6013 - Malay Language for Postgraduates

This course is offered to international students of the Master and PhD programmes, from Indonesia, Brunei, Southern Thailand and Singapore. In this course students are given exposure on how to write scientific works (in Malay). The focus of this course is the spelling aspect, punctuation, sentence variety, language adjustment, paragraph writing and writing style. In addition, students will be exposed to writing formats such as literature writing, citations, bibliographies, abstracts, and editing.

URTS6013 - Environmental Ethics

Environmental ethics is the discipline in philosophy that studies the moral relationship of human beings to, and the value and moral status of, the environment and its nonhuman contents. It covers the challenge of environmental ethics to the anthropocentrism (i.e., human-centeredness) embedded in traditional western ethical thinking; the early development of the discipline in the 1960s and 1970s; the connection of deep ecology, feminist environmental ethics, and social ecology to politics; and the attempt to apply traditional ethical theories, and virtue ethics, to support contemporary environmental concerns. It focuses on environmental literature on wilderness, and possible future developments of the discipline.
UECS6013 - IT Project Management

This course presents a hands-on perspective to Information Technology project management. This course will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, that covers: i) Basic concepts, life cycle and framework of project management, ii) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications, and iii) Real Project Initiation, Planning, Executing, Monitoring and Closing. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risks and procurement management. Students will also be utilizing the latest tools for understanding, reviewing, communicating, and developing Business Model for a project. Teams of students are expected to perform real projects and achieve agreed Key Performance Indicators (KPI).

UECS6023 - Introduction to Technopreneurship

This course provides an overview of the basic concepts on entrepreneurship focusing on the nature, environment, and risks of new venture formation and building of businesses with IT in the Malaysian context. Students will learn on how to analyse and evaluate the business opportunities using knowledge and skills taught in this course and suggest innovative business ideas, business planning, self-assessment and operating strategies required to start a new small business. Students will also be exposed to current case studies of existing companies involved in the IT business. Active participation by students during class discussions and activities is encouraged & expected so that students can gain hands-on experience with conducting research, developing, writing, evaluating, presenting and defending segments of a business plan.

UMJJ6013 - Basic Japanese Language and Culture

At this course, students will be introduced to simple yet useful familiar everyday expressions and very basic phrases using basic grammars to develop oral communication skills for social purposes. This course is suitable for beginners who wish to develop basic conversational skills in a short period. E-learning will be introduced, and students must complete some Kana and communication courses within the time frame by self-learning. After this course, students are expected to speak common phrases in different situations and make simple conversations in Japanese language.

RESEARCH

MECS XX80 - Dissertation II

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

MECS XX80 - Dissertation III

This is the second part of a 2-part Master dissertation that every student must fulfil successfully. In this stage, students are required to execute the next phases of their development plan from Part 1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully integrated project following software development and research testing practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.

MASTER OF SCIENCE (DATA SCIENCE)

PROGRAMME SPECIFICATIONS

The Master of Science (Data Science) is a coursework programme offered on a full-time basis at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between one and half (1 1/2) years to a maximum of four (4) years.

The coursework programme is offered based on a 2-Semester per academic session. In this programme, the candidate will learn not only to apply data science, but they will acquire insight into how and why methods work so they will be able to construct solutions to new challenges in data science. Furthermore, students will also be able to work on problems specific to a scientific discipline and to combine knowledge domain with the latest data analysis methods and tools.

1. Awarding Institution		Universiti Teknologi Malaysia			
2. Teaching Institution		Universiti Teknologi Malaysia			
3. Programr	ne Name		Master of Science (Data Science)		
4. Final Award		Master of Science (Data Science)			
5. Programme Code		MCSDA1AJA			
6. Professional or Statutory Body of Accreditation		Malaysian Qualificatio	on Agency (MQA)		
7. Language(s) of Instruction		English and Bahasa Melayu			
8. Mode of St Learning,	8. Mode of Study (Conventional, Distance Learning, etc)		Conventional		
9. Mode of Operation (Franchise, Self- govern, etc)		Self-governing			
10. Study Scheme (Full Time/Part Time)		Full Time			
11. Study Duration		Minimum: 1 year 6 months (3 semesters) Maximum: 4 years (8 semesters)			
No. of Semesters		No of Weeks/Semesters			
Semester	Full Time	Part Time	Full Time	Part Time	
Normal	3	-	8	-	
Short	-	-	-	-	

General Information

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses	3	6.66%
ii.	Core Courses	21	46.67%
iii.	Elective Courses	9	20.00%
iv.	Master Project	12	26.67%
	Total	45	100%
Total Credit Hours to Graduate		45 credit hours	

COURSE MENU

SYLLABUS	SEM 1	SEM 2	SEM 3	TOTAL
University Elective Course			(Choose 1) U*** 6**3	3
Faculty Compulsory Courses	MCSD1113 MCSD1013 MCSD1123 MCSD1043 MCSD1053	MCSD2123 MCSD2213		21
Faculty's Elective Courses	(Choose 1) MCSD1123 MCSD1103 MCSD1133 MCSD1143 MCSD1153	(Choose 1) MCSD1123 MCSD1103 MCSD1133 MCSD1143 MCSD1153	(Choose 1) MCSD1123 MCSD1103 MCSD1133 MCSD1143 MCSD1153	9
Master Project		MCSD6215	MCSD6227	12
Total Credits	18	14	13	45

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Data Science field.
PEO2	Practice professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Synthesize complex information, specialized concepts, theories, methods and practice independently in the field of Data Science. (Knowledge and Understanding)
PLO2	Solve complex problems critically and integratively using systematic approaches. (Cognitive Skills)
PLO3	Apply practical skills to solve problems in the field of Data Science. (Practical Skills)
PLO4	Demonstrate effective collaboration with stakeholders professionally. (Interpersonal Skills)
PLO5	Communicate effectively the knowledge, skills and ideas using appropriate methods to peers, experts and communities. (Communications Skills)
PLO6	Use digital technologies and appropriate softwares competently to enhance study and practice. (Digital Skills)
PLO7	Evaluate numerical and graphical data critically using quantitative or qualitative tools in solving problems. (Numeracy Skills)
PLO8	Demonstrate leadership, autonomy and responsibility in managing resources. (Leadership, Autonomy and Responsibility)
PLO9	Engage self-advancement through continuous learning or professional development. (Personal Skills)
PLO10	Initiate entrepreneurial projects supported by relevant knowledge and skills. (Entrepreneurial Skills)
PLO11	Demonstrate respectable ethical conducts and professionalism skills in an organization and society. (Ethics and Professionalism Skills)

GRADUATION CHECKLIST

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

*Please attach a copy of results for previous semesters and a copy of registration slip for					
current semester.					
University Common Elective (Choose 1 course)			Grade	Pass	
UHAP6013	Seminar on Global Development, Economics and Social Issues	3			
UHAW6023	Philosophy of Science and Civilization	3			
UECS 6013	IT Project Management	3			
UHAZ 6123	Malaysian Society and Culture	3			
	Core Subject (Compulsory)			1	
MCSD1013	Business Intelligence and Analytics	3			
MCSD1043	Research Design and Analysis in Data Science	3			
MCSD1053	Data Science Governance	3			
MCSD1113	Statistic for Data Science	3			
MCSD1123	MCSD1123 Big Data Management				
MCSD2123	MCSD2123 Massive Data Mining and Streaming				
MCSD2213	Advanced Analytics for Data Science	3			
	Elective Subject (Choose 3 courses)		·	
MCSD1103	Data Visualization	3			
MCSD1133	Operational Research and Optimization	3			
MCSD1143	Supply Chain Analytic	3			
MCSD1153	Human Based Computing	3			
MCSD1123	Big Data Computing	3			
Master Projects					
MCSD6215	Master Project I	5			
MCSD6227	Master Project II	7			
Total		45			

COURSE SYNOPSIS

CORE COURSES

MCSD1013 - Business Intelligence and Analytics

Business intelligence and analytics refers to the solutions implemented by enterprises such as businesses, non-profits and governments using data to gain insights for making better decisions. Business intelligence and analytics is applied in operations, marketing, finance and strategic planning among other functions. The ability to use data effectively to drive rapid, precise and profitable decision has been critical strategic advantages for companies. With the increasing availability of broad and deep sources of information-so called "Big data"-business intelligent and analytics are becoming an even more critical capability for enterprises of all types and all sizes to identify trends and understand the information that can drive business change and support sustained successful business practices.

