

## 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. Students with a minimum CGPA of 3.5 can register one (1) elective course together with dissertation. Students who register courses with UM status can also register dissertation. 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 evaluation 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. Programme Name	Master of Computer Science
4. Final Award	Master of Computer Science
5. Programme Code	MCSSA2AJA
6. Professional or Statutory Body of Accreditation	Ministry of Higher Education
7. Language(s) of Instruction	English
8. Mode of Study (Conventional, distance learning, etc)	Conventional
9. Mode of operation (Franchise, self-govern, etc)	Self-governing
10. Study Scheme (Full Time/Part Time)	Full Time
11. Study Duration	Full-time : Minimum - 3 semesters : Maximum - 8 semesters

Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	3	-	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%
	<b>Total</b>	<b>45</b>	<b>100%</b>
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 their first assessment (proposal defense).

- xii. **FOUR** Core Courses
- xiii. **TWO** Elective Courses
- xiv. **ONE** University Elective Course (course code U\*\*\* \*\*3).
- xv. Research (course code MCSS xx80)

**FULL TIME MODE**

<b>YEAR 1: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
MCSS1023	Advanced Data Structure and Algorithm	3	
MCSS2313	Advanced Computer System and Architecture		
MCSS2093	Advanced Theory of Computer Science		
MCSS1283	Research Methodology in Computer Science		
Mxxx xxx3	Elective I	3	
Uxxx xxx3	University Common Elective	3	
	<b>TOTAL CREDIT</b>	<b>18</b>	
	<b>CUMULATIVE CREDITS</b>	<b>18</b>	

<b>YEAR 1: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
Uxxx xxx3	Elective II	3	
MCSSxx80	Dissertation I	9	
	<b>TOTAL CREDIT</b>	<b>12</b>	
	<b>CUMULATIVE CREDITS</b>	<b>30</b>	

<b>YEAR 2: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
MCSSxx80	Dissertation II	15	
	<b>TOTAL CREDIT</b>	<b>15</b>	
	<b>CUMULATIVE CREDITS</b>	<b>45</b>	

**PART TIME MODE**

<b>YEAR 1: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
MCSS1023	Advanced Data Structure and Algorithm	3	
MCSS2313	Advanced Computer System and Architecture		
MCSS1283	Research Methodology in Computer Science		
	<b>TOTAL CREDIT</b>	<b>9</b>	
	<b>CUMULATIVE CREDITS</b>	<b>9</b>	

<b>YEAR 1: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
MCSS2093	Advanced Theory of Computer Science	3	
Uxxx xxx3	Elective I		
Uxxx xxx3	University Common Elective		
	<b>TOTAL CREDIT</b>	<b>9</b>	
	<b>CUMULATIVE CREDITS</b>	<b>18</b>	

<b>YEAR 2: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
Uxxx xxx3	Elective II	3	
MCSSxx90	Dissertation I	9	
	<b>TOTAL CREDIT</b>	<b>12</b>	
	<b>CUMULATIVE CREDITS</b>	<b>30</b>	

<b>YEAR 2: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
MCSSxx80	Dissertation II	15	
	<b>TOTAL CREDIT</b>	<b>15</b>	
	<b>CUMULATIVE CREDITS</b>	<b>45</b>	

\* Research (course code MCSS \*\*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	MCSS xx80
2	MCSS xx80

#### **Programme Educational Objectives (PEO)**

After having exposed to 3 to 5 years working experience, our graduates should become professionals who demonstrate the following competencies:

<b>Code</b>	<b>Intended Educational Objectives</b>
PEO1	<b>Ability to independently acquire, develop &amp; apply advanced computer science knowledge and skills to solve problems</b>
PEO2	Competent to be a good researchers and/or academicians in areas related to computer science.
PEO3	Communicate effectively in both written and oral across different organizational contexts and multiple stakeholders.
PEO4	Consistently perform their responsibilities ethically and professionally and understand the impact of computing solution in the global context

### Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Ability to demonstrate a mastery of knowledge in the field of computer science
PLO3	Ability to demonstrate ability to contribute idea in solving problems related to computer science to society
PLO4	Ability to demonstrate behaviours that are consistent with the code of Professional Ethics and Responsibilities
PLO5	Ability to communicate technical solutions and research findings to a range of audience orally and in writing
PLO6	Ability to generate solutions to problems using scientific and critical thinking skills
PLO7	Ability to manage information for lifelong long learning

## 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 EARNED (JKD)	CREDIT COUNT-ED (JKK)	TICK (✓) IF PASSED
<b>CORE COURSES (12 CREDITS) - ALL</b>					
1	MCSS1023	Advanced Data Structure and Algorithm	3	3	
	MCSS1283	Research Methodology in Computer Science			
	MCSS2093	Advanced Theory of Computer Science			
	MCSS2313	Advanced Computer System and Architecture			
<b>TOTAL CREDIT OF CORE COURSES (a)</b>			<b>12</b>	<b>12</b>	
<b>ELECTIVE COURSES (6 CREDITS) – CHOOSE 2 ONLY</b>					
2	MCSS 1093	Advanced Software Engineering	3	3	
	MCSS 1323	Advanced Computer Graphics			
	MCSS 1413	Cryptography			
	MCSS 1453	Advanced Database			
	MCSS 1513	Advanced Artificial Intelligence			
	MCSS 2323	Advanced Computer Communication and Network			
	MCSS 2423	Data Mining			
	MCSS 2443	Network and Internet Security			
	MCSS 2603	Special Topic in Computer Science			
<b>TOTAL CREDIT OF ELECTIVE COURSES (b)</b>			<b>6</b>	<b>6</b>	
<b>UNIVERSITY GENERAL COURSES (3 CREDITS) – CHOOSE 1 ONLY</b>					
1	UCSM1263	IT Project Management	3	3	
	ULAM 6013	Malay Language for Academic Writing			
	UHAP 6013	Seminar on Global Development, Economic and Social Issues			

<b>RESEARCH</b>						
1	Hard-Bound Thesis endorsed by supervisor – 3 copies					
2	Copy of CD for Each Thesis – Extra 1 unit					
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					
	UICW 6023	Philosophy of Science and Civilization				
	UHAZ 6123	Malaysian Society & Culture				
<b>TOTAL CREDIT OF UNIVERSITY GENERIC COURSES (c)</b>			<b>3</b>	<b>3</b>		
<b>RESEARCH (24 CREDITS)</b>						
1	MCSS xx80	Dissertation I	9	9		
2	MCSS xx80	Dissertation II	15	15		
<b>TOTAL CREDIT OF CORE COURSES (d)</b>			<b>24</b>	<b>24</b>		
<b>TOTAL CREDIT TO GRADUATE (a + b + c + d)</b>			<b>45</b>	<b>45</b>		

## **COURSE SYNOPSIS**

### **CORE COURSES**

#### **MCSS1023 – Advanced Data Structure & Algorithms**

This course provides a solid or advanced understanding to 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.

#### **MCSS1283 – 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 an 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.

#### **MCSS2093 – 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 question 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 to 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.

#### **MCSS2313 – Advanced Computer System and 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, high-speed 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. An undergraduate course in computer architecture (or equivalent) is the prerequisite.



## **ELECTIVE COURSES**

### **MCSS1093 – Advanced Software Engineering**

This course is intended to provide exposure and in-depth comprehension on the concepts, principles, and state-of-the-art methods and use of UML in object-oriented analysis, software design, software pattern and software architectures, including domain-specific software architectures, architectural styles, their properties and the types of problems for which they are most appropriate, and architecture-based testing and analysis. The course also examines the practical applicability of concepts, principles and methods, specifically the relationship between requirements, design and implementation. The course also provides extensive hands-on experience in applying theories, concepts and principles in analysis and design of software extensive real-life projects utilizing UML notation and object-oriented design.

### **MCSS1323 – Advanced Computer Graphics**

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 theory of Computer Graphics & Image Processing. Later part of lectures will deal with applications of Computer Graphics & Image Processing. At the end of the course, students should be able to write graphics and image processing application using standard software tools.

### **MCSS1413 – Cryptography**

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

### **MCSS1453 – Advanced Database**

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 paper on their topic of interest and a practical group project in databases to expose them to issues and research solutions regarding emerging database technologies.

### **MCSS1513 – Advanced Artificial Intelligence**

Increasing practical implementation of several Soft Computing (SC) /Computational Intelligence (CI) approaches in real world problems has grounded this course to explore the intensity of SC/CI techniques. As such, Artificial Neural Network (ANN), Evolutionary Computing (EC), Swarm Intelligence and Fuzzy System (FS) 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.

### **MCSS2323 – Advanced Computer Communication and Network**

This subject covers an up-to-date survey of research and development activities in the area of computer communications and networks. Recent developments in computer networking are covered in this course via class lecture notes, survey articles and reading assignments. Topics covered in this subject are: Overview of Computer Networks, Network Architectures with emphasis on TCP/IP, Internetworking Techniques and Protocols, Multimedia Communications, Network Management, Network Security, Mobile Networks, and other current research issues in the area of Computer Communication and Networks.

### **MCSS 2423 – Data Mining**

This subject presents a comprehensive introduction to knowledge discovery in databases (KDD). It provides a solid understanding of the entire discovery processes and the needs for it. Data mining as steps taken within KDD are explained. Students apply the knowledge learnt to solve some real world problems.

### **MCSS2443 – Network and Internet Security**

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

### **MCSS2603 – Special Topic in Computer Science**

This course focus on varied topics in computer science and technologies, presented as a result of technological change or community or student interest, that include a variety of computer-related skills or intensive study in a specific area of computer science and technologies. Topics are announced each semester in the class schedule. Course may be repeated for different topics. Upon course completion, a student will be able to assess the feasibility and applications of the specialized technologies, recognize and explain the methods, techniques and skills specific to the topics and apply the specialized methods, techniques, and skills in software implications in computer and information systems.

## **RESEARCH**

### **MCSS XX80/XX90 – Dissertation**

A dissertation is a research component of the program which carries a total equivalent to 24 credit hours. There will be a taught component covering the theory and practical aspects of conducting research for students taking the subject for the first time. Topics covered include

problem formulation, literature review, research methodology, data analysis, research ethics, report writing, publication and presentation. In the dissertation for the following semesters, students will continue to carry out the research work guided by a single or a panel of supervisor(s). Students have to undergo first assessment of a research proposal to ensure their research is viable. Students are expected to submit the dissertation after which they will be assessed by a panel of examiners comprising of internal and external experts in the field.