MCSD1043 - Research Design and Analysis in Data Science

This course will cover the fundamental steps and implementation on developing the initial ideas to formal academic writing accordingly. Students will be given the mechanisms on how to transform and digest the literature reviews that leads to the proposed title. The theoretical and practical aspects of implementing draft project proposal will be the milestone of this course. Ordered, Critical and Reasoning Exposition of knowledge through student efforts.

MCSD1053 - Data Science Governance

Data governance is a mandatory requirement for a successful organization which aims to be data driven, achieve master data management, build business intelligence, improve data quality or efficiently manage documents. This course provides an overview of the data governance life cycle. Students will learn why data governance is needed, how to design, initiate, and execute a program and how to keep the program sustainable. The governance in the aspect of big data will be explored for the best practice in managing and manipulating large amount of data. At the end of the course, students should be able to understand the design and the implementation of data governance and its importance to an organization.

MCSD1113 - Statistic for Data Science

This course provides a fundamental concept in statistics for data science. Students will learn descriptive statistics, statistical inference including estimation, hypothesis testing and nonparametric tests. Further, students will be introduced to linear regression and analysis of variance. R will be used to apply these statistical methods. At the end of the course, students should be able to apply the statistical methods to real large data sets.

MCSD1123 - Big Data Management

This course provides a basic fundamental of big data modeling, management and architecture. Students will learn the big data processes and the current big data technologies that are available. The big data management will be explored for the best practice in managing and manipulating large amount of data. At the end of the course, students should be able to understand the architecture and management of big data and also can develop simple application of big data handling using particular platform in assignment.

MCSD2123 - Massive Data Mining and Streaming

This course aims to introduce students to basic principles and methods of machine learning algorithms that are typically used for mining large data sets. This course also will provide students with the skill and knowledge to build system and capable of analyzing huge amount of data. It explains the principle of distributed file systems and shows map reduce as a tool for creating parallel algorithms. Typically, it covers the algorithms that used for analyzing networks, fundamental principles of techniques such as decision trees and support vector machines and finally neural network architecture. The students will gain practical understanding through a coding exercise where they will implement and apply one machine learning algorithm on a particular large dataset.

MCSD2213 - Advanced Analytics for Data Science

This course provides a basic yet solid understanding on the use of analytics approach in the examination of data or content to discover deeper insights and make predictions using sophisticated techniques and tools on real world problems. Students will learn descriptive analytics using analytics tools to gain insight into the past. Students will also acquire understanding of predictive analytics using statistical and machine learning techniques to understand future outcome. The prescriptive analytics provides knowledge in simulation and optimization to quantify the effect of future decision to advise possible outcomes before decision is made. The analytical abilities to be acquired by students in this course are to reliably select analytic techniques or method and specify steps involve in the analysis process for descriptive analytical techniques or tools in real world problems to be able to apply the knowledge on analytical techniques or tools in real world problems to be able to make an informed decision through analytical interpretations of results.

ELECTIVE COURSES

MCSD1103 - Data Visualization

This course is an introduction to the principles and techniques for visualization to transform and visualize the large datasets to aid knowledge discovery and decision-making. Students will learn the principles, techniques, and practical skill necessary to communicate information about data clearly and effectively through data visualization. Further, students will be exposed to techniques for visualizing different types of data including categorical, time series, spatial, and multiple variables data. Additionally, students will utilize available tools to visualize the dataset. At the end of the course students should be able to implement and apply the theory and use tools to communicate information out of the data clearly and effectively through graphical means.

MCSD1133 - Operational Research and Optimization

The aim of the course is to introduce students to some applications of data science that can be formulated and solved by operational research and optimization techniques. Students will learn the theory and how to practice it for modeling (formulate, analyze and solve) optimization problems arising in data intensive environments. Further, students will be exposed to use appropriate operational research or optimization software

MCSD1143 - Supply Chain Analytics

The course aims to improve operational efficiency and effectiveness by enabling data-driven decisions at strategic, operational and tactical levels. The student will able to perform analysis using data analytics methods and analytical tools necessary in the areas of predictive, descriptive and prescriptive analytics to efficiently manage demand and supply networks. Through the analysis and discussion of case studies they will discover business insights in order to optimize the value of supply chain processes and operations. The topics covered including designing the supply chain network, planning demand and supply in a supply chain, retail analytics, inventory management and transport analytics. Software packages such as R, Python and Tableau will be utilized.

MCSD1153 - Human-based Computing

This course offers students a new perspective on the study of human biological systems to human computing system. This course will emphasis on the theoretical of human computing aspect which includes dendrite, immune, membrane and cell computing. The fundamental concept of this course will be designed to come out with algorithmic computing based for solving meta complex data in chaotic environment.

MCSD1163 - Big Data Computing

This course is designed to be suitable for an introductory course at master levels. This course covers intensive exploration on GPU computing with CUDA programming. The foundations of the CUDA programming will be addressed in terms of the concept, design, architecture and programming model to deal with the needs of big data computing. Students will also be exposed to the current needs of big data era in which the big data computing accessory will be given especially on the implementation of high-performance computing in executing GPU Machine Learning Library (GPUMLib).

MASTER PROJECT

MCSD6215 - Master Project 1

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

MCSD6227 - Master Project 2

This is the second part of a 2-part Master project that every student must fulfill successfully. In this phase, students are required to execute the next phases of their development plan from Part 1 (Project 1). Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated project following programming code development and research testing practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.

UNIVERSITY COMMON ELECTIVE COURSES

UECS6013 IT Project Management

This course presents a hands-on perspective to Information Technology project management. This course will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, that covers: i) Basic concepts, life cycle and framework of project management, ii) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications, and iii) Real Project Initiation, Planning, Executing, Monitoring and Closing. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risks and procurement management. Students will also be utilizing latest tools for understanding, reviewing, communicating and developing Business Model for a project. Teams of students are expected to perform real projects and achieve agreed Key Performance Indicators (KPI).

UHIS6013 Philosophy of Science and Civilization

This course discusses the meaning and nature of the philosophy of science and civilization. It seeks first to explore the different denotation, connotation, and cognitive substance of philosophy, science, and civilization, as independent concepts. It then seeks to understand these terminologies individually in their historical perspectives and their relationship to each other. Understanding the meaning and import of culture is necessary to our understanding of civilization. The study of the nature and meaning of religion is therefore significant in our appreciation of culture and civilization. Historically, Islam and the Muslims have always been intricately connected to the Western world. Thus, the discussion also includes comparative studies of Islamic and western philosophy and universal values. The final discussion is about the contribution of Islam to the world's civilization, education, culture and scientific development.

UHLM6013 Malay Language for Postgraduates

This course is offered to international students of the Masters and PhD programmes, from Indonesia, Brunei, Southern Thailand and Singapore. In this course students are given exposure on how to write scientific works (in Malay). The focus of this course is the spelling aspect, punctuation, sentence variety, language adjustment, paragraph writing and writing style. In addition, students will be exposed on writing formats such as literature writing, citations, bibliographies, abstracts and editing.

UHMS6013 Seminar on Global Development, Economic and Social Issues

This course focuses on different approaches to economic development with reference to economic growth. Discussion on this course also includes issues related to globalization, technology and digital divides as well as the social crisis that has become a global concern. It aims in developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in detail.

UHMZ6023 Malaysian Society and Culture

This course is designed for international postgraduates. This course discusses on the various aspects of the Malaysian culture and society. Topics on belief system, religious festivals, customs and etiquettes of different ethnic groups in Malaysia will be introduced to the students. In addition, students will also been introduced to the Malay Language. At the end of the course students should be able to understand the cultures practiced among Malaysians and adapt themselves to these new cultures.

UHPS6013 Dynamics of Leadership

This course is intended to encourage students discover and develop their personal leadership qualities. Students will be exposed to leadership theories so that they could develop an insight that leadership itself is a dynamic relationship based on mutual influence and common purpose between leaders and followers. Topics covered include Introduction to Leadership, Leadership Traits & Ethics, Leadership Behaviour and Motivation, Influencing: Power, Politics, Networking and Negotiation, Contingency Leadership Theories, Communication, Coaching, and Conflict Skills, The LeaderFollower Relationship, Team Leadership, Leading Self-Managed Teams, Transformational and Level 5 Leadership. Students will be evaluated based on their class leadership role, short talk and personal learning portfolios.

URTS6013 Environmental Ethics

Environmental ethics is the discipline in philosophy that studies the moral relationship of human beings to, and also the value and moral status of, the environment and its nonhuman contents. It covers the challenge of environmental ethics to the anthropocentrism (i.e., human-centeredness) embedded in traditional western ethical thinking; the early development of the discipline in the 1960s and 1970s; the connection of deep ecology, feminist environmental ethics, and social ecology to politics; and the attempt to apply traditional ethical theories, and virtue ethics, to support contemporary environmental concerns. It focuses on environmental literature on wilderness, and possible future developments of the discipline.

UMJJ6013 Basic Japanese Language and Culture

At this course, students will be introduced to a simple yet useful familiar everyday expressions and very basic phrases using basic grammars to develop oral communication skills for social purposes. This course is suitable for beginners who wish to develop basic conversational skills in a short period. E-learning will be introduced and students must complete some Kana and communication courses within the time frame by self-learning. After this course, students are expected to speak common phrases in different situations and make simple conversation in Japanese language.

UECS6023 Introduction to Technopreneurship

This course provides an overview of the basic concepts on entrepreneurship focusing on the nature, environment, and risks of new venture formation and building of businesses with IT in the Malaysian context. Students will learn on how to analyse and evaluate the business opportunities using knowledge and skills taught in this course and suggest innovative business ideas, business planning, self-assessment and operating strategies required to start a new small business. Students will also be exposed to current case studies of existing companies involved in the IT business. Active participation by students during class discussions and activities is encouraged & expected so that students can gain hands on experience with conducting research, develop, write, evaluate, presenting and defending segments of a business plan.

UBSS6023 Business Ethics, Responsibility and Sustainability

Business plays a significant role in societal and environmental well-being. Private and public organizations are no longer responsible to shareholders and those inside the organizations. but to external parties including consumers, politicians, regulators, communities and ordinary citizens. To fulfil the conflicting needs of these stakeholders, business leaders and managers often encounter complex situations that require them to make difficult decisions whereby the lines between right and wrong are blurry. This course aims to provide students the fundamental knowledge about the role of organizations in a society and to develop their skills to sustainably manage organizations that integrate legal, ethical, economic, environmental, and social dimensions into their decision-making. The course intends to develop responsible managers who have high integrity, professionalism and interpersonal skills. The course will also teach strategies on how managers can promote responsible conducts in their companies. The course objectives will be achieved through various teaching and learning methods specifically through critical examination of case studies involving ethical issues and dilemmas on complex and controversial business problems. This course is integrative in nature built upon the understanding and reflection of the main disciplines covered in the core courses in the MBA program.

UBSS6013 Organization Behavior and Development

This course helps students integrate behavioural science theories, tools, concepts, and techniques learned in the lab to an OB application in a "real" organization. Students are expected to conceptualize and apply Organization Behaviour three-level of analysis and synthesize it with the theory and practice of Planned Change for individuals, groups and organizations. Throughout the course, participants are exposed to the important topics central to behaviours of organization and its holistic process for development and change. Some of the topics include multiple views of organizations that influence organizational change, the evolution of organizational development and its challenges. The course also covers the nature of planned change, theories and types of change, the role of values and ethics in organizational change, and the concept of emergent change to enable participants to have an overall view of how available approaches to planned change management can be applied in organizational settings.

MASTER OF CYBER SECURITY

PROGRAMME SPECIFICATIONS

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

This programme bridges the gap between those cyber security aspects with the real-world requirements. The aim of this programme is to support the global need in producing professional, dedicated and ethical cyber security experts who will effectively plan, design, manage and practice reliable cyber security mechanisms and technologies. The programme is designed based on top cyber security professional certifications such as CISSP (Certified Information Systems Security Professional), CDSP (Certified Penetration Tester), CSAP (Certified Secure Application Professional), CDSP (Certified Data Security Professional) and CHFI (Computer Hacking and Forensic Investigation).

General Information

1. Awarding Institution		Universiti Teknologi Malaysia			
2. Teachin	2. Teaching Institution			Universiti Teknologi Malaysia	
3. Program	ime Name		Master of Cyber Se	curity	
4. Final Aw	vard		Master of Cyber Se	curity	
5. Program	nme Code		MECRA1AJA		
6. Professi Accredi	onal or Statutory tation	Body of	Ministry of Higher E	ducation	
7. Languaç	ge(s) of Instruction	า	English		
8. Mode of	Study (Convention	onal, distance	Conventional,		
learning	g, etc)		Open Distance Learning (ODL).		
9. Mode of operation (Franchise, self- govern, etc)		Self-governing			
10. Study S	cheme (Full Time	e/Part Time)	Full Time		
			Full Time		
11. Study D	uration		Minimum: 1.5 years		
			Maximum: 4 years		
Type of No. of Minimum Semesters		No. of Maximum Semesters			
Semester	Full Time	Part Time	Full Time Part Tim		
Normal	3	-	8 -		
Short	-	-	-	-	

Course Classification

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

COURSE MENU

Additional Courses (for non-Computer Science/IT background)		
MECR0013	Cryptography	
MECR0023	Computer Security	

University Common Elective Courses (Choose 1 only)			
UECS6013	IT Project Management		
UHIS6013	Philosophy of Science and Civilization		
UHLM6013	Malay Language for Postgraduates		
UHMS6013	Seminar on Global Development, Economic and Social Issues		
UHMZ6023	Malaysian Society and Culture		
UBSS6013	Organization Behavior and Development		
UBSS6023	Business Ethics, Responsibility and Sustainability		
UHPS6013	Dynamics of Leadership		
URTS6013	Environmental Ethics		
UECS6023	Introduction to Technopreneurship		
UMJJ6013	Basic Japanese Language and Culture		
Core Faculty Cou	rse (Compulsory)		
MECR1013	Research Methodology		
Core Courses (Co	ompulsory)		
MECR1023	Information Security Governance and Risk Management		
MECR1033	Digital Forensics		
MECR1043	Cloud Computing Security		
MECR1053	Secure Software Engineering		
MECR1063	Cryptographic Engineering		
MECR1073	Penetration Testing		
Elective Courses	(Choose 3 only)		
MECR2113	Business Continuity Planning		
MECR2123	Security Audit & Assessment		
MECR2213	Cyber Threat Intelligence		
MECR2223	Security Data Exploration		
MECR2233	Security Data Analytics & Visualization		
MECR2313	Software Exploitation		
MECR2323	Malware Analysis		

Projects (Compulsory)			
MECR2415	Project 1		
MECR2427	Project 2		

Programme Structure (Full Time)

SYLLABUS	SEMESTER 1	SEMESTER 2	SEMESTER 3	TOTAL CREDITS
University Common Elective Courses		(Choose 1) U*** 6**3		3
Core Faculty Course	MECR 1013			3
Core Courses	MECR 1023 MECR 1033 MECR 1043 MECR 1053	MECR 1063 MECR 1073		18
Elective Courses		(Choose 1) MECR 2113 MECR 2123 MECR 2213 MECR 2223 MECR 2233 MECR 2313 MECR 2323	(Choose 2) MECR 2113 MECR 2123 MECR 2213 MECR 2223 MECR 2233 MECR 2313 MECR 2323	9
Project 1		MECR 2415		5
Project 2			MECR 2427	7
Total Credits	15	17	13	45

Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Mastery of knowledge and competency in advanced areas of Cyber Security field.
PEO2	Practice professionalism and high standards of ethical conducts within organization and society.
PEO3	Responsive to changing situations by continuously acquiring new knowledge and skills.

Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Synthesize complex information, specialized concepts, theories, methods and practice independently in the field of Cyber Security. (Knowledge and Understanding)
PLO2	Solve complex problems critically and integratively using systematic approaches. (Cognitive Skills)
PLO3	Apply practical skills to solve problems in the field of Cybersecurity. (Practical Skills)
PLO4	Demonstrate effective collaboration with stakeholders professionally. (Interpersonal Skills)
PLO5	Communicate effectively the knowledge, skills and ideas using appropriate methods to peers, experts and communities. (Communications Skills)
PLO6	Use digital technologies and appropriate software competently to enhance study and practice. (Digital Skills)
PLO7	Evaluate numerical and graphical data critically using quantitative or qualitative tools in solving problems. (Numeracy Skills)
PLO8	Demonstrate leadership, autonomy and responsibility in managing resources. (Leadership, Autonomy and Responsibility)
PLO9	Engage self-advancement through continuous learning or professional development. (Personal Skills)
PLO10	Initiate entrepreneurial projects supported by relevant knowledge and skills. (Entrepreneurial Skills)
PLO11	Demonstrate respectable ethical conducts and professionalism skills in an organization and society. (Ethics and Professionalism Skills)

GRADUATION CHECKLIST

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

*Please attach a copy of results for previous semesters and a copy of registration slip for current semester.				
	Courses	Credit	Grade	Pass
Additional C	ourses (for Non-CS background)	1		
MECR 0013	Cryptography	3		
MECR 0023	Computer Security	3		
University C	ommon Elective Courses (Choose 1 only))		<u> </u>
UECS 6013	IT Project Management	3		
UHIS 6013	Philosophy of Science and Civilization	3		
UHLM 6013	Malay Language for Postgraduates	3		
UHMS 6013	Seminar on Global Development, Economic and Social Issues	3		
UHMZ 6023	Malaysian Society and Culture	3		
UBSS 6013	Organization Behavior and Development	3		
UBSS 6023	Business Ethics, Responsibility and Sustainability	3		
UHPS 6013	Dynamics of Leadership	3		
URTS 6013	Environmental Ethics	3		
UECS 6023	Introduction to Technopreneurship	3		
UMJJ 6013	Basic Japanese Language and Culture	3		
Core Faculty	Course (Compulsory)			
MECR 1013	Research Methodology	3		
Core Course	es (Compulsory)	1		
MECR 1023	Information Security Governance and Risk Management	3		
MECR 1033	Digital Forensics	3		
MECR 1043	Cloud Computing Security	3		
MECR 1053	Secure Software Engineering	3		
MECR 1063	Cryptographic Engineering	3		

MECR 1073	Penetration Testing	3		
Elective Cou	rses (Choose 3 only)	·		
MECR 2113	Business Continuity Planning	3		
MECR 2123	Security Audit & Assessment	3		
MECR 2213	Cyber Threat Intelligence	3		
MECR 2223	Security Data Exploration	3		
MECR 2233	Security Data Analytics & Visualization	3		
MECR 2313	Software Exploitation	3		
MECR 2323	Malware Analysis	3		
Projects (Compulsory)				
MECR 2415	Project 1	5		
MECR 2427	Project 2	7		
	TOTAL CREDITS:			

CAREER OPPORTUNITIES

Security Specialist/ Administrator/ Architect/ Analyst/ Auditor/ Director/ Consultant/ Engineer/ Manager; Cryptographer; Cryptanalyst; Chief Information Security Officer; Vulnerability Assessor; Incident Responder; Forensic Expert; Penetration Tester; Source Code Auditor.

COURSE SYNOPSIS

ADDITIONAL COURSES

MECR0013 Cryptography

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

MECR0023 Computer Security

This course covers the body of knowledge on technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, damage, or unauthorized access. The types of computer security that will be covered are application security, network security, internet security, data security, information security and end user security.

CORE FACULTY COURSE

MECR1013 Research Methodology

This course covers the fundamental steps and implementation on developing the initial ideas to formal academic writing accordingly. Students will be given the mechanisms on how to transform and digest the literature reviews that leads to the proposed research title. This course helps students to prepare the research proposal for Projects. The theoretical and practical aspects of implementing the proposal will be the milestone of this course.

CORE COURSES

MECR1023 Information Security Governance and Risk Management

The course is aimed at imparting knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an information system. This course covers issues related to administration, management and governance of security of information systems. Topics include auditing and data management, risk management (risk identification, risk analysis, risk control), contingency planning, incident handling and risk governance. The course will study in detail principles and tools related to these topics. The course will also cover security standards, evaluation and certification process, security planning, ethical and legal issues in information and privacy.

MECR1033 Digital Forensics

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

MECR1043 Cloud Computing Security

In this course, we are going to learn about common cloud misconfigurations, how to perform a risk assessment and verify compliance for various Cloud Services. Further, we will delve deeper into identifying security risks in these cloud services and to implement best practices to mitigate the common cloud misconfigurations. Other topics include topics of data ownership, privacy protections, data mobility, quality of service and service levels, bandwidth costs, data protection, and support.

MECR1053 Secure Software Engineering

This course provides the principles of Secure Software Engineering and practical methods to secure requirements, design, implementation, testing, deployment and maintenance in software development. Students will also review policy specific requirements necessary to implement a secure development program within enterprise organizations. The students will also be able to understand software vulnerability, and how to evaluate, and address security risks to software.

MECR1063 Cryptographic Engineering

This course is a continuation from the introductory cryptography. All networked computers and devices must have cryptographic layers implemented and must be able to access to cryptographic functions to provide security features. In this context, efficient (in terms of time, area, and power consumption) hardware and software structures will have to be designed, implemented, and deployed. Discussion and analysis on how to resist cryptanalytic attacks by protecting access to primary (communication) and secondary (power, electromagnetic, acoustic) channels. Learn the algorithms, methods, and techniques to create latest cryptographic embedded software and hardware using common platforms and technologies. In addition to that, ethical issues in cryptography are discussed as well.

MECR1073 Penetration Testing

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

ELECTIVE COURSES

MECR2113 Business Continuity Planning

The course is aimed at imparting knowledge and skill sets required to prepare to respond to a disaster and restore normal operations afterward. This subject covers issues related to administration and management of disaster recovery program. The important plan for disaster recovery includes the contingency plans: i) the Incident Response Planning (IRP), ii) Disaster Recovery Planning (DRP), iii) Business Impact Analysis (BIA) and iv) Business Continuity Planning (BCP). Topics include preparing to develop disaster recovery plan, assessing risk, prioritizing system and functions for recovery, developing plans and procedure and organizational relationships in disaster recovery. The subject will study in detail principles and tools related to these topics. The subject will also cover procedures to response to attacks on computer, implementing disaster recovery plans, testing and rehearsal, assessment of needs, threats and solutions and living through a disaster.

MECR2123 Security Audit & Assessment

The aim of this course is to provide students with knowledge of how security audits and assessment are being performed against company's information security system. Security audits are often used to determine regulatory compliance, in the wake of legislation (such as HIPAA, the Sarbanes-Oxley Act or etc.) that specifies how organizations must deal with information. The purpose is to evaluate, assess and measure how well the security conforms to a set of established criteria. Within the broad scope of auditing information security there are multiple types of audits, multiple objectives for different audits. Most commonly the controls being audited can be categorized to technical, physical (e.g. system's physical configuration) and administrative (e.g. information handling processes and user practices). Also, auditing information security covers topics from auditing the physical security of data centers to auditing the logical security of databases and highlights key components to look for and different methods for auditing these areas.

MECR2213 Cyber Threat Intelligence

With the rapid increase of cyber-attacks, accurate security information is becoming more difficult to obtain. This course exposes the students to a complete cycle of CTI which includes hunting, behavioral patterns extraction, clustering and correlation, threat actor attribution until taking it down. Besides, it also explains the Cyber Kill Chain process in launching an attack. Understanding CKC is important in detecting cyberthreat. CTI will be explained in 3 different levels; strategic, tactical and operational.

MECR2223 Security Data Exploration

This course is essential to help the CTI analyst to dissect data to find clues in detecting the cyberthreats. It covers techniques commonly used to explore and understand data obtained from various sources. Exploratory Data Analysis in general is an approach to analyzing data sets to summarize their main characteristics, usually visual methods are used. Primarily, data is explored to see what the data can tell us beyond the formal modeling or hypothesis testing task. It ranges from pre-processing techniques for detection, validation, error correction, and filling up of missing or incorrect data. Emphasis on finding the relationship among variables and Clustering to find patterns and associations among groups of data is also covered.

MECR2233 Security Data Analytics & Visualization

This course consists of security analytics and visual analytics. Security analytics is an approach to cyber security focused on the analysis of data to produce proactive security measures. For example, monitored network traffic could be used to identify indicators of compromise before an actual threat occurs. Classification, regression and clustering we will be explored in analyzing security data. Model evaluation is also covered. Data visualization is the only approach that scales to the ever-changing threat landscape and infrastructure configurations. Using data visualization techniques, we can gain a far deeper understanding of what's happening on our network. We can uncover hidden patterns of data, identify emerging vulnerabilities and attacks, and respond decisively with countermeasures that are far more likely to succeed than conventional methods. Visual analytics and its concept and design will be covered. Security data will be visualized using selected visualization tool.

MECR2313 Software Exploitation

This course will discuss issues pertaining to software exploitation, finding vulnerabilities in various computer programs and exploiting them in an ethical manner. Topics covered include vulnerability discovery, stack overflow exploitation, format string exploitation, head overflow exploitation, shell coding, and current issues in exploitation.

MECR2323 Malware Analysis

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

PROJECTS

MECR2415 Project 1

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

MECR2427 Project 2

This is the second part of a 2-parts Master project that every student must fulfill successfully. Students are required to execute the next phases of their development plan in Project 1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated project following software development and research testing practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report to be evaluated and present their final work. The corrected report will be printed as a Master's thesis.

UNIVERSITY COMMON ELECTIVE COURSES

UECS6013 IT Project Management

This course presents a hands-on perspective to Information Technology project management. This course will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, that covers: i) Basic concepts, life cycle and framework of project management, ii) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications, and iii) Real Project Initiation, Planning, Executing, Monitoring and Closing. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risks and procurement management. Students will also be utilizing latest tools for understanding, reviewing, communicating and developing Business Model for a project. Teams of students are expected to perform real projects and achieve agreed Key Performance Indicators (KPI).

UHIS6013 Philosophy of Science and Civilization

This course discusses the meaning and nature of the philosophy of science and civilization. It seeks first to explore the different denotation, connotation, and cognitive substance of philosophy, science, and civilization, as independent concepts. It then seeks to understand these terminologies individually in their historical perspectives and their relationship to each other. Understanding the meaning and import of culture is necessary to our understanding of civilization. The study of the nature and meaning of religion is therefore significant in our appreciation of culture and civilization. Historically, Islam and the Muslims have always been intricately connected to the Western world. Thus, the discussion also includes comparative studies of Islamic and western philosophy and universal values. The final discussion is about the contribution of Islam to the world's civilization, education, culture and scientific development.

UHLM6013 Malay Language for Postgraduates

This course is offered to international students of the Masters and PhD programmes, from Indonesia, Brunei, Southern Thailand and Singapore. In this course students are given exposure on how to write scientific works (in Malay). The focus of this course is the spelling aspect, punctuation, sentence variety, language adjustment, paragraph writing and writing style. In addition, students will be exposed on writing formats such as literature writing, citations, bibliographies, abstracts and editing.

UHMS6013 Seminar on Global Development, Economic and Social Issues

This course focuses on different approaches to economic development with reference to economic growth. Discussion on this course also includes issues related to globalization, technology and digital divides as well as the social crisis that has become a global concern. It aims in developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in detail.

UHMZ6023 Malaysian Society and Culture

This course is designed for international postgraduates. This course discusses on the various aspects of the Malaysian culture and society. Topics on belief system, religious festivals, customs and etiquettes of different ethnic groups in Malaysia will be introduced to the students. In addition, students will also been introduced to the Malay Language. At the end of the course students should be able to understand the cultures practiced among Malaysians and adapt themselves to these new cultures.

UHPS6013 Dynamics of Leadership

This course is intended to encourage students to discover and develop their personal leadership qualities. Students will be exposed to leadership theories so that they could develop an insight that leadership itself is a dynamic relationship based on mutual influence and common purpose between leaders and followers. Topics covered include Introduction to Leadership, Leadership Traits & Ethics, Leadership Behaviour and Motivation, Influencing: Power, Politics, Networking and Negotiation, Contingency Leadership Theories, Communication, Coaching, and Conflict Skills, The Leader Follower Relationship, Team Leadership, Leading Self-Managed Teams, Transformational and Level 5 Leadership. Students will be evaluated based on their class leadership role, short talk and personal learning portfolios.

URTS6013 Environmental Ethics

Environmental ethics is the discipline in philosophy that studies the moral relationship of human beings to, and also the value and moral status of, the environment and its nonhuman contents. It covers the challenge of environmental ethics to the anthropocentrism (i.e., human-centeredness) embedded in traditional western ethical thinking; the early development of the discipline in the 1960s and 1970s; the connection of deep ecology, feminist environmental ethics, and social ecology to politics; and the attempt to apply traditional ethical theories, and virtue ethics, to support contemporary environmental concerns. It focuses on environmental literature on wilderness, and possible future developments of the discipline.

UMJJ6013 Basic Japanese Language and Culture

At this course, students will be introduced to a simple yet useful familiar everyday expressions and very basic phrases using basic grammars to develop oral communication skills for social purposes. This course is suitable for beginners who wish to develop basic conversational skills in a short period. E-learning will be introduced and students must complete some Kana and communication courses within the time frame by self-learning. After this course, students are expected to speak common phrases in different situations and make simple conversation in Japanese language.

UECS6023 Introduction to Technopreneurship

This course provides an overview of the basic concepts on entrepreneurship focusing on the nature, environment, and risks of new venture formation and building of businesses with IT in the Malaysian context. Students will learn on how to analyse and evaluate the business opportunities using knowledge and skills taught in this course and suggest innovative business ideas, business planning, self-assessment and operating strategies required to start a new small business. Students will also be exposed to current case studies of existing companies involved in the IT business. Active participation by students during class discussions and activities is encouraged & expected so that students can gain hands on experience with conducting research, develop, write, evaluate, presenting and defending segments of a business plan.

UBSS6023 Business Ethics, Responsibility and Sustainability

Business plays a significant role in societal and environmental well-being. Private and public organizations are no longer responsible to shareholders and those inside the organizations, but to external parties including consumers, politicians, regulators, communities and ordinary citizens. To fulfil the conflicting needs of these stakeholders, business leaders and managers often encounter complex situations that require them to make difficult decisions whereby the lines between right and wrong are blurry. This course aims to provide students the fundamental knowledge about the role of organizations in a society and to develop their skills to sustainably manage organizations that integrate legal, ethical, economic, environmental, and social dimensions into their decision-making. The course intends to develop responsible managers who have high integrity, professionalism and interpersonal skills. The course will also teach strategies on how managers can promote responsible conducts in their companies. The course objectives will be achieved through various teaching and learning methods specifically through critical examination of case studies involving ethical issues and dilemmas on complex and controversial business problems. This course is integrative in nature built upon the understanding and reflection of the main disciplines covered in the core courses in the MBA program.

UBSS6013 Organization Behavior and Development

This course helps students integrate behavioural science theories, tools, concepts, and techniques learned in the lab to an OB application in a "real" organization. Students are expected to conceptualize and apply Organization Behaviour three-level of analysis and synthesize it with the theory and practice of Planned Change for individuals, groups and organizations. Throughout the course, participants are exposed to the important topics central to behaviours of organization and its holistic process for development and change. Some of the topics include multiple views of organizations that influence organizational change, the evolution of organizational development and its challenges. The course also covers the nature of planned change, theories and types of change, the role of values and ethics in organizational change, and the concept of emergent change to enable participants to have an overall view of how available approaches to planned change management can be applied in organizational settings.

MASTER in INNOVATIVE COMPUTING

PROGRAM SPECIFICATIONS

The Master in Innovative Computing is a coursework programme offered on a full-time basis at the UTM Main Campus in Johor Bahru. The duration of study for the full-time programme is subjected to the students' entry qualifications and lasts between one (1) year to a maximum of four (4) years.

The coursework programme is offered based on 2 normal semesters and 1 short semester per academic session. This program is a general program for computing field that provides exposure in computing field to graduates of computer science, science and technology engineering, mathematics and social sciences. The program is suitable for graduates who have none or have work experience. In addition, this program is a conversion program for graduates with specialization other than Computer Science where graduates can make this program as an additional field (supplementary) or re-skilling to their field at their first-degree level.

1. Awarding Ins	stitution		Universiti Tel	knologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia		
3. Programme	Name		Master in Inn	ovative Computing	
4. Final Award			Master in Innovative Computing		
5. Programme	Code		MECC	MECC	
6. Professional or Statutory Board of Accreditations			Malaysian Qualification Agency (MQA)		
7. Language(s) Instruction			English		
8. Mode of Study (Conventional, Distance Learning, etc.)			Conventional		
9. Mode of Operation (Franchise, Self-govern, etc.)			Self-governing		
10. Study Scheme	e (Full Time / Part Tir	me)	Full Time		
11. Study Duratior	1		Minimum Maximum	1 Year (2 Normal Semesters + 1 Short Semesters 4 Years (8 Semesters)	
Types of	No of Se	emesters	No of V	Neeks / Semesters	
Semesters	Full Time	Part Time	Full Time	Part Time	
Normal	2	-	17	-	
Short	1	-	9	-	

GENERAL INFORMATION

COURSE CLASSIFICATION

No	Classification	Credit Hours	Percentage (%)
i.	University compulsory courses	3	6.7
ii.	Core courses	21	46.7
iii.	Elective courses	12	26.6
iv.	Master project	9	20
	Total	45	100
Total Credit Hours to Graduate		45 crec	lit hours

AWARD REQUIREMENTS

Student will be awarded with Master in Innovative Computing after graduating and meet the conditions set by UTM as below:

- Pass all courses with a total accumulated credit of 45 and pass CGPA of 3.0 and above.
- Achieved all conditions given in the preparation of master's Project.
- An applicant has applied for the award of Master in Innovative Computing.

ENTRY REQUIREMENTS

General University Requirements:

Minimum Bachelor's Degree (Honors) with CPA 2.50/4.00 in the relevant field, or equivalent from a recognized university based on UTM's "Syarat Kemasukan Penilaian 1998 Pindaan 1/2013 (Kerja Kursus/ Mod Campuran/ Penyelidikan).

School's Requirements:

Bachelor's Degree in the Computer Science field recognized by the Senate of UTM with honours or equivalent with at least CGPA 2.50 and above.

OR

Bachelor's Degree in Science / Technology / Engineering or Mathematics or other related fields recognized by the Senate of UTM or equivalent with at least CGPA 2.50 and above.

OR

Bachelor's Degree in Social Sciences or equivalent with at least CGPA 2.50 AND pass (honours) in Mathematics at STPM or Foundation level AND pass the following pre-Master courses during the first semester studies:

- i) Object-oriented Programming
- ii) Computer Security

OR

An applicant with a CGPA < 2.50 is required to have at least 5 years working experience in computing related field.

OR

An applicant with a Diploma in Computer Science recognized by the Senate of UTM or equivalent is required to have at least 5 years of working experience in a field related to Computer Science or its equivalent AND pass the APEL A - T7 assessment.

English Language Requirements:

International students who apply to UTM requires following qualification:

- TOEFL or IELTS within two years with a TOEFL score (IBT 60 OR IELTS Band 6 OR
- ELS Certified Intensive English Program (CIEP) Level 108 **OR**
- Cambridge English Qualifications (CEQ) B2 First, C1 Advanced, C2 Skill Score sometime 169 **OR**
- Academic PTE-59 **OR**
- Malaysian University Entrance Test (MUET) Band 4.

Refer to English eligibility requirements on the old web: https://admission.utm.my/englishlanguagerequirements-3 /

An applicant who does not fulfil English language requirements requires one of the following before registering for the program:

- Intensive English Language Program (IEP) by Language Academic (LA), UTM and pass IELTS Band 6.0 **OR** pass CEFR aligned test with required score **OR**
- Certified Intensive English Program (CIEP) conducted by ELS Language Center and passed level 108

Accepted OKU category if only the category of physical disability and paralysis as outlined by the Suruhanjaya Perkhidmatan Awam (SPA). However, applicants are able to use their hands to write and type.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The aim of this programme is to meet the needs of improving the knowledge and skills of employees from the field of computer science and other than computer science.

To meet this goal, after 3 to 5 years of graduates, the program graduates will be able to:

Program Objectives	Description
PEO1	To produce graduates who are mastery of knowledge and competency in areas of Computing field.
PEO2	To produce graduates who are professionalism with high standards of ethical conducts within organization and global society.
PEO3	To produce students who can be responsive to changing situations by continuously acquiring new knowledge and skills.

PROGRAMME LEARNING OUTCOME (PLO)

This Master in Innovative Computing programme offers learning outcomes that cumulatively reflects eleven (11) learning outcomes based on MQF (2nd Edition) and the Programme Standards for Computing. Graduates from this programme will be able to:

Program Learning Outcomes	Description
PLO1	Synthesize complex information, specialized concept, theories, methods and practice independently in the field of computing
PLO2	Construct innovative solutions to complex problems or issues in the field of computing.
PLO3	Apply practical skills and tolls that are based on the innovative forefront knowledge and the latest development in the field of computing.
PLO4	Collaborate with different people in communities ethically and professionally.
PLO5	Communicative effectively the results of scholarly work to peers, experts and non-experts.
PLO6	Use digital technologies and software competently to support research work or studies.
PLO7	Analyse numerical and graphically data using quantitative or qualitative tools related to the field of computing.
PLO8	Demonstrate leadership, autonomy and responsibility in the context of complex application and unpredictable situation.
PLO9	Demonstrate self-advancement through continuous academic and professional development.
PLO10	Initiate entrepreneurial project with relevant knowledge and expertise.
PLO11	Demonstrate adherence to ethical and professional codes of practice in advising and decision making.

COURSE MENU

Syllabus	SEMESTER 1	SEMESTER 2	SEMESTER 3	TOTAL
University Compulsory Course (Choose 1)	UBSS 6013 / UBSS 6023 / UHMS 6013 / UHMZ 6023 / UHISS 6013 / UHPS 6013 / UHLM 6013 / URTS 6013 / UECS 6013 / UECS 6023 / UMJJ 6013			3
School Compulsory Courses	MECC1103 MECC1113 MECC1133 MECC1143 MECC1123	MECC1213 MECC1203		21
School Contemporary & Advanced Elective Courses (Choose: 2 – Contemporary 2 - Advanced)		MECC 1403 / MECC 1413 / MECC 1423 / MECC 1423 / MECC 1433 / MECC 1443 / MECC 1453 / MECC 1503 / MECC 1513 / MECC 1523 / MECC 1523 / MECC 1543 / MECC 1603 / MECC 1613 / MECC 1623 / MECC 1633 Choose 3	MECC 1403 / MECC 1413 / MECC 1423 / MECC 1423 / MECC 1433 / MECC 1443 / MECC 1453 / MECC 1503 / MECC 1513 / MECC 1523 / MECC 1523 / MECC 1543 / MECC 1603 / MECC 1613 / MECC 1623 / MECC 1633 Choose 1	12
Innovative Computing Project 1 & 2		MECC1233	MECC1316	9
Total Credits	18	18	9	45

GRADUATION CHECKLIST

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

University Com	nmon Course (Choose 1 course)	Credit		
UBSS 6013	Organisation Behaviour and Development	3		
UBSS 6023	Business Ethics, Responsibility and Sustainability	3		
UHMS 6013	Seminar on Global Development, Economic and Social Issues	3		
UHMZ 6023	Malaysian Society and Culture	3		
UHISS 6013	Philosophy of Science and Civilization	3		
UHPS 6013	Dynamic of Leadership	3		
UHLM 6013	Malay Language for Post Graduates	3		
URTS 6013	Environmental Ethics	3		
UECS 6013	IT Project Management	3		
UECS 6023	Introduction to Technopreneurship	3		
UMJJ 6013	Basic Japanese Language and Culture	3		
Core Courses (Compulsory)			
MECC1103	Research Methodology	3		
MECC1113	Computation and Programming	3		
MECC1133	Machine Learning	3		
MECC1143	Cloud Computing	3		
MECC1123	Software Engineering and Innovation	3		
MECC1213	Cyber Security	3		
MECC1203	Computational Statistic for Data Analysis	3		
Cotemporary E	lective Courses (Choose 2)			
MECC1403	Cotemporary Software Development	3		
MECC1433	Secure Software Development	3		
MECC1443	Advanced Human Computer Interaction	3		
MECC1513	Business Intelligence and Analytics	3		
MECC1543	Professional Special Topic	3		
MECC1603	Cloud Computing Security	3		
MECC1633	Digital Forensic	3		
Advanced Elective Courses (Choose 2)				
MECC1413	Software Verification and Validation	3		
MECC1423	Cyber Physical System	3		
MECC1453	Virtual and Augmented Reality	3		
MECC1503	Big Data Management	3		
MECC1523	Business Continuity Planning	3		

MECC1533	Supply Chain Data Analytics	3
MECC1613	Penetration Testing	3
MECC1623	Information Security Governance and Risk Management	3
Innovative Project		
MECC1233	Innovative Computing Project I	3
MECC1316	Innovative Computing Project II	6
Total		45

COURSE SYNOPSIS

CORE COURSES

MECC1103 Research Methodology

This course covers the general principles of Research Methodology that are applicable to Computing and Digital Technology discipline. It discusses the fundamental process in conducting academic research. The theoretical and practical aspects of preparing a research proposal presented. Among topics that will be covered are introduction to research and its philosophy, problem formulation and research objectives, literature review, research methodology and design, data collection procedures, data analysis, research proposal and thesis preparation and research management.

MEC1113 Computation and Programming

Solving problems in areas such as business, biology, physics, chemistry, engineering, humanities, and social sciences often requires manipulating, analyzing, and visualizing data through computer programming. This course aims of the module is to equip students with a grounding in foundations of computing, to enable students from a wider background to confidently undertake a taught master's programme in advanced computing topics. At the end of this course, students are expected to mastery in foundational concepts of computing.

MECC1133 Machine Learning

This course introduces students to the fundamentals of cognitive computing. The subject matter focuses on simulating human thought processes in a computerized model. Using self-learning algorithms that use data mining, pattern recognition and natural language processing, the computer can mimic the way the human brain works. this course emphasizes on theoretical and practical aspects of various machine learning algorithms related to represent the cognitive capabilities in computational technologies. The course features practical implementations through assignments undertaken both individually and in groups.

MECC1143 Cloud Computing

This course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large-scale distributed systems which form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

MECC1123 Software Engineering and Innovation

Software Development and Engineering is a comprehensive industry project-based learning course which requires student to investigate community or industry needs, solve the related problems, design and develop application according to software engineering practices. This course offers the student to develop their entrepreneurial skill by discovering a practical solution and innovates a unique application to reveal potential niche opportunities.

MEC1213 Cyber Security

The course is aimed at imparting fundamental knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an information system. This course covers the topics of the threats to computer as well as other general security areas such as program and network, evaluating the relative risks of these threats and developing cost-effective and user-friendly countermeasures. The course will study in detail principles and tools related to these topics. At the end of this course, the student should gain some knowledge and experience with respect to the risks of secure computing.

MECC1203 Computational Statistic for Data Analysis

This course provides a foundation concept to data analytics. Students will learn statistical inference including estimation, hypothesis testing and nonparametric tests. Further, students will be introduced to Bayesian inference, linear regression and classification. R will be used to apply these statistical methods. At the end of the course, students should be able to apply the statistical methods to real large data sets.

ELECTIVE COURSES

COTEMPORARY ELECTIVE COURSES

MECC1403 Cotemporary Software Development

This course aims to equip students to develop techniques of software-intensive systems through successful requirements engineering, design, testing, maintenance and evolution, and project and quality management. Students build on their basic software engineering knowledge by extending it with specific techniques for maintenance, evolution, dependability, reliability, safety, security, and resilience.

MECC1433 Secure Software Development

This course provides the principles of Secure Software Development and practical methods to secure requirements, design, implementation, testing, deployment and maintenance in software development. Students will also review policy specific requirements necessary to implement a secure development program within enterprise organizations. The students will also be able to understand software vulnerability, and how to evaluate, and address security risks to software.

MECC1443 Advance Human Computer Interaction

This course provides the students with advanced topics in Human Computer Interaction (HCI). The course gives students practice and theoretical knowledge of the use of HCI methodologies for both design and evaluation, different types of HCI experimentation, including both quantitative and qualitative methods. Students are expected to participate in group activities, student-led presentations and discussion of several research papers in HCI.

MECC1513 Business Intelligence and Analytics

Business analytics refers to the ways in which enterprises such as businesses, non-profits and governments can use data to gain insights and make better decisions. Business analytics is applied in operations, marketing, finance and strategic planning among other functions. The ability to use data effectively to drive rapid, precise and profitable decision has been critical strategic advantages for companies. With the increasing availability of broad and deep sources of information-so called "Big data"-business analytics are becoming an even more critical capability for enterprises of all types and all sizes. It combines statistical analysis and predictive modelling to identify trends and understand the information that can drive business change and support sustained successful business practices.

MECC1543 Professional Special Topics

This course provides students with current issues related to software engineering in general and specifically in software development life cycle that includes planning, analysis, design, implementation, and maintenance. The key objective of this course is to equip the students with the knowledge in current issues mainly the current trend and technology in industry. Based on the given problems, the students should argue and think critically what could be other alternatives besides the current solutions.

MECC1603 Cloud Computing Security

In this course, we are going to learn about common cloud misconfigurations, how to perform a risk assessment and verify compliance for various Cloud Services. Further, we will delve deeper into identifying security risks in these cloud services and to implement best practices to mitigate the common cloud misconfigurations. Other topics include topics of data ownership, privacy protections, data mobility, quality of service and service levels, bandwidth costs, data protection, and support.

MECC1633 Digital Forensic

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

ADVANCED ELECTIVE COURSES

MECC1413 Software Verification and Validation

The content of the course discusses the Software Quality issues much beyond the classic boundaries of custom-made software development by large established software houses. It dedicates significant attention to the other software development and maintenance environment that reflect the current state of industry. This course is designed to provide students with in depth knowledge on software quality assurance components, software testing and its test process. The course covers the basic principles of software quality assurance, software testing and test activities that include the test plan, test design, monitoring, implementation and test closure. The students will also learn various categories of test design techniques and methods used in both black-box and white-box testing. At the end of this course, students should be able to recognize various types and levels of testing as well as categorizing and applying software testing process and techniques. The students should also be able to do work effectively in a team and lead the team in the test activities throughout the software testing life cycle.

MECC1423 Cyber Physical System

Cyber-physical systems (CPS) are engineered systems that are built from, and depend upon, the seamless integration of computational algorithms and physical components. Designing algorithms to control CPS is challenging due to their tight coupling with physical behavior. The future CPS workforce is likely to include CPS engineers, who focus on the knowledge and skills spanning cyber technology and physical systems that operate in the physical world. This course provides a foundation that highlights the interaction of cyber (computation and/or communication) and physical aspects (physical plants) of systems.

MECC1453 Virtual and Augmented Reality Environment

This course focuses on Virtual and Augmented Reality (AR) systems, algorithms, and applications. With the proliferation of powerful, always-on, Internet- connected mobile devices such as smartphones, tablets and newer head-worn displays, sophisticated applications that combine location-specific content with the current user view are becoming more possible. Application developers for these devices require a broad set of technical and design skills to create effective interactive AR experiences. Topics will include vision-based marker and feature tracking, model-to-view space transformations, mobile application development, and AR interaction techniques.

MECC1503 Big Data Management

This course provides a basic fundamental of big data architecture and management. Students will learn the big data processes and the current big data technologies that are available. Further, students will be exposed to the big data platform ecosystem for big data manipulation. The big data management will be explored for the best practice in managing and manipulating large amount of data. At the end of the course, students should be able to understand the architecture and management of big data and also can develop simple application of big data handling using particular platform in assignment.

MECC1523 Business Continuity Planning

The subject is aimed at imparting knowledge and skill sets required to prepare to respond to a disaster and restore normal operations afterward. This subject covers issues related to administration and management of disaster recovery program. The important plan for disaster recovery includes the contingency plans: i) the Incident Response Planning (IRP), ii) Disaster Recovery Planning (DRP), iii) Business Impact Analysis (BIA) and iv) Business Continuity Planning (BCP). Topics include preparing to develop disaster recovery plan, assessing risk, prioritizing system and functions for recovery, developing plans and procedure and organizational relationships in disaster recovery. The subject will study in detail principles and tools related to these topics. The subject will also cover procedures to response to attacks on computer, implementing disaster recovery plans, testing and rehearsal, assessment of needs, threats and solutions and living through a disaster.

MECC1533 Supply Chain Analytics

The course aims to improve operational efficiency and effectiveness by enabling data-driven decisions at strategic, operational and tactical levels. The student will able to perform analysis using data analytics methods and analytical tools necessary in the areas of predictive, descriptive and prescriptive analytics to efficiently manage demand and supply networks. Through the analysis and discussion of case studies they will discover business insights in order to optimize the value of supply chain processes and operations. The topics covered including designing the supply chain network, planning demand and supply in a supply chain, retail analytics, inventory management and transport analytics. Software packages such as R, Python and Tableau will be utilized.

MECC1613 Penetration Testing

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

MECC1623 Information Security Governance and Risk Management

The course is aimed at imparting knowledge and skill sets required to assume the overall responsibilities of administration and management of security of an information system. This course covers issues related to administration, management and governance of security of information systems. Topics include auditing and data management, risk management (risk identification, risk analysis, risk control), contingency planning, incident handling and risk governance. The course will study in detail principles and tools related to these topics. The course will also cover security standards, evaluation and certification process, security planning, ethical and legal issues in information and privacy.

UNIVERSITY COURSES

UBSS6013 Organization Behavior & Development

This course helps students integrate behavioral science theories, tools, concepts, and techniques learned in the lab to an OB application in a "real" organization. Students are expected to conceptualize and apply Organization Behavior three-level of analysis and synthesize it with the theory and practice of Planned Change for individuals, groups and organizations. Throughout the course, participants are exposed to the important topics central to behaviors of organization and its holistic process for development and change. Some of the topics include multiple views of organizations that influence organizational change, the evolution of organizational development and its challenges. The course also covers the nature of planned change, theories and types of change, the role of values and ethics in organizational change, and the concept of emergent change to enable participants to have an overall view of how available approaches to planned change management can be applied in organizational settings.

UBSS6023 Business Ethics, Responsibility and Sustainability

This course aims to provide students the fundamental knowledge about the role of organizations in a society and to develop their skills to sustainably manage organizations that integrate legal, ethical, economic, environmental, and social dimensions into their decision-making. The course intends to develop responsible managers who have high integrity, professionalism and interpersonal skills. The course will also teach strategies on how managers can promote responsible conducts in their companies. The course objectives will be achieved through various teaching and learning methods specifically through critical examination of case studies involving ethical issues and dilemmas on complex and controversial business problems. This course is integrative in nature built upon the understanding and reflection of the main disciplines covered in the core courses in the MBA program.

UHMS6013 SEMINAR ON GLOBAL DEVELOPMENT, ECONOMIC AND SOCIAL ISSUES

This course focuses on different approaches to economic development with particular reference to economic growth. Discussion on this course also includes issues related to globalization, technology and digital divides as well as the social crisis that has become a global concern. It aims in developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in detail.

UHMZ6023 Malaysian Society & Culture

This course is designed for international postgraduates. This course discusses on the various aspects of the Malaysian culture and society. Topics on belief system, religious festivals, customs and etiquettes of different ethnic groups in Malaysia will be introduced to the students. In addition, students will also be introduced to the Malay Language. At the end of the course students should be able to understand the cultures practiced among Malaysians and adapt themselves to these new cultures.

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This course discusses the meaning and nature of the philosophy of science and civilization. It seeks first to explore the different denotation, connotation, and cognitive substance of philosophy, science, and civilization, as independent concepts. It then seeks to understand these terminologies individually in their historical perspectives and their relationship to each other. Understanding the meaning and import of culture is necessary to our understanding of civilization. The study of the nature and meaning of religion is therefore significant in our
appreciation of culture and civilization. Historically, Islam and the Muslims have always been intricately connected to the Western world. Thus, the discussion also includes comparative studies of Islamic and western philosophy and universal values. The final discussion is about the contribution of Islam to the world's civilization, education, culture and scientific development.

UHPS6013 Dynamics of Leadership

This course is intended to encourage students discover and develop their personal leadership qualities. Students will be exposed to leadership theories so that they could develop an insight that leadership itself is a dynamic relationship based on mutual influence and common purpose between leaders and followers. Topics covered include Introduction to Leadership, Leadership Traits & Ethics, Leadership Behavior and Motivation, influencing: Power, Politics, Networking and Negotiation, Contingency Leadership Theories, Communication, Coaching, and Conflict Skills, The Leader- Follower Relationship, Team Leadership, Leading Self-Managed Teams, Transformational and Level 5 Leadership. Students will be evaluated based on their class leadership role, short talk and personal learning portfolios

UHLM6013 Malay Language for Post Graduates

Kursus ini ditawarkan kepada pelajar antarabangsa program Sarjana dan Doktor Falsafah dari rumpun Melayu seperti Indonesia, Brunei, Selatan Thailand dan Melayu-Singapura. Dalam kursus ini pelajar diberi pendedahan tentang penulisan karya ilmiah. Perkara yang menjadi fokus kursus ini adalah aspek ejaan, tanda baca, ragam ayat, laras bahasa, penulisan perenggan dan gaya penulisan. Di samping itu pelajar akan didedahkan dengan format-format penulisan seperti penulisan literatur, kutipan, bibliografi, abstrak dan penyuntingan.

URTS6013 Environmental Ethics

Environmental ethics is the discipline in philosophy that studies the moral relationship of human beings to, and also the value and moral status of, the environment and its nonhuman contents. It covers the challenge of environmental ethics to the anthropocentrism (i.e., human-centeredness) embedded in traditional western ethical thinking; the early development of the discipline in the 1960s and 1970s; the connection of deep ecology, feminist environmental ethics, and social ecology to politics; and the attempt to apply traditional ethical theories, and virtue ethics, to support contemporary environmental concerns. It focusses on environmental literature on wilderness, and possible future developments of the discipline.

UECS6013 IT Project Management

This course presents a hands-on perspective to Information Technology project management. This course will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, that covers I) Basic concepts, life cycle and framework of project management II) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications, and III) Real Project Initiation, Planning, Executing, Monitoring and Closing. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risks and procurement management. Students will also be utilizing latest tools for understanding, reviewing, communicating and developing Business Model for a project. Teams of students are expected to perform real projects and achieve agreed Key Performance Indicators (KPI).

UECS6023 Introduction to Technopreneurship

This course provides an overview of the basic concepts on entrepreneurship focusing on the nature, environment, and risks of new venture formation and building of businesses with IT in the Malaysian context. Students will learn on how to analyze and evaluate the business opportunities using knowledge and skills taught in this course and suggest innovative business ideas, business planning, self-assessment and operating strategies required to start a new small business. Students will also be exposed to current case studies of existing companies involved in the IT business. Active participation by students during class discussions and activities is encouraged & expected so that students can gain hands on experience with conducting research, develop, write, evaluate, presenting and defending segments of a business plan.

UMJJ6013 Basic Japanese Language & Culture

students will be introduced to a simple yet useful familiar everyday expressions and very basic phrases using basic grammars to develop oral communication skills for social purposes. This course is suitable for beginners who wish to develop basic conversational skills in a short period. E-learning will be introduced and students must complete some Kana and communication courses within the time frame by self-learning. After this course, students are expected to speak common phrases in different situations and make simple conversation in Japanese language.

MASTER PROJECT

MECC1233 Innovative Computing Project I

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

MECC1316 Innovative Computing Project II

This is the second part of a 2-part Master project that every student must fulfil successfully. In this installation, students are required to execute the next phases of their development plan from Part1. Students are now required to code and integrate the different modules that make up the proposed project. Students will test the developed modules and the final fully-integrated project following software development and research testing practices. Students must meet regularly with supervisor(s) who will monitor their continuous progress. Students are required to prepare a report and present their final work